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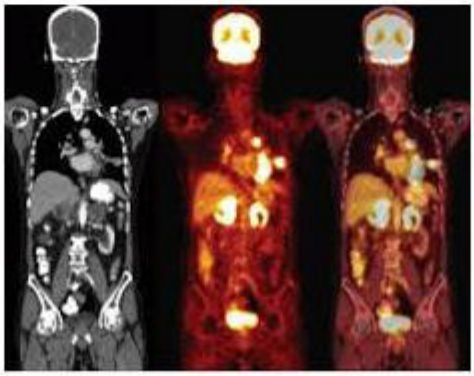

Sara Raquel Costa Soares

Financial and Operational Management of Nuclear Medicine Departments in the NHS within the London Area

Dissertação de Mestrado em Gestão e Economia da Saúde, apresentada à Faculdade de Economia da Universidade de Coimbra
Orientadora: Drª. Prof. Carlota Quintal

Setembro de 2015

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Cover (FEUC template) and illustration: Sara Soares

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Coimbra, 2015

Acknowledgments

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I am very grateful for all the interviewees that made this study possible. Without their cooperation and understanding, I would not have learnt so much like I did.

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A very special thanks for all my friends and family for almost unbelievable support.

Abstract

Nuclear Medicine departments have a very complex structural organisation. These offer a variety of diagnostic and therapeutic procedures, which often play a central role in patient management. A diversity of professionals work together to provide the best possible care to patients, by using the available resources in the most efficient way. The financial and operational management of these departments is dependent on the payment system model, Trust policies and actions taken by the service/divisional managers. It is expected that 2015/16 will be one of the toughest financial years that the NHS in England has ever faced. In this circumstances, providers and commissioners will need to work together to identify opportunities for improving system efficiencies. Taking that into consideration, the main objective of this dissertation is to analyse Nuclear Medicine department service leaders' perspectives of how to increase efficiency and productivity, considering the context in which they operate. For that, semi-structured interviews were conducted, face-to-face, to 10 Nuclear Medicine department´ service leaders in their workplace.

The adopted methodology was qualitative and applied the techniques of thematic analysis in the study of the interviews. One part of the results reveals that the service leaders are trying to reduce costs and improve the department performance, to meet the Trust Cost Improvement Plan target. To improve the efficiency, each department needs to evaluate and optimize all processes, since receiving the referral to report the results. Service improvements methodologies can be an asset.

For some it is being difficult to meet the demand requirements, because there are not sufficient human and material resources.

More preventive actions (cost savings) actions need to be taken. Service leaders need to fulfil their managerial responsibilities and the Trust needs to provide the correct incentives to make that happen.

Keywords: Nuclear Medicine, Trusts, Payment by Results system, Operational Management, Financial Management.

Resumo

Os departamentos de Medicina Nuclear têm uma organização estrutural muito complexa. Estes fornecem uma grande variedade de procedimentos diagnósticos e terapêuticos, que muitas vezes desempenham um papel central na gestão paciente. Diversos profissionais trabalham em conjunto para proporcionar os melhores cuidados possíveis aos pacientes, usando da maneira mais eficiente os recursos disponíveis. A gestão operacional e financeira destes departamentos é dependente do modelo de pagamento, políticas do hospital e ações adotadas pelo gestor do serviço ou gestores divisionais. Espera-se que 2015/16 seja um dos anos financeiros mais complicados de enfrentar. Nestas circunstâncias, os prestadores e comissários terão que trabalhar em conjunto para identificar oportunidades em que possam melhorar a eficiência do sistema. Tendo estes fatores em consideração, o objetivo principal deste trabalho é identificar as variáveis que levam ao aumento da eficiência e produtividade dos departamentos de Medicina Nuclear, na perspectiva dos seus líderes. Para isso, foram conduzidas entrevistas semi-estruturadas e presenciais, a líderes de 10 serviços de Medicina Nuclear nos seus respectivos locais de trabalho.

A metodologia adotada foi qualitativa e foram aplicadas as técnicas de análise temática no estudo das entrevistas. Uma parte dos resultados revela que os líderes dos serviços estão a tentar reduzir os custos e a melhorar o desempenho do departamento, para atingir a meta do *Trust Cost Improvement Plan*. Para melhorar a eficiência, cada departamento deve avaliar e otimizar todos os processos envolvidos desde a entrega da prescrição até os resultados do exame. A aplicação de metodologias para otimizar estes processos, podem ser uma mais-valia.

Para alguns, está a ser difícil satisfazer as necessidades da procura, uma vez que os recursos humanos e materiais são insuficientes. Assim, mais ações preventivas (com o intuito de reduzir custos) precisam de ser tomadas. Os gestores dos departamentos precisam de cumprir as suas responsabilidades gerenciais e os hospitais devem fornecer os incentivos corretos para fazer isso acontecer.

Palavras-chave: Medicina Nuclear, *Trusts,* Sistema por Pagamento de Resultados, Gestão Operacional, Gestão Financeira.

List of Abbreviations

A&E- Accident & Emergency

APC- Admitted Patient Care

ARSAC- Administration of Radioactive Substances Advisory Committee

BNMS- British Nuclear Medicine Society

BSc- Bachelor of Science

CCGs- Clinical Commisioning Groups

CIP- Cost Improvement Plan

CSU- Commissioning support units

CT- Computed Tomography

DATScan- Dopamine Transporters Scan (tradename)

DCR- Diploma of the College of Radiographers

DEXA- Dual-energy X-ray absorptiometry

DH- Department of Health

DMSA- Dimercaptosuccinic Acid

DNA-Did Not Attend

DTPA- Diethylene Triamine Pentaacetic Acid

DVLA- Driver and Vehicle Licensing Agency

EBS- Electronic booking compliant

e.g.- exempli gratia (for example)

EPR- Electronic Patient Record

Euratom- European Atomic Energy Community

FDG- Fludeoxyglucose

FT- Foundation Trust

GBq- Gigabecquerel

GFR- Glomerular Filtration Rate

GP- General Practitioners

HIDA- Hepatobiliary Iminodiacetic Acid

HIS- Hospital Information System

HMPAO- Hexamethylpropyleneamine Oxime

HRG- Healthcare Resource Groups

HSCIC-Health & Social Care Information Centre

ICD-10- International Classification of Diseases tenth revision

i.e.- id est (that is to say)

IRMER- Ionising Radiation Medical Exposure Regulations

IT- Information Technology

MAG3- Mercaptoacetyltriglycine

MBq- Megabecquerel

MDP- Methylene Diphosphonate

MDT- Multidisciplinary Team

MFF- Market Forces Factor

MIBG- Metaiodobenzylguanidine

MPS or cardiacs- Myocardial perfusion scans

MRI- Magnetic resonance imaging

MSc- Master of Science

mSv- Millisievert

MUGA- Multi Gated Acquisition (Scan)

n.d. - no date

NFSIR- National Framework for Service Improvement In Radiology

NHS- National Health Service

NICIP- National Interim Departmental Imaging Procedure

NM-Nuclear Medicine

NMD-Nuclear Medicine departments

OP- Outpatients Procedures

OPCS-4- Office of Population Censuses and Surveys 4

OT- Outpatients Attendance

PACS- Picture archiving and communication system

PbR-Payment by results

PCT-Primary Care Trusts

PET/CT- Positron Emission Tomography/Computed Tomography

PGDip- Postgraduate Diploma

QIPPs- Quality, Innovation, Productivity and Prevention

RIS or CRIS- Radiological Information System

RIT- Radioisotope Therapy

SeHCAT- Selenium Homocholic Acid Taurine

SLA- Service Level Agreement

SLR- Service-Line Reporting

SMS- Short Message Service

SPECT/CT- Single-Photon Emission/Computed Tomography

SUS- Secondary Uses Service

TFC-Treatment function codes

TRUD- Terminology Reference-data Update Service

UK- United Kingdom

V/Q- Pulmonary Ventilation/Perfusion Scan

VR- Voice Recognition

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Introduction

The National Health Service (NHS) is a very large and complex organisation (BBC, 2013). "Organisation, reorganisation and re-disorganisation" is what the Kings Fund once described as the disease of the NHS. Every new government has a new health minister, who has his own ideas of revolutionising and fixing the NHS. This is despite various objective independent surveys showing that it remains the best and most efficient health system in the world (Khan, 2015). In 2013, the NHS England had one of the biggest reorganisation since its creation (BBC, 2013). The current reorganisation has the potential to distract NHS organisations and staff from the challenge of restoring and maintaining financial balance (HFMA, n.d.). Adding to that situation, there are other factors to take into consideration. The current financial crisis, rising costs of services, energy and supplies; innovations and technological breakthroughs that require more investment – along with higher numbers of people to cater for – all spell out a huge economic disaster for the NHS. It is estimated that without radical changes to the way the system works, as demand rises and costs rise too, the NHS will become unsustainable, with huge financial pressures and debts. If no changes are made, there will be approximately £30 billion funding gap for the NHS nationally by 2020 (myhealthlondon, n.d.).

In this context, the clear challenge for the health sector is to improve what matters to patients while keeping within a fixed budget. The challenges faced by providers and commissioners are substantial and varied. For providers there is the need to improve productivity, and for commissioners the need to support system-wide productivity improvements through their commissioning decisions while keeping within a fixed NHS budget. At the same time, both are seeking to listen to patients better and to improve the quality of care that patients receive (Monitor, 2013). Commissioning is the process of procuring health services. It is a complex process, involving the assessment and understanding of a population's health needs, the planning of services to meet those needs and securing services on a limited budget, then monitoring the services procured (Adlington, *et al.*, 2015).

In the United Kingdom (UK), Nuclear Medicine departments (NMD) that are in the NHS are paid by the activity completed. This is called Payment by Results (PbR), and

requires good data keeping and strict audit on all activity within the department, so that all income is accounted for (Vara, 2006).

PbR is the payment system in England under which commissioners pay healthcare providers for each patient seen or treated, taking into account the complexity of the patient's healthcare needs. The two fundamental features of PbR are nationally determined currencies and tariffs. Currencies are the unit of healthcare for which a payment is made, and can take a number of forms covering different time periods from an outpatient attendance (OT) or a stay in hospital, to a year of care for a long term condition. The currency for admitted patient care (APC), accident & emergency (A&E) and some outpatients procedures (OP) is the healthcare resource groups (HRG). HRG are departmentally meaningful groups of diagnoses and interventions that consume similar levels of NHS resources. The currency for OT is the attendance itself, divided into broad medical areas known as treatment function codes (TFC).

Tariffs are the set prices paid for each currency. PbR currently covers the majority of acute healthcare in hospitals, with national tariffs for APC, OT, A&E, and some OP (DH PbR team, 2012).

The development and implementation of a national tariff requires robust, reliable costing information. Tariff prices have traditionally been based on the average cost of services reported by NHS providers in the mandatory annual reference costs collection (HSCIC, 2014b).

NMD deal with patients to whom radioactive materials have been administered for diagnostic purposes or therapy (SWEDAC, 2000). Nuclear Medicine (NM) has various types of examinations, each with its own time scale, preparation, and various complications. Diagnostic imaging is the most common type of examination which most centres schedule routinely (Vara, 2006).

The contribution of NM to the work of the Trust (hospitals in England are managed by acute Trusts) requires recognition as a core departmental service. The department must be represented at senior level in Trust management structures and at a similar level to other departmental specialties. The importance and hence influence of the NM manager service within the Trust management structure should not be

undervalued (The Royal College of Radiologists, 2012). The departments should have competent managerial staff with the authority and resources needed to carry out their duties and competence to take the medical/departmental, scientific and technical responsibilities for the services provided (SWEDAC, 2000). Critical decisions relating to the organisation and delivery of NM services should reflect the service manager's knowledge of service provision, training and maintenance of standards. Plans for departmental service reconfiguration within or between Trusts may be directed towards improving the quality of and/or reducing the cost of the departmental service provision. Departmental technologists must be involved from the outset in any such discussions with representation by the service manager (The Royal College of Radiologists, 2012).

In the financial / budgetary perspective, the two main objectives are to reduce operating costs and to increase the sustainability of the service. The financial success of any organisation will ensure its future development. In the case of the NMD, ensuring sustainability is to ensure its continuity, its economic and financial viability. The budget constraint should not be seen as a constraint but as a motto to develop initiatives that promote the reduction of costs, including operational costs. A strategic plan should not put cost reduction as a goal, it should be an inevitable consequence of the efforts made in the different stages of the process. The reduction of expenditures of an organisation may result from increased productivity or the ability to better use the resources (human, material and financial) (Ferreira, 2013).

Taking into consideration these variables, the main objective of this dissertation is to analyse NMD service leaders' perspectives of how to increase efficiency and productivity, considering the context in which they operate.

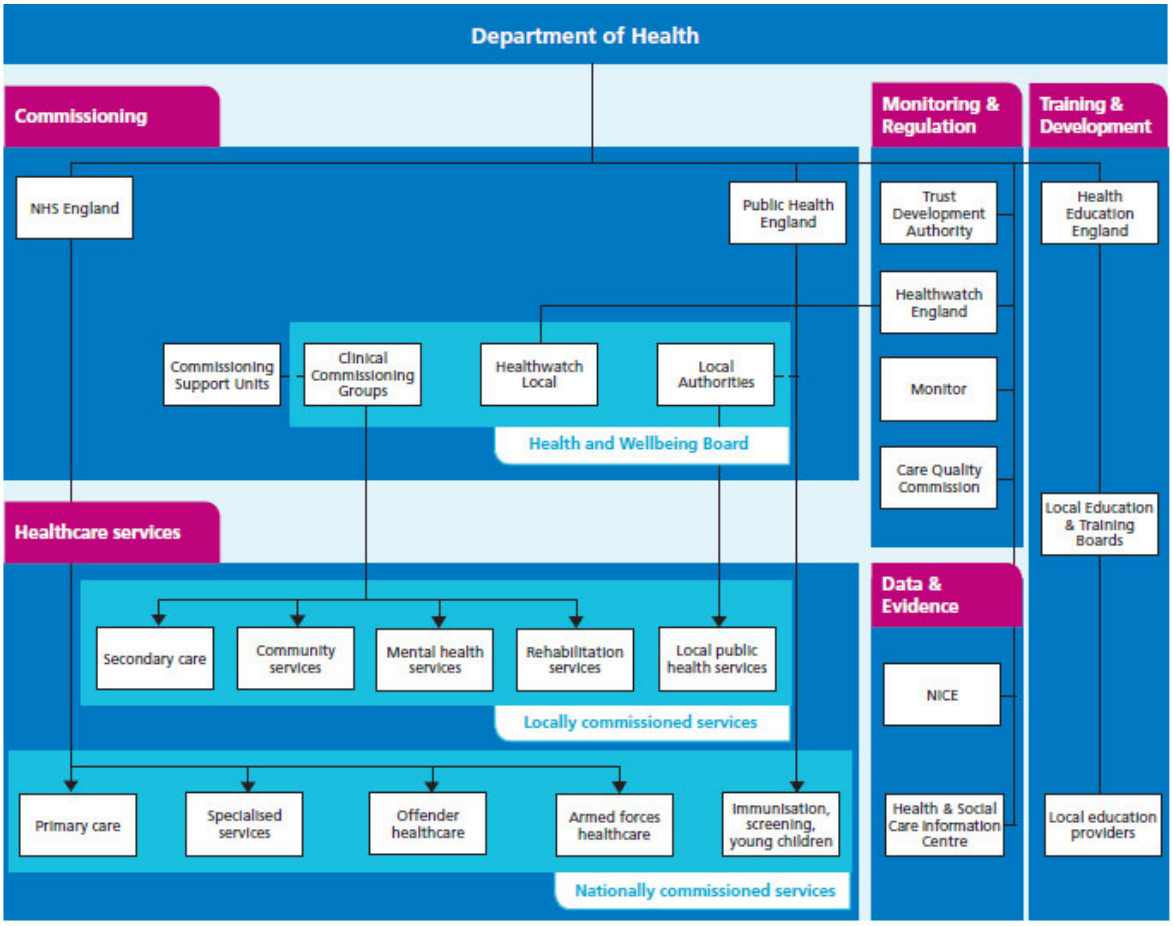
The methodology adequate for this research is based on the qualitative method specifically individual in-depth interviews, being conducted through the use of semi-structured interviews to 10 NMD service leaders in their workplace.

This dissertation is organised in eight chapters: 1. The NHS structure, its funding and financing; 2. Payment system; 3. Payment by results in diagnostic imaging; 4. Operational and financial management of nuclear medicine departments; 5. Methods and methodology; 6. Results; 7. Discussion and 8.Conclusion.

Chapter 1: The NHS structure, its funding and financing

This chapter is describing the main organisations within the NHS structure (Figure 1). It explains the main functions of these organisations and how the NHS is funded, and financed.

Figure 1- Structure of the NHS in England



Source- NHS England (2014) Understanding the new NHS. 9.

1.1 Overview of the main organisations responsible for NHS financing and their role

1.1.1 The Department of Health

The Department of Health (DH) is responsible for strategic leadership and funding for both health and social care in England. The DH is a ministerial department, supported by 23 agencies and public bodies. The Secretary of State has overall responsibility for the work of the DH (NHS choices, 2015).

1.1.2 NHS England

NHS England was formally established as the NHS Commissioning Board in October 2012. It is an independent departmentally led organisation. Its main aim is to improve health outcomes and deliver high-quality care for people in England by: providing national leadership for improving outcomes and driving up the quality of care; overseeing the operation of clinical commissioning groups (CCGs) and allocating to them the resources; and commissioning primary care and directly commissioned services (specialised services, offender healthcare and military healthcare) (NHS England, 2014; NHS choices, 2015).

It has a budget of just over £95 billion. Within this overall funding, it allocates over £65 billion to CCGs and local authorities, which commission services locally for patients. The remainder is allocated to direct commissioning activities and to operational costs (NHS England, 2014).

NHS England's responsibilities are discharged through four regional teams (North, Midlands & East, London and South) and 27 Local Area Teams. These area teams have responsibility for directly commissioning £25.4 billion of health care services, including general practitioner (GP) and other independent primary care contracts (including dentists and ophthalmologists) for their local populations (£11.1 billion), and specialised services (£12.0 billion; high-cost/low-volume services, led by ten of the area teams for national consistency). The oversight function for area teams and regional teams is vital. These teams also provide an important link with the national NHS England team and it is hoped these relationships will improve communication between national strategy and local delivery of healthcare (Marshall, *et al.*, 2014).

To ensure that the taxpayer (to whom the Government is accountable) has a say in how NHS money is spent, a Mandate is published yearly to provide ambitions and directions for NHS England. NHS England has a duty to achieve the ambitions that are set out in the Mandate and will be held to account by the Secretary of State for Health to do so. However, the day-to-day running of the NHS is determined by NHS England, independent of political control (NHS England, 2014).

The Health and Social Care Act 2012 introduced radical changes to the way that the NHS in England is organised. The legislative changes from the Act came into being on 1 April 2013 and include:

-A move to departmentally led commissioning. Planning and purchasing healthcare services for local populations had previously been performed by England's 152 primary care Trusts (PCTs). The Act replaced the PCTs with 211 CCGs, led by clinicians. CCGs now control the majority of the NHS budget, with highly specialist services and primary care being commissioned by NHS England.

-An increase in patient involvement in the NHS. The Act established independent consumer champion organisations locally (Healthwatch) and nationally (Healthwatch England) to drive patient and public involvement across health and social care in England. The Healthwatch network has significant statutory powers to ensure the voice of the consumer is strengthened and heard by those who commission, deliver and regulate health and care services.

-Allowing healthcare market competition in the best interest of patients. The Act aimed to allow fair competition for NHS funding to independent, charity and third-sector healthcare providers, in order to give greater choice and control to patients in choosing their care (NHS England, 2014).

1.1.3 Clinical Commissioning Groups

The Health and Social Care Act 2012 replaced the previous system of PCTs by 211 CCGs, each serving on average a population of around 250,000 people (range 61,000 to 860,000). The advantage of the new system is that CCGs are departmentally led local organisations that know the area in which they are working, and so are able to commission services that are specifically required by the population that they serve. The members set out in their constitution the way in which they will run their CCG. Constitutions are agreed with NHS England and published. The law requires that members appoint a governing body who oversees the governance of the CCGs and which must have at least six members including a chair and a deputy chair: the CCG's accountable officer; the chief finance officer; a registered nurse; a secondary care specialist and two lay members (NHS England, 2014).

Many CCGs have appointed additional members to bring added perspectives to their governing body. Details must be set out in their constitution. Although the members of CCGs are general practitioners (GP) practices, CCGs are required to obtain expert advice from a broad range of health professionals (NHS England, 2014). They are responsible for about 60 % of the NHS budget and commission most secondary care services such as: planned hospital care; rehabilitative care; urgent and emergency care (including out-of-hours); most community health services and mental health and learning disability services. CCGs can commission any service provider that meets NHS standards and costs. These can be NHS hospitals, social enterprises, charities or private sector providers (NHS choices, 2015).

1.1.4 Commissioning Support Units

Commissioning support units (CSUs) assist CCGs in the more practical aspects of their roles. CSUs are hosted by NHS England and provide support in a number of areas, including market management, contract negotiation, information and data analysis (transactional commissioning) and service redesign (transformational commissioning). There are 9 groups of CSUs across England. CCGs can use CSUs as they wish, from a very minimal amount to a much broader partnership – there is no obligation to use them and accountability for delivery of services will always remain with CCGs (NHS England, 2014).

1.1.5 Monitor and Trust Development Authority

Monitor is the financial regulator of NHS Foundation Trust (FT). Monitor works to make sure that NHS FT are well-led and well-run (so they provide quality care) and essential services are maintained if a provider gets into difficulty. Monitor also checks quality and efficiency in the NHS payment system and ensures that competition between Trusts operate in the best interests of patients (Monitor,2013; NHS choices, 2015).

The NHS Trust Development Authority is responsible for overseeing the performance management and governance of 90 NHS Trusts, including clinical quality, and managing their progress towards FT status (NHS Trust Development Authority , n.d.).

The Monitor advises the NHS Trust Development Authority about the impact of choices and competitions in the transactions involving NHS trusts.

1.1.6 Difference between Trusts and Foundation Trusts

FT are a different type of NHS organisation with a stronger local influence.

FT hospitals are still part of the NHS and subject to NHS standards, performance ratings and systems of inspection. They will continue to treat patients according to NHS principles of free healthcare according to need, not the ability to pay.

However, FT are different from existing NHS trusts in several important ways. FT are independent legal entities - public benefit corporations; devolve decision-making from central Government to local organisations and communities and have different governance arrangements to NHS Trusts as they are accountable to local people, who can become members and governors. They are not directed by Government so they have greater freedom to decide, with their own members and governors, their own strategy and the way services are run. They can be more responsive to their local communities. They are not run for profit, but do have more financial freedom to raise capital funds from both the public and private sectors, they can also retain financial surpluses to invest in the delivery of new NHS services, whereas NHS Trusts have to return their surpluses to the Treasury and are regulated by Monitor, rather than the DH. The freedoms given to NHS FT are underpinned by a framework of national standards which will safeguard quality and protect the public interest (Imperial College Healthcare NHS Trust, 2015; New Queen Elizabeth Hospital Birmingham, n.d.).

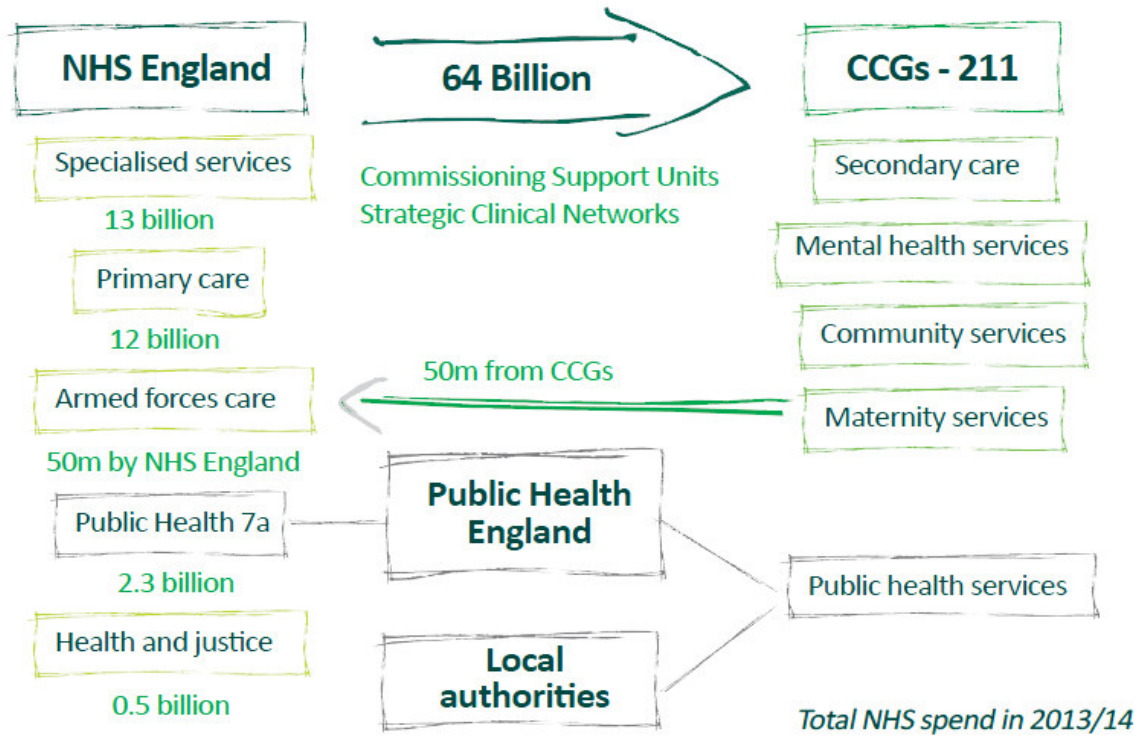
1.2 Funding

Funding for the NHS comes directly from taxation. The money for the NHS comes from the Treasury. The Treasury allocates money to the DH, which in turn allocates to NHS England. The DH retains a proportion of the budget for its running costs and the funding of bodies such as Public Health England. NHS England currently receives around £95 billion a year from the DH. Approximately £30 billion is retained by NHS England and the remainder is passed on to CCGs to enable them to commission services for their populations. Figure 2 explains 2013/2014 budget within NHS organisations. CCGs budgets are allocated on a 'weighted capitation' basis. This means that budgets are set based on the size of the population, and adjusted for other factors: the age profile, the health and location of the population. The Treasury holds a Spending Review every two to three

years, through which the budgets for all major public services are agreed (NHS England, 2014). When the NHS was launched in 1948, it had a budget of £437 million (roughly £9 billion at today's value). For 2015/16, it was around £115.4 billion (NHS choices, 2015).

Historically, service providers were paid an annual lump sum to provide a service locally. These were known as 'block contracts', and were not linked to the number of patients seen, the work actually carried out, or the quality of care provided. In 2003/04 the Government introduced PbR, an activity based system that reimburses providers for the work that they carry out, at an agreed national price. Currently, PbR represents almost 30 % of NHS expenditure. Most of the remainder is covered by old-style block contracts and local variations on these. NHS England and local commissioners are working towards a payment system based on quality of care and health outcomes achieved (NHS England, 2014).

Figure 2- Total NHS spend in 2013/14 in all organisations



Source- Adlington, Katherine *et al.* (2014). Commissioning. What´s the big deal? Faculty of Medical Leadership and Management.1.

1.3 Financing

NHS Trusts are financed in two main ways: revenue financing and capital funding. The first is used for the day to day running of the Trust. In revenue terms NHS providers are funded by NHS commissioners for: pay costs; non-pay costs (*e.g.*, rates, utilities, drugs) and capital financing costs such as public dividend capital to the Secretary of State, and the expenditure consequences of depreciating assets (SUHT, n.d.).

The capital funds the purchase of assets (building and equipment) which support the provision of departmental services. Expenditure which cannot be defined as capital includes the following: repairs; maintenance costs, which cannot be shown to be enhancements; training costs associated with the installation and use of the new asset; employee costs not directly attributable to a specific asset, including site selection activities; and other costs, which are capital in nature but which do not either create a new asset or enhance an existing asset (Hick, 2014).

The Trust compiles an annual Financial Plan which is approved by the Trust Board submitted to Monitor, as part of the Trust's Service Plan for the year. The Service Plan demonstrates how expenditure is to be contained within income whilst undertaking activity at the required level, deliver departmental contracts and achieve Government waiting targets. The Plan also contains an analysis of the risks faced by the organisation in the coming year. From information contained within the Service Plan, annual budgets are compiled for all departments in the Trust. The Trust exercises tight financial control through a system of daily/ monthly monitoring of expenditure and investigation into variances from budget. The budget reports form part of the papers submitted to the Finance Committee on a monthly basis and the Trust Board on a bi-monthly basis (Hick, 2014).

The funding of the Trust's annual capital programme is based on the estimated depreciation charge for the year. This can be supplemented by either, re-invest revenue surpluses generated in previous years, re-investing receipts from the sale of surplus assets or through the receipt of funds from the DH for centrally funded schemes. Prior to the commencement of each financial year, the Trust Board approves the Capital Programme (SUHT, n.d.).

The majority of capital funding will be approved as part of the annual planning round and budget setting.

As part of the annual budget setting process, budget holders should review the service needs and assets held within their service area. This should include needs and risk assessment of new items and items which need replacing. Based on this review, budget holders should identify a list of potential capital investments, prioritised for those items which have the highest impact on business continuity and feed these into the capital prioritisation process (Hick, 2014).

Divisional Directors and Divisional General Managers are responsible for ensuring that their division is adequately represented on each of the subcommittees and that they have a process for ensuring that the investment needs of the individual services can be considered in these committees (Hick, 2014).

For medical equipment, *e.g.*, Divisional Directors and Divisional General Managers will need to consider the bids from each budget holder within their division to determine the Divisional priorities forwarded into the Trust-wide process. These should then be submitted to the Director of Transformation who will chair the Medical Equipment Programme Board which will manage that prioritisation process. Medical Equipment is defined as equipment connected to the patient as part of their treatment and care in hospitals and health centres; and devices used for diagnostic, therapeutic and laboratory purposes. Medical Equipment does not include consumable medical devices such as syringes and dressings, which should be charged to revenue (Hick, 2014).

The Trust Board has an on-going responsibility to ensure that only appropriate business cases are approved and that the Trust has the legal powers to undertake them.

The availability of finite capital resources for radiology equipment replacement programmes as part of overall organisation budgeting may necessitate consideration of other methods of equipment financing and procurement such as leasing (The Royal College of Radiologists, 2012).

Chapter 2: Payment system

A characterization of the PbR system is made in this chapter.

2.1 Payment by results

PbR is the payment system in England under which commissioners pay healthcare providers for each patient seen or treated, taking into account the complexity of the patient's healthcare needs. To operate effectively, PbR needs three building blocks:

-A classification system: to capture information about patient diagnoses and healthcare interventions in a standard format.

-A currency: the codes in the primary classification systems above are too numerous to form a practical basis for payment. They are therefore grouped into currencies, the unit of healthcare for which payment is made.

-Costing information: once there is a currency, the costs are attached and a price is assigned. Where the price is set nationally, it is called the tariff (DH PbR, 2012).

Payment is linked to activity and adjusted for case mix.[1] This ensures a fair and consistent basis for hospital funding rather than being reliant principally on historic budgets and the negotiating skills of individual managers (HSCIC, 2015b).

PbR currently covers the majority of acute healthcare in hospitals, with national tariffs for APC, OTs, A&E, and some OP (DH PbR, 2012). Before PbR, commissioners tended to have block contracts with hospitals where the amount of money received by the hospital was fixed irrespective of the number of patients treated (DH PbR team, 2012).

There was no incentive for providers to increase activity or to reduce waiting times, since they got no additional funding. If providers failed to deliver planned activity, there was no agreed basis for commissioners to withdraw funding, in order to commission care elsewhere. Some areas of the NHS, however, were using more sophisticated cost and volume agreements as the basis for their contracts, and were using HRG to adjust their agreements for case mix (DH PbR team, 2012; HSCIC, 2015b).

[1] The term case mix is also often applied to HRG, to reflect a system whereby the complexity (mix) of the care provided to a patient (cases) is reflected in an aggregate secondary healthcare classification (DH PbR, 2012).

PbR was introduced to support patient choice by allowing the money to follow the patient to different types of providers; reward efficiency and quality by allowing providers to retain the difference if they could provide the required standard of care at a lower cost than the national price; reduce waiting times by paying providers for the volume of work done and refocus discussions between commissioner and provider away from price and towards quality and innovation (DH PbR team, 2012; HSCIC, 2015b).

2.1.1 Classification system

Departmental classification systems describe information from the patient records using standardised definitions and nomenclature. PbR relies on two standard classifications to process departmental data on acute care: International Classification of Diseases tenth revision (ICD-10) for diagnoses (the fourth edition was implemented in April 2012) and Office of Population Censuses and Surveys 4 (OPCS-4) for operations, procedures and interventions. The latest upgrade for OPCS-4, OPCS-4.7, was introduced in April 2014 and has been incorporated into the currency design used for 2015/16 prices (NHS England & Monitor, 2014b).

2.1.2 Currency

A currency is the unit of healthcare for which a payment is made and can take a variety of forms (DH PbR team, 2013).

HRG are the currency for APC, A&E, some procedures performed in outpatients and (in combination with TFC) outpatient attendances (DH PbR team, 2013). HRG are departmentally meaningful groupings of diagnoses and interventions that consume similar levels of NHS resources. Grouping the extensive and growing number of departmental codes into HRG allows tariffs to be set at a sensible and workable level (HSCIC, 2015b). HRG4 is the current payment currency (DH PbR team, 2013). For APC each HRG covers a spell of care,[2] from admission to discharge (HSCIC, 2015b). Where a procedure is reported in outpatients, an OT cannot also be counted for the same activity

[2] A spell is a continuous period of care for a patient at a given provider. APC spells can be constructed from one or multiple episodes. A&E and OP records are also assigned to spells, even though they are always defined as single 'episode' of care (HSCIC, 2015b).

(DH, 2014). TFC record the service within which the patient is treated. There are separate prices for first and follow-up attendances, and in each case also for single and multi-professional attendances (NHS England & Monitor, 2014b).

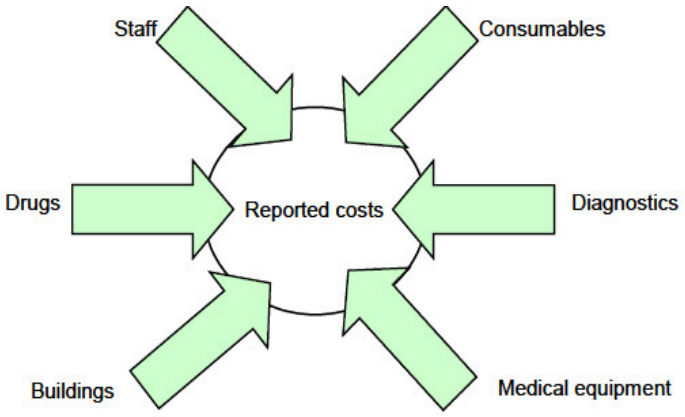
2.1.3 Costing information

2.1.3.1 Reference costs

Reference costs are the average unit cost to the NHS of providing a defined service in a given financial year. To ensure consistency across all NHS organisations, the costs and income have to be calculated on a full absorption basis (Figure 3) (this means that the full running costs of each activity are included in the return), charged directly to the relevant activity where possible and matched with the services that generate them to avoid cross subsidisation.

Costing involves a distinction between direct costs (*e.g.*: doctors, nurses, drugs) which can be easily identified with an activity; indirect costs (*e.g.*: laundry) which cannot be directly attributed to an activity but can usually be allocated among a number of activities, *e.g.* in proportion to the number of bed days in each ward and overheads (*e.g.* finance and human resources) which relate to the overall running of the organisation and are charged out on a more general basis. In addition to underpinning the calculation of the national tariff, reference costs are used for local prices where activity is outside the scope of the tariff; accountability for the cost of NHS services; programme budgeting, which is the analysis of expenditure in healthcare programmes, such as cancer, mental health and cardiovascular diseases, academic research and calculating public service healthcare output, undertaken by the Office for National Statistics (DH PbR, 2012).

Figure 3- Full absorption costing



Source- DH PBR Team (2012). A simple guide to Payment by Results.27.Fig 14.

2.1.3.2 Tariff

Mandatory tariffs are produced for APC, outpatients and A&E (scope) and its design must create the right incentives and achieve particular policy goal (structure).

Since its introduction in 2003-04, the tariff has been calculated on the mean (or simple average) unit costs of NHS providers collected annually in reference costs. The logic is that organisations with costs above the average will make efficiency savings to reduce their costs in line with the tariff, which in turn will drive down the tariff in future years. The tariff also has to recognise care that is significantly different from the average of reference costs, create the right incentives to treat patients in the most efficient setting and to provide the highest quality care, and support particular policy goals or business rules (*e.g.*: a reduction in emergency admissions). Increasingly, tariffs are being informed by departmental best practice rather than average cost (DH PbR, 2012).

Each tariff is several years in the making. Cost and activity data from year one are collected in year two and analysed in year three before being used for prospective payments in year four. This lag between collecting data and publishing a tariff is of limited significance if costs are fairly stable over time, as long as prices are updated in line with inflation and some account is taken of changing departmental practice and technology, and allows time for the testing of the tariff with the NHS (DH PbR, 2012).

The reference cost collection predates the introduction of the tariff, and the tariff is therefore calculated using the reference costs of all NHS organisations, in contrast

to some other countries with tariff systems which do not have a comprehensive collection and therefore use a sample of providers. The reference costs are, however, filtered to remove services outside the scope of the tariff, and any extreme outliers are removed (the general rule is less than one twentieth of, or greater than twenty times, the national average). Each organisation's reference costs are divided by its market forces factor (MFF) index to remove differences in unavoidable costs (DH PbR, 2012).[3]

The tariff adjustment is used to turn historic costs into prospective prices, and is the net result of an increase for NHS pay and price inflation and a decrease for efficiency. Three years of adjustments are used in the calculation in line with the lag between reference costs and the tariff (DH PbR, 2012).

The combination of more recent reference costs, and a reduction in prices if the efficiency requirement exceeds inflation, means that providers may be paid less as well as more for treating a patient than they were for carrying out the same procedure in the previous year (DH PbR, 2012).

Before publishing the final tariff, the draft tariff prices are shared and guidance with the NHS for comment. This has two stages: sense check and road test.

The sense check involves some of the advisory groups (External Advisory Group and Clinical Advisory Panel), a network of clinicians who are expert in the development of PbR currencies (the Expert Working Groups), all single specialty hospitals and a small group of NHS providers and commissioners. The aims of the sense check are to scrutinise the draft prices to ensure that there are no hidden incentives to perverse departmental practice and to double check, using up-to-date data available to providers and commissioners, the impact of what is proposed.

The road test, which generally happens in December, allows all organisations to familiarise themselves with the detail of the tariff and its accompanying guidance. The expectation is that the tariff will not change between road test and the final published

[3] Organisations in some parts of the country have higher costs because labour, land and buildings cost more in these areas. The purpose of the MFF is to compensate for the unavoidable cost differences of providing healthcare in different parts of the country. The underlying costs are inflated to tariff year prices. Finally, a number of normative changes are made to specific prices in response to feedback during testing of the tariff or to correct known problems (DH PbR, 2012).

tariff, although the guidance will be updated to reflect feedback (DH PbR, 2012; HSCIC, 2014b).

2.2 Method for determining national prices in 2015/16

The national prices for 2015/16 are based on a refreshed tariff model, different from the 2014/15 national prices, which were based on a rollover approach.[4]

The methodology for the tariff model for the '2015/16 National Tariff Payment System' prices is based in a 'modelled approach'. A key task in the modelling approach is to update the inputs used in calculating prices, notably reference costs and activity levels. When taken alongside changes in the modelling approach, updates of these inputs (particularly reference costs) lead to modelled prices that are significantly different from last year in a number of areas.

In summary, the modelled approach for the '2015/16 National Tariff Payment System' involves: the introduction of approximately 200 new or changed currencies (*i.e.* HRG) that require one or more national prices; updated inputs for price setting using the 2013/14 DH PbR method (involves manual adjustments to minimise the risk of setting implausible tariffs) and the use of 2011/12 reference cost data (although more up-to-date reference cost data are available (2012/13), the 2011/12 reference cost dataset is very closely aligned with the currency design of the 2015/16 tariff). Basing prices on 2012/13 reference costs would require remapping the costs onto the 2015/16 currency design (NHS England & Monitor, 2014b).

[4] For the 2014/15 national tariff used 2013/14 prices as the base and adjusted those prices generally for cost pressures on providers and expectations for improved efficiency (NHS England & Monitor, 2014b).

Chapter 3: Payment by results in diagnostic imaging

This chapter is describing the payment system (currencies, tariff and data processing) specifically for the diagnostic imaging setting. Diagnostic Imaging covers radiology (NM is inserted and it is the main focus of this work).

3.1 Currencies

3.1.1 Treatment Function Code

TFC are defined in the NHS Data Model and Dictionary as codes for "a division of departmental work based on main specialty, but incorporating approved sub-specialties and treatment interests used by lead care professionals including consultants". TFC are used to describe types of OTs. TFC records the service within which the patient is treated and is, in effect, a sub-specialisation.[5] TFC are used to record activity undertaken, irrespective of the type of healthcare professional who performs it, and is not restricted to consultants (Salt, 2012).

An OT tariff is payable for a pre-booked appointment at a consultant-led department (the consultant may not be physically present but they remain departmentally responsible) (DH PbR team, 2012; Monitor, 2013).

Nuclear Medicine has the code number 371, but only has a mandatory tariff for the treatment of patients. Diagnostic imaging should also be reported by the TFC of the outpatient department in which the imaging was requested. TFC code 812 has a mandatory tariff of zero pounds (£0) (Table 1). No payment should be agreed or made for this activity. Following a consultant referral, the wait for a patient referred to any diagnostic service should be captured using the TFC of the referring specialty.

[5] The Main Specialty is the specialty within which a Consultant is recognised or contracted to the organisation. Specialties are divisions of departmental work which may be defined by body systems (dermatology), age (paediatrics), departmental technology (NM), departmental function (rheumatology), group of diseases (oncology) or combinations of these factors (Salt, 2012).

Table 1- TFC codes and description for Diagnostic Imaging and Nuclear Medicine

TFC code	Description	Justification
812	Diagnostic imaging	The production and interpretation of high quality images of the body to diagnose injuries and disease, *e.g.* x-rays, Ultrasound Scan, MRI Scan, PET Scan or CT Scan. To ensure that direct access diagnostic imaging unbundling can generate a core outpatient TFC attendance tariff, but without generating an additional tariff.
371	Nuclear Medicine	The treatment of patients through the use of radioactive substances.

Source- Own elaboration based on DH PbR team (2013). Payment by Results Guidance for 2013-14.

3.1.2 Healthcare Resources Groups (unbundled activity)

HRG4 introduced unbundled HRG, making it possible to separately report, cost and remunerate the different components within a care pathway. This provides a mechanism for moving parts of a care pathway – diagnostic imaging for instance – away from the traditional hospital setting (Monitor, 2014).

Unbundled HRG were developed to identify specialist services, ensure recognition of priority areas, support service redesign and patient choice, and improve the performance of HRG so they better represent activity and costs (DH, 2014).

Unbundled HRG can be derived from the APC and OP datasets. The A&E and critical care dataset does not generate unbundled HRG (The National Casemix Classifications Service, 2009).

3.2 National price in diagnostic imaging

3.2.1 For outpatients

In 2013/14, separate national prices were set for diagnostic imaging unbundled from the OT prices. This change was made to address concerns raised by the sector about under-payment of diagnostic imaging delivered for complex patients and under-provision of imaging services in some local areas (DH PbR team, 2013). It was also felt that paying separately for outpatient diagnostic imaging may support greater use of direct access services, supporting primary care clinicians to make diagnoses without the need for an outpatient referral and promoting greater departmental integration and development of

departmental pathways between primary and secondary care and within departmental networks (DH, 2014).

The approach of setting separate national prices for diagnostic imaging in outpatients will continue in 2015/16. These national prices are mandatory, regardless of whether or not the core OT activity has a mandatory national price (DH PbR team, 2013).[6]

3.2.2 Direct access

There are several national prices for activity accessed directly from primary care, for diagnostic imaging. One example is where a GP sends a patient for a scan and results are sent to the GP for discussion with the patient. While the costs of reporting are included in the published prices, they are also shown separately so that they can be used in case an organisation provides a report but does not carry out the scan. This is in contrast to such a service being requested as part of an outpatient consultation (NHS England & Monitor, 2014b).

3.2.3 Admitted Patient Care

The costs of diagnostic imaging in APC and A&E should be included within the core HRG (DH, 2014).The A&E dataset does not generate unbundled HRG; investigation and treatment activity is incorporated in the core HRG for emergency and urgent care (HSCIC, 2015b).

However, where diagnostic imaging is requested as part of an APC episode but carried out post-discharge, this should be recorded as outpatient activity and attract a separate payment (DH, 2014).

3.3 National Variation in diagnostic imaging

National variations form one important part of an overarching framework, and sit alongside local variations and local modifications. National variations only apply to services with a national price (NHS England & Monitor, 2014b).

[6] Grouping is the main stage of the process in which one HRG code is assigned to the Spell. This is referred to as the core HRG. Patient record data items, such as procedures, diagnoses, age and length of stay are used to determine the appropriate HRG code for the Spell (HSCIC, 2015b).

In 2013/14 separate prices were set for diagnostic imaging undertaken as part of OTs. A national variation was established for 2013/14 to mitigate the financial risks that could result from the 'unbundling' of the cost of this activity from national prices.

There were three areas of financial risk in moving from the "bundled" model to separate tariffs for diagnostic imaging in outpatients in 2013-14:

-The risk to either commissioners or providers of moving from reimbursement at an average level of diagnostic imaging activity to reimbursement for actual diagnostic imaging activity. That means that providers were paid for the diagnostic imaging that they carry out rather than being paid at a national average basis. Providers and commissioners agreed risk sharing arrangements to transition to the new level of provider income.

-The risk to commissioners from providers increasing their diagnostic imaging activity. The new payment structure facilitates access to diagnostic imaging and could lead to an increase in the number of scans for legitimate departmental reasons. In order to manage the potential financial impact of an increase in scanning, providers and commissioners agreed a baseline for activity undertaken (but adjusted for growth in line with trends for diagnostic imaging), and placing arrangements to pay a marginal rate of 50 % in 2013-14 for activity over and above that baseline. The marginal rate of 50 % represents risk sharing between providers and commissioners, and should not be seen as a penalty to providers or an incentive to cap activity.

-The risk to commissioners from providers increasing the reporting of diagnostic imaging, where this is currently under reported. Providers needed to comply with the PbR Code of Conduct and NHS Standard Contract in relation to changes in the counting and coding of activity.

In 2015/16, the national variation was removed for unbundled diagnostic imaging in outpatients. This is because providers and commissioners have had two years to adapt to these reimbursement arrangements (Monitor, 2014; HSCIC, 2014b).

3.4. Scope and Composition

The HRG codes have a meaning. The first letter represents the chapter; the second letter represents the sub-chapter; the number represents the intervention or diagnosis. These four characters give the HRG root. The last letter represents the split for

age, complications and comorbidities or length of stay (Z is used where there is no split) (DH PbR, 2012).

The chapter R is Imaging and Interventional Radiology and subchapter RA is Diagnostic Imaging Procedures, which cover diagnostic imaging for all ages, delivered in admitted or non-admitted care settings (Casemix Service, 2008). The HRG, in this subchapter, is related to the examination type (HSCIC, 2014a).

One HRG may account for scans of multiple body areas within the same visit to a scanner. Therefore, one scan should equal one HRG, but the scan may be of multiple body areas. These HRG are unbundled in addition to the core HRG (HSCIC, 2014a). Table 2 demonstrates the HRG codes including description of each category, and correspondent tariff for the financial years of 2014/2015 and 2015/2016.

Annex A provides data information for the HRG total activity in 2013/14.

Table 2- HRG codes, description and tariff for Nuclear Medicine Procedures

Direct access and outpatient diagnostic imaging services			
NM HRG codes	Description	Tariff	
		2015/16	2014/15
		(including cost of reporting) (£)	
RA35Z- category 1	Procedures requiring no radiation protection, minimal equipment costs and standard staff costs of up to one hour technologist time, including patient explanation and processing.	138	143
RA36Z- category 2	Procedures requiring diagnostic level radiation protection, basic gamma camera or sample counter, standard technologist time of up to one hour and low to medium isotope costs.	182	157
RA37Z- category 3	Procedures requiring diagnostic level radiation protection, technologist time of up to two hours, gamma camera with SPECT and/or medium isotope costs. For cardiac procedures, cardiology supervision is included.	212	220
RA38Z- category 4	Procedures requiring diagnostic level radiation protection, technologist time of up to three hours, gamma camera with CT and high isotope costs.	408	347
RA39Z-	Procedures requiring diagnostic level radiation protection, technologist time of up to three hours with	385	306

category 5	high equipment costs and/or very high isotope costs.		
RA40Z-category 6	Procedures requiring diagnostic level radiation protection, high equipment costs and/or very high isotope costs.	405	304
RA41Z-category 7	Has been reserved for future development.	-	
RA42Z-category 8 (PET-CT)	Procedures requiring diagnostic level radiation protection, high equipment costs and/or very high isotope costs.	Negotiated locally	
RA15Z	DEXA Scan	60	62

Source- Own elaboration based on NHS & Monitor (2014). 2015/16 National Tariff Payment System: A consultation notice-Annex 5h: Unbundled services model; Case mix service (2008). Introduction to Sub-chapter RA-Diagnostic Imaging Procedures.

The tariff for PET/CT should be the same for every Trust in England. The only difference is that there are different Market Forces Factors (MFF) applied dependent on the local area, *e.g.* London gets a higher tariff due to a bigger MFF being applied.

However, each Trust could try and negotiate a different price but as it is the same commissioner (NHS England) it is unlikely that they would agree to a higher tariff in the same region for one provider.

The contracts have a baseline performance (based on last year's activity). If there is an over-performance against it the NHS England can refuse to pay the exceed activity.

Potentially a contract may be created where over-performance is significantly penalised by a big reduction of the tariff value. This would mean that each organisation will have to consider restricting the number of scans being performed or receive a lower tariff for those scans, if they will go over the contracted activity.[7]

3.5 Processing data

3.5.1 Grouping

Grouping describes the process by which OPCS-4 and ICD-10 codes are assigned to an HRG using software called a grouper.

[7] Information obtained by one of the interviewees (I1).

The HSCIC releases two groupers each year to the NHS for general use: the local payment grouper and the reference costs grouper. The Case mix Local Grouper is the software application that aggregates ICD-10 and OPCS-4 codes to be assigned to HRG (DH PbR team, 2013). Providers use the local payment grouper to plan, benchmark and send results to commissioners as part of their request for payment, and the reference cost grouper to group their activity for submitting costs annually. Commissioners can also use the grouper if they have access to the raw data.

The Grouper groups data to HRG, but does not apply exclusions or tariff adjustments. This needs to be done by users or a third party. Secondary Uses Service Payment by Results (SUS PbR) groups the data and applies exclusions and tariff adjustments. SUS PbR houses the HRG4 grouping logic and, given the same input as the Grouper, produces the same results.

The SUS is the central repository which supports the flow of commissioning data sets between providers and commissioners. SUS also applies the tariff and tariff adjustments, which the grouper does not (HSCIC, 2015b).

3.5.2 Data stages

Grouping is one of several broad stages in the application of PbR rules to patient data. Table 3 shows each stage.

Table 3- Applying PbR rules to patient data

Stage	Description
PbR pre-processing stage	Excluding episodes and calculating length of stay adjustments prior to grouping
Grouping	Running the data through the Grouper software
PbR post-grouping stage	Excluding spells after they have been grouped
PbR adjustments stage	Applying tariff adjustments to data

Source- DH PBR (2012).Payment by Results Guidance for 2013-14. 22. Table 3.

PbR operates a two phase reconciliation process to arrive at a final agreed position for each month's activity.

Providers submit initial data to SUS related to activity in a calendar month. At a nationally determined deadline, the inclusion date, a snapshot of this data is taken and extracts are produced for both providers and commissioners. The point at which this first snapshot is taken is referred to as either the reconciliation (or flex) point.

Providers and commissioners agree between themselves which payments are to be made by whom during the reconciliation period. Providers are responsible for re-submitting data to SUS reflecting the agreements made with the commissioners. At a second nationally determined inclusion date, for that month, a second snapshot of the data is taken and again extracts are produced for both commissioners and providers. This second snapshot point is referred to as either the post-reconciliation (or freeze) point (HSCIC, 2015b).

3.5.3 Processing diagnostic imaging data

Where there is no existing link between the radiology system and the provider's patient administration system, imaging records should be matched via other means, for example the NHS number or other unique identifier and scan request date to outpatient records. This will enable identification of which radiology activity should and should not be charged for separately. The Terminology Reference-data Update Distribution Service (TRUD) provides a mapping between National Interim Departmental Imaging Procedure (NICIP) codes and OPCS-4 codes (Annex B). The grouper documentation published by the HSCIC sets out how these OPCS-4 codes map to HRG. It is necessary to map the NICIP codes to OPCS-4 codes, using the mapping held on TRUD. In some systems it may be necessary to map local diagnostic imaging codes to the NICIP codes before mapping to OPCS-4 (NHS England & Monitor, 2014a).

National departmental coding guidance both for the OPCS-4 codes and their sequencing must be followed. More than one HRG for diagnostic imaging will be generated where more than one scan has been carried out, and each HRG will attract a separate price. However, where a patient has a scan of multiple body areas under the same modality, this should be recorded using OPCS-4 codes to indicate the number of body areas, and this will result in one HRG which reflects the number of body areas involved. Therefore, it is not generally expected more than one HRG for a given modality

on the same day.

The diagnostic imaging record should be submitted to SUS PbR as part of the OT record, and will generate an unbundled HRG in subchapter RA (DH PbR team, 2013).

Where direct access activity is processed through the grouper, both a core HRG and an unbundled HRG will be created. When the activity is direct access, the core HRG should not attract any payment but the separate diagnostic imaging should attract a payment.[8]

If there is a practical reason why it is difficult to submit the diagnostic imaging record as part of an OT record, for example because the scan happens after the flex and freeze date for SUS relevant to the OT, then it is recommended a pragmatic approach. For example, the scan could be submitted as for a direct access scan, using a dummy OT of TFC 812 Diagnostic Imaging to ensure that no double payment is made for the OT (NHS England & Monitor, 2014a).

Providers and commissioners can, however, use the information in this optional field locally to identify services accessed directly. In APC the SUS PbR not assigns a tariff for the unbundled diagnostic imaging but it will price the core HRG (Monitor, 2013).

There is an important distinction between currency structure and funding policy, which means that unbundled HRG will not necessarily attract a tariff. For example, the costs of diagnostic imaging HRG are included, or rebundled, into core HRG for APC and OP attendances. These unbundled HRG act as a marker that the activity has taken place, but do not receive a separate tariff (Monitor, 2014).

Table 4 shows the different scenarios for data processing.

[8] SUS PbR does not yet use this field, and will not distinguish between outpatient services and services accessed directly. For diagnostic imaging, this means that SUS PbR will assign a national price to any direct access diagnostic imaging activity that is submitted to the outpatient commissioning data sets, and providers must ensure that this activity is reported against TFC 812 (diagnostic imaging) so that an attendance national price is not paid in addition. As OTs recorded against TFC 812 are zero priced, this will ensure that no price is generated for the record apart from that for the diagnostic imaging activity (Monitor, 2013).

Table 4- How SUS PbR processes the data

Scenario	How will SUS PbR process the data?
Core HRG in WF (with a mandatory price)	It will price the core HRG activity
Core HRG in WF (with a mandatory price) with one or more unbundled HRG in RA (with a mandatory price)	It will price the core HRG activity and the unbundled imaging activity
Core HRG in WF (without a mandatory price) with one or more unbundled HRG in RA (with a mandatory price)	It will not price the core HRG activity but will price the unbundled imaging activity(*e.g.*: direct access)
Core procedure-based HRG (with a mandatory price)	It will price the core HRG activity
Core procedure-based HRG (with a mandatory price) with one or more unbundled HRG in RA (with a mandatory price)	It will price the core HRG activity only (*e.g.*: admitted care)
Core procedure-based HRG (without a mandatory price) with one or more unbundled HRG in RA (with a mandatory price)	It will price the equivalent WF core activity (if relevant) and the unbundled imaging activity

Source- Monitor and NHS England (2013). 2014/15 National Tariff Payment System: Annex 4A: Additional information on currencies with national prices. 20. Table 4-5A. [1]

NOTE: Chapter WF: Non admitted consultations (HSCIC, 2014b) Non-admitted consultations includes outpatients and ward attenders, for patients of all ages. For outpatients or ward attenders, a significant procedure will not always be recorded. In these cases, grouping is based on the type of attendance (HSCIC, 2015b).

3.5.4 Payment

The NHS standard contract is a mandated document published by DH that commissioners must use when contracting for healthcare services. Included within the contract is an indicative activity plan that sets down the amount of work expected to be done, based on a standard currency (*e.g.*: HRG or TFC) and the price to be paid, based on the national tariff. Commissioners and providers may agree an estimated annual contract value, paid in equal twelfths each month which is adjusted based on actual activity.

SUS, having grouped the patient data to an HRG based on departmental codes, assigns the relevant tariff and applies any pricing adjustments. Commissioners and providers extract reports from SUS, which they use to compare and financially adjust for the difference between the actual value of activity and the expected contract value. This could be an additional payment from the commissioner to the provider if actual is greater than plan, or a refund from the provider to the commissioner if it is less.

Sub-contracted imaging activity should be dealt with as for any other sub-contracted activity, *i.e.* if Provider A provides scans on behalf of Provider B, Provider B should pay Provider A and Provider B should charge their commissioner for the activity (DH PbR team, 2013).

Chapter 4: Operational and financial management of nuclear medicine departments

This chapter introduces the Nuclear Medicine speciality and subsequent entities, organisation, leadership and departmental management. Service improvement models and techniques that are expected to increase efficiency and productivity of these departments are also explained below. Some quantitative data regarding NM examinations in the UK and London is presented in the Annex C. At the end of this chapter it is explained the budget structure and income sources.

4.1 Nuclear medicine

NM procedures (tests or studies) are typically multi-step, involve multiple resources, and require the administration of a radiopharmaceutical (radioactive isotope, *e.g.*, iodine-131) to the patient for diagnostic purposes and therapy (SWEDAC, 2000; Pérez, *et al.*, 2009). This allows for images of specific body organs to be taken (scan) using gamma cameras that sense the radiation emitted by the radiopharmaceutical. Since radiopharmaceuticals have a short half-life (minutes), their decay imposes strict time constraints on scheduling patients and resources in order to get good quality scans.

Some NM tests require only a single scan while others involve multiple scans in a day or multiple days. Each scan takes several minutes to hours to complete. Since at many NMD radiopharmaceuticals are prepared at remote radiopharmacies from the department, scheduling patient injection and image acquisition requires lead time and must be carefully managed (Pérez, *et al.*, 2009).

A typical NMD involves several interacting entities. These include humans (staff), procedures/tests, stations, and patients (Pérez, *et al.*, 2009).

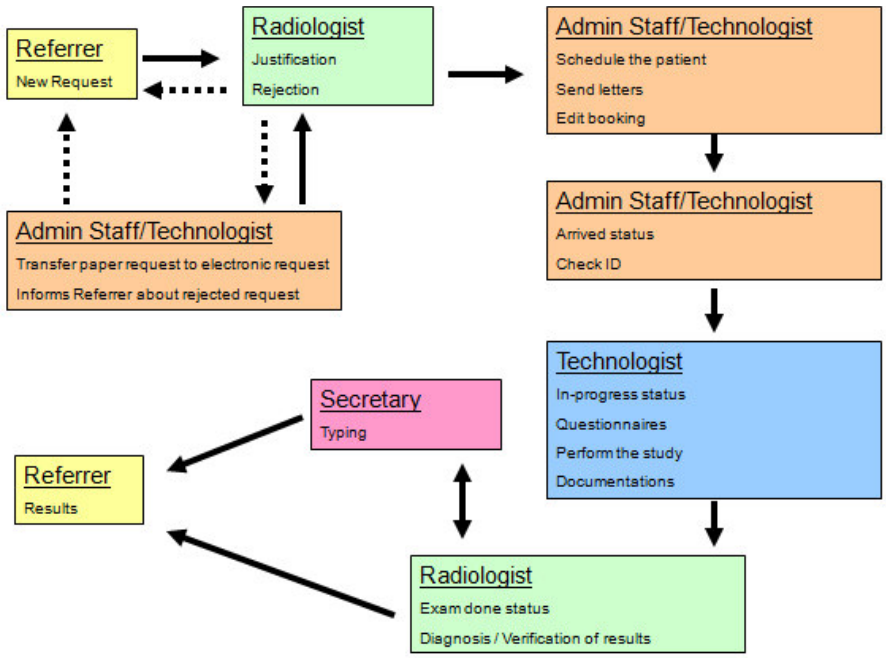
4.1.1 Entities

There are five types of human resources: technologists, nurses, physicians, managers and administration and clerical staff (Figure 4). Each human resource possesses his/her own expertise and experience, which determine the set of activities they can perform and the amount of time required to complete each activity. Human resources that have more experience are expected to complete their tasks relatively quickly.

Procedures/tests are usually requested by the patient's primary physician or attending physician. The NM procedures provide physicians with information about the function of organs of the human body for diagnosis purposes but they are also used for patient treatment (Pérez, *et al.*, 2009).

NMD are subdivided into stations where procedures/tests are performed. Each station contains at least one type of equipment. Stations are classified depending on the equipment they contain. NM equipment includes different types of gamma cameras and treadmills for cardiovascular tests. All the entities needed to perform a procedure step have to be present in the station before starting any activity. For example, in order to perform a scan, the technologist and the patient have to be present in the station and the camera has to be configured to take the appropriate image. The time spent by these entities in the stations will depend on several things that include the expertise of the human resource and the procedure protocol (Pérez, *et al.*, 2009).

Figure 4- Flow within NMD



Source- Nuclear Medicine (Flow). Royal Marsden Intranet.

NMD shall be identifiable as a distinct unit within the hospital organisation (SWEDAC, 2000).

NMD have the responsibility to ensure that their practice achieves the highest possible standards. These standards include departmental care, quality of images and image interpretation, results of interventions measured by outcome data as well as issues such as waiting times, facilities, patient experience and speed of issue of the report. Most of these standards will be influenced by the workforce and equipment resources available (The Royal College of Radiologists, 2012).

4.2 Organisation and leadership

NMD should provide a diagnostic and therapy service of high quality within a defined budget. Effective and efficient administration is facilitated by good leadership. This should be provided by a designated service manager who has experience in NM and will be responsible for managing the activities of the department.

No single person can achieve all of the leadership functions and be involved personally in every group within the department. The service manager should have senior technologists dealing with the different areas, functions or activities of the department.

The service manager will have clearly defined line management responsibility to the Trust Board and should be appointed for a defined and agreed period sufficient to allow for the proper development and continuity of management processes (The Royal College of Radiologists, 2012).

4.2.1 Responsibilities of the NM service manager

The NM service manager is responsible for a variety of management and leadership activities. Some of the service manager duties are described next.

Operational responsibilities include:

-To have a comprehensive understanding of all areas within NM and to be able to draw on this knowledge when developing and managing the service.

-Provide management support and leadership to the designated areas, ensuring effective day to day management and operational delivery of the services (The Royal Marsden NHS Trust, 2013). The service manager must ensure that there is an equitable distribution of work within the department with efficient rota to meet the required activities. This

includes the proper management of annual, study and professional leave (The Royal College of Radiologists, 2012).

-Development of the department's business plan.

-Input into the Trust's contracting process and service planning, including the prioritisation of demands and workload agreements (The Royal College of Radiologists, 2012).

-To work closely with the lead consultant(s) in NM to ensure the provision of a timely and reactive service.

-To work closely with other professional groups within the Trust and to write, or assist in the writing of policies and procedures to improve the quality of service provided.

-To advise on professional standards and legislation, ensuring that working practices meet these guidelines.

-To take into account the financial, departmental, professional and logistical implications when determining or informing on future strategy.

Human resources responsibilities include:

-To be responsible for the effective recruitment, selection and induction of staff in accordance with the Trust recruitment and selection processes.

-To work alongside the Human Resources Department to devise and implement recruitment and retention strategic policy.

-To contribute to the appraisal cascade system and ensure all staff are involved in annual objective appraisal and personal development planning (The Royal Marsden NHS Trust, 2013). All staff are required to have a job plan specifying their contractual obligations. These should be reviewed and agreed annually, providing an opportunity for staff to assess their own programmes and workloads and to plan their personal professional development. Appraisal based upon the job plan is a valuable method of assessing the performance and effectiveness of individual technologists (The Royal College of Radiologists, 2012).

-To conduct exit interviews with all leavers.

-To monitor sickness/absence levels and where necessary implement corrective action.

-To ensure that the requirements of each post are reviewed upon becoming vacant, prior to advertising for replacement staff.

-To hold regular departmental meetings and to ensure that staff are kept fully informed of departmental and Trust developments.

Financial responsibilities include:

-To be responsible for the Trust's Radioisotope Service budget (NM, PET and Radioisotope therapy (RIT)).

-In conjunction with the Deputy Divisional Director, to be responsible for the implementation of efficient management and control of pay and non-pay expenditure, initiating corrective action as appropriate.

-To monitor income and expenditure. To identify causes of variance and ensure the timely reporting of significant issues. To devise remedial action plans where appropriate.

-To identify cost improvement programmes in line with the Division and Trust requirements.

-To review all maintenance contracts within the radioisotope service and to ensure value for money is achieved.

-Working alongside the Finance Department, to maintain the assets register for the NM.

-To oversee a rolling programme of equipment replacement, upgrading and disposal, and ensure timely submission of bids for capital items.

-To take the departmental lead for the Trust in purchasing and commissioning of capital equipment.

-To develop sound working relationships with equipment manufacturers and to constantly work with them to ensure that the Trust receives the highest level of support from them.

-To liaise with hospital procurement in the purchasing of capital equipment.

-To contribute to the preparation of the Annual Business Plan for the Division, to include a planned budget, efficiency savings and productivity targets and any changes in service.

Professional responsibilities include:

-To have highly developed, advanced specialist knowledge and to be the departmental Trust lead for NM, RIT and PET and the lead in professional role development and educational NM/PET/RIT issues.

-To promote the service and enhance the reputation of the Trust both internally and externally through participation and attendance at National and International meetings.

-To develop training protocols and performance indicators for role development within NM/PET/RIT for radiographers and technologists.

-To participate in the Governance of the department in areas including Risk Management, Health and Safety, Research and Audit activities.

-To implement recommendations from audit and to complete the audit cycle.

Research responsibilities include:

-To oversee development and implementation of research and departmental trial protocols by NM staff according to best practice and referral guidelines.

-To co-ordinate with departmental units, departmental scientists, equipment manufacturers, and drug companies regarding research and to provide agreed protocols for Imaging.

Departmental responsibilities include:

-To ensure the timely, efficient and courteous provision of the NM, RIT and PET imaging services within the available resources.

-To promote the department by disseminating imaging protocols and providing advice to other imaging institutions.

-To build/create protocols using a variety of computer software on the gamma cameras and PET/CT scanner and to update and/or modify them as required.

Administrative responsibilities include:

-To ensure that the department implements an agreed programme for quality assurance and ultimately an external quality assurance accreditation standard as applicable.

-To train/teach visiting doctors, physicists, radiographers and NM technologists on the technical aspects of NM and PET including radiation protection, protocol and parameter selection and data analysis (The Royal Marsden NHS Trust, 2013). Training of all staff groups within NM departments requires an appropriate structure and resource to promote safe and effective delivery of the service (The Royal College of Radiologists, 2012).

4.3 Service improvement and performance evaluation

Service improvement seeks to support clinical and administrative excellence, by continuously adapting and refining processes and pathways, for the benefit of patients, carers, and staff (NHS Radiology Service Improvement Team, 2011). It is too easy in the current economic situation with budgetary restraints and demands for greater efficiency and productivity, for inappropriate, short-term service configurations to be introduced. Service improvement is part of a continual process that should be built into the everyday activity of the clinical imaging service. There are a number of different methodological approaches to driving improvements, including: Total quality management; Six Sigma; Lean thinking; Theory of constraints; Model for improvement and Process mapping. There is no particular best model and the method employed need not be complex (The Royal College of Radiologists and the Society and College of Radiographers, 2012).

Two important methodologies are incorporated within the National Framework for Service Improvement in Radiology: “lean” thinking and process mapping. Lean thinking is centred on preserving value while using less work, which in the context of healthcare can be summarised as considering wasteful the use of any resource that does not add value to the patient journey, and which should therefore be removed from current practice (it is known that up to 40 % of steps within a ‘‘patient pathway’ do not

add value to the ultimate treatment outcome) (Grant, *et al.*, 2012). The 85/15 principle maintains that usually processes, not people, are the cause of problems. This rule expresses that 85 % of the time the process, structure, or practices of the organisation are the root cause of the problem or error. Only about 15 % of the time people are the cause. The 85/15 principle is a reminder to focus on processes rather than people (Farrell & Abreu, 2012).

A lean transformation is not a short-term process; it requires a lifelong commitment to learning and implementing lean principles (Kruskal, *et al.*, 2012). Many categories of lean tools are available: value stream mapping for visualizing the current state of a process and identifying activities that add no value; root cause analysis for determining the fundamental cause of a problem; team charters for planning, guiding, and communicating about change in a specific process; management dashboards for monitoring real-time developments; and a balanced scorecard for strategic oversight and planning in the areas of finance, customer service, internal operations, and staff development (Kruskal, *et al.*, 2012).

Lean considers the entire patient pathway rather than just steps within the department, by first identifying those elements of the total process that add true value to the patient experience and then mapping these in the context of the whole pathway – the value stream map. The process is similar to conventional process mapping but on a wider scale (NHS Radiology Service Improvement Team, 2011).

Process mapping analyses a specific process, step by step, from initiation to completion (Grant, *et al.*, 2012). It is surprising how staff at all levels misunderstand the complexity of the patient processes they are involved in every day. No single person knows or understands all the processes across the entire patient pathway, end to end.

Process mapping requires designated time for representatives of all staff groups to meet and scrutinise departmental processes across the entire pathway (NHS Radiology Service Improvement Team, 2011).

Once the individual steps are identified it is then possible to identify those that add little value to the overall patient journey, potentially removing any bottlenecks and

unnecessary steps. This may involve the complete redesign of the whole process (Grant, *et al.*, 2012).

Waiting is an activity that does not add value, whether it is waiting for patients to arrive, register, and undress; for an intravenous line to be inserted; for transport personnel, or isotopes to arrive; or for images to be sent to a picture archiving and communication system (PACS) workstation and for the workstation to boot up. Likewise, performing unnecessary or redundant imaging examinations or inappropriately targeted or excessive image acquisitions don´t contribute for the service efficiency (Kruskal, *et al.*, 2012).

UK radiology departments that are successfully implementing lean thinking are already constantly redesigning their patient pathways in order to increase quality and efficiency by optimising flow. For example, substantial resources and time have been devoted to efficient telephone booking procedures and up-to-date patient information sheets and consent forms have been developed (Grant, *et al.*, 2012).

There are many other opportunities for application of a lean approach: for example, to reduce clinical and technical errors and mistakes, reduce patient and report waiting times, improve patient outcomes, increase staff productivity, decrease costs, and improve employee and customer (both patient and referring clinician) satisfaction (Kruskal, *et al.*, 2012). Successful implementation of lean will result in long term cost savings, but the main benefit is as a driver of quality. By eliminating bad processes and waste, and creating standard working practices that eliminate variations from best practice, lean can create a safer working environment for the patient (NHS Radiology Service Improvement Team, 2011).

Table 4- Benefits of service improvement

Patients	**Staff**	**Organisation**
• Shorter waiting times for examinations and results. • Better quality information. • Fewer unnecessary visits to hospital. • Choice and certainty about appointment times. • Informed choice and decisions about their care. • A more user-friendly service with respect for dignity and privacy. • More equitable service provision across the health community. • Increased patient safety.	• Improved morale. • Decreased pressure of work. • More predictable workload. • Ability to plan services more effectively. • Fewer incoming calls and complaints. • Fewer interruptions, more peaceful environment (reduced "turmoil"). • Improved skills and learning. • Heightened opportunities for career development. • Removal of unnecessary steps. • Staff empowerment.	• Efficient, cost effective services. • Removal of unnecessary steps leading to: • Lower DNA rates • Shorter waiting times. • Improved recruitment and retention of staff. • Improved service quality. • Reduced risk. • Fewer complaints. • Potential to release under-utilised capacity, and so increase activity. • Increased opportunities for innovation and service expansion. • Smoothing patient flow across the whole organisation.

Source- Own elaboration based on Kruskal, *et al.*, (2012). Lean Approach to Improving Performance and Efficiency in a Radiology Department. And NHS Radiology Service Improvement Team, (2011) Radiology Service Improvement: a signposting document summarising service improvement methodology and benefits.

This data alone can give little indication of the efficiency or effectiveness of the service, or the influence of external pressures (NHS Radiology Service Improvement Team, 2011). It is often mistakenly thought that long patient waits are due to excessive demand or insufficient capacity, but quite often it is found that they are due to the

adverse effects of variation on capacity or by the underutilisation of existing capacity (Grant, *et al.*, 2012). Only when capacity and demand are measured can a service be truly understood (NHS Radiology Service Improvement Team, 2011).

Once potential issues have been identified, a useful model for initiating improvement is the plan-do-study-act cycle, which has many similarities to the familiar audit cycle. The ‘‘plan’’ stage will identify the objectives of the review: who needs to be involved, the relevant methodology required (including outcome measures) and the length of time over which the process will be run. The ‘‘do’’ stage is where the change is implemented and any impact is measured. The data collected during the do phase are then analysed as part of the ‘‘study’’ phase of the process, in order to determine whether the desired outcome has been achieved. Finally, the study phase will direct the course of the ‘‘act’’ phase of the cycle, whereby either the change undergoes wholesale implementation or a further plan–do–study–act cycle is required in order to make additional amendments (Farrell & Abreu, 2012).

4.3.1 Implementing and improving existing processes

For a service improvement to be successful and sustainable, the department must be receptive to change. Not every change is an improvement but certainly every improvement is a change and something cannot be improved unless it is changed (The Royal College of Radiologists and the Society and College of Radiographers, 2012).

Using the concepts previously described, existing processes within a department can be re-evaluated under the auspices of increased efficiency and productivity.

The aim is to adopt best practice in pathway and operational management, leading to improved patient flow through a department. Improved service design will avoid duplication of work and unnecessary waste, as well as increasing the quality of the services that is provided (Grant, *et al.*, 2012).

The following factors can be considered and re-evaluated in order to increase the quality, efficiency and productivity of the service.

4.3.1.1 Staff related

-Budget: As 60-70 % of a hospital budget is spent on staff costs (representing 50 % of the total NHS spend), possible considerations include vacancy freezes, reduced use of agency and locum staff, and alterations to staff pay and pensions (Grant, *et al.*, 2012). The Human Resources team and service manager reliance on bank and agency workers will not exceed their overall budgeted establishment (if that happens, they must seek appropriate approval for spend that may result in a deficit). It is for this reason that fixed term and permanent recruitment is managed through the vacancy control process, and local controls exist for bank/agency, overtime and additional hours (Stevens, 2014).

In order to manage pay variances, it may be helpful to consider some of the possible contributory factors: more or less staff in post than in the budgeted establishment; more or less expensive mix of staff than in the budgeted establishment, *i.e.* more Band 6's to Band 5's than initially budgeted; use of premium pay, *e.g.* overtime, additional hours, on-call and unsocial hours; use of bank and agency in excess of any underspend resulting from vacancies; appointing staff at a different point on the salary scale to their predecessor; re-grading staff in post without a cost neutral business case; staff sitting in the wrong cost code; gaps / overlaps in replacing leavers; secondment / career break / temporary vacancies / maternity & sickness cover; unplanned income / loss of income; inability to recruit / deliberately holding vacancies; not completing leavers forms / changes forms and cost of engaging contractors.

For most managers, effective staffing and establishment management is the key to financial control. It is therefore critical that managers at every level have a good understanding of the departmental / administrative areas for which they are responsible (Stevens, 2014).

-Competence: NMD shall have sufficient personnel, having the necessary education, training technical knowledge and experience for their assigned functions. Competence is here understood to be the product of basic, postgraduate and continuing education, as well as specialised training and experience. The service manager shall ensure that the training of its personnel is kept up-to-date. The department shall have documented policies and procedures to ensure that existing and new staff maintain

relevant professional qualifications, technical skills and professional expertise. The department has to have relevant literature, journals and handbooks for this purpose. Descriptions of internal authorisation of staff for particular tasks shall be recorded and be available. Job specifications and job descriptions shall be produced for all staff and reviewed at least once a year as part of individual performance review (SWEDAC, 2000). Exceptional performance of employees means there will be less technical errors, resulting in a lower frequency of interventional episodes in the equipment and thereby increasing the operational availability. The quality of the NM's internal processes is achieved if there is availability and a variability of skills. That way there is a reduction of the employee's mistakes. Improvement and innovation increases skills considered critical for the job and that reflects in enhanced quality of service (Ferreira, 2013).

-Dedicated porters: a common underutilisation of resources is the inability to get patients to a department in a timely and predictable manner. Porters that are solely accountable to a department will feel more ''ownership'' over their essential role and provide a more reliable and predictable service, improving patient flow through a department. This must be in combination with safe, comfortable areas for ''stacking'' patients so that expensive equipment and staff can work to maximum efficiency (Grant, *et al.*, 2012).

4.3.1.2 Working practices

-Pathway redesign: historically, the NHS has been structured such that individual hospital directorates may only contribute to part of the complete patient pathway, without necessarily enabling integration on a more complete level. This has resulted in multiple outpatient visits, interspersed with imaging investigations, with an accompanying delay incurred at every stage. Analysis by the NHS Modernisation Agency has shown that up to 90 % of errors and delays occur when a patient is handed from one professional or department to another, with up to 50 % of the steps in a typical patient pathway involving such a ''handoff'. Greater integration across the whole care pathway can reduce the overall number of patient visits and overall time to treatment. Improvements can be attained with ''one-stop'' departments providing simultaneous departmental assessment and imaging, direct access to diagnostic investigations for

appropriately identified referrers, and facilitation of further imaging instigated by the technologists on the basis of a previous imaging result (Grant, *et al.*, 2012).

-Waiting list management: An aggressive ‘‘did not attend’’ (DNA) policy will reduce the number of unfilled imaging slots (Grant, *et al.*, 2012). DNAs waste capacity and cause duplication of effort. Many departments have found that sending patients a second appointment results in a further DNA, and they have adopted a “one strike” policy, returning requests to the referrer after a single DNA (NHS Radiology Service Improvement Team, 2011). Booked appointments are known to be an effective way of reducing the DNA rate by engaging the patient in their care and offering a choice of appointments suitable to them. Proactive appointment reminders can further reduce DNAs, either by text message or phone call. Validating a waiting list, by contacting the patients just prior to their appointment, will confirm that the test is still required. Booking patients in chronological order will potentially avoid vacant protected slots for pre-categorised patients (*e.g.* ‘‘urgent’’ referrals), as well as avoiding delays by banning referrals to ‘‘named’’ consultants. Patients are not generally prepared to wait for more than 30 min for an examination. If departments followed a ‘‘show, have the procedure and go’’ policy, then such an extreme adoption of lean thinking could eliminate much of the above (Grant, *et al.*, 2012).

-Sweating assets by substantial extension of working hours: most scanners are currently only utilised on a ‘‘9 to 5’’ basis, and therefore these high cost assets are not delivering value for a significant proportion of any given day. ‘‘Sweating’’ these assets by the use of substantial extension of working hours is essential (this may also provide appointments at times that are more convenient for the patient) (Grant, *et al.*, 2012). The use of the PET/CT scanner by CT after the NMD working hours would benefit monetarily the department.

-Scheduling daily workflow: NMD should try to schedule the same type of scans in a specific weekday. That may improve the workflow. Preparing the gamma camera before each different study (*e.g.*: changing the collimators, determining the equipment sensitivity values) and not scheduled injections times are wasting time factors that can be frequent if there are many different scans in the same day. Likewise, in departments

where the radiopharmaceuticals are produced in situ, these resources are less used, once a vial is fully used for patients with the same type of scan.

-Inpatients: In NMD with a large inpatient case-load, there are higher probabilities of constrains in the patients' pathway and service efficiency. Frequently those appointments are delayed or cancelled due to internal or external factors. Forgetting to check the patient status (inpatient or outpatient) in the Radiological Information System (RIS), incorrect patient preparation (due to lack of communication or information not followed by the wards) and simultaneous appointments times are the most common reasons for delays or cancellations. There are many solutions for this problem. The referrer should inform the patient (and responsible nurse) about the exam. However, when the patient has many scheduled appointments there are greater chances of misunderstandings. The best solution is to create a mechanism that will allow the ward to know the exam date and the preparation for each scan. Not only should the patient´s nurse know but also the other ones. In NMD, the best solution is to check (in the previous day or in the morning) which patients are inpatients, if the examination is still needed and send a porter before the schedule appointment time.

-Resilience: no procedure should be undertaken within a department unless resilience is built in. For example, an individual should not develop a new service without two or three others being involved. A service must never depend on only one individual providing the expertise, as this would place the service at risk during their absence (Grant, *et al.*, 2012).

-Teaching and research: one area that may possibly be at risk of a short-term ''slash and burn'' approach to cost saving is that of the running of conferences, research, and all aspects of undergraduate and postgraduate education. This is absolutely crucial for many departments; it is part of the fabric of NM and should be funded appropriately. The benefits are not necessarily immediately tangible, but are crucial to the long-term efficient and productive running and development of the NHS, and as such should be given a degree of protection (Grant, *et al.*, 2012).

-Suggestions to make a service even more patient centred: suggestion boxes, focus groups and open days. Questionnaires are generally of limited value unless

designed to address a specific area. All appointment letters, information leaflets and the content of the departmental website must be review. Hospital signposting needs to be checked to know how easy it is to find the department. Patient dignity during NM procedures must be evaluated. Robust mechanisms for investigation of complaints, and its review at the department governance meeting must be done. The flexibility of extended day working allows patients the option of attending out of office hours, which may be more convenient and when parking is often easier (NHS Radiology Service Improvement Team, 2011).

4.3.1.3 Information technology

-Standard scanning protocols and imaging process: *The Ionising Radiation (Medical Exposure) Regulations (2000)*19 require employers to ensure that written protocols are in place for every type of standard radiological practice for each piece of medical equipment (Sec 4[2]). Protocols define what imaging is to be carried out and how it should be conducted. The detail of protocols will vary with locality and service need, but an essential component for effective team working is that the rationale for the protocols is clear, and agreed and understood by all members of the team within the clinical imaging (The Royal College of Radiologists and the Society and College of Radiographers, 2012). Lack of standardization in protocols for imaging may lead to inefficiencies in a process. All technologists have different ways of working. New employees or trainees may feel confuse if scanning and imaging protocols are not set up in the department. The protocols must be known among all staff to avoid time wasting and discrepancies in the patient's results. By standardizing complex, multistep work processes, variation can be minimized or even eliminated and quality improved.

-Standard reporting formats for common examinations: these will improve the efficiency of reporting and allow an easier access to relevant departmental findings by the referring clinician. Standard report templates may also be considered for normal examinations, and this is easily adapted to voice recognition (VR) templates (Grant, *et al.*, 2012).

-Complete PACS: modern departments should have at their epicentre a perfect IT system – without this, failure is the norm. Integrated complete PACS and RIS must be the

standard found in all departments (Grant, *et al.*, 2012). PACS offers potential benefits from instant availability of images, possibility of viewing images at multiple sites simultaneously, teleradiology for remote reporting or specialist opinion. If PACS is implemented without service redesign the benefits will not be maximised and the department will have poor electronic processes to replace poor paper processes. PACS creates new roles and releases staff to take on new roles. It can make reports and images available over networks to GP, Independent Sector Treatment Centres and tertiary care centres. Report verification and correction is simplified as images can be viewed easily alongside the report being checked (NHS Radiology Service Improvement Team, 2011). Improving NM information systems reduces the likelihood of human error, often caused by the loss / exchange of information, promotes a control at the level of productivity and consumption, improves the speed of information access and reliability of internal processes, contributing to higher management efficiency (Ferreira, 2013).

-Totally integrated digital direct reporting that is perfectly integrated into PACS: VR is a viable reporting method for experienced users, and has made as much of an impact on reporting as has PACS. As the final report is made at the time of dictation, it is likely to be more accurate and succinct, and can use predetermined templates to increase reporting efficiency. It significantly reduces the turnaround for availability of reports, as well as freeing secretarial staff to perform other, more efficient departmental duties (NHS Radiology Service Improvement Team, 2011; Grant, *et al.*, 2012).

-A central reporting area: this is essential and allows expensive PACS electronic equipment to be used more effectively, as well as providing an area for second and multiple opinions where clinicians wishing to discuss a case with a radiologist are guaranteed to find appropriate help easily. A more communal approach to reporting also generates a better teaching environment for training technologists (Grant, *et al.*, 2012).

4.3.1.4 Department related

-Knowing the department: By understanding the NM productivity, it is possible to predict drugs, consumables and human resources costs, and the level of service interruptions. Reliability is also related to the quality of service. The establishment of routines will contribute in order to better detect the constraints at each critical point of

the process, promoting the implementation of improvements and the reduction of non-compliance, resulting in increased customer satisfaction (stakeholders) (Ferreira, 2013).

-Monitoring nonconformities: Monitoring the frequency and severity of the nonconformities occurrence is important to decrease the negative impact in the service quality, patient and staff safety. To be able to plan the workflow (and to reduce unpredictable factors) it is necessary to monitor patients, equipment and resources trends. For example, monitor the patient's delays trend, helps to improve the planning agenda so that delays have a less negative impact on the satisfaction of the remaining patients who are affected by the delay. Predicting and scheduling equipment maintenance episodes (increasing preventive over corrective maintenance), promotes efficient management and minimizes the clinical activity interruption. The repetition of examinations has a direct negative impact on the quality of service, satisfaction, resource efficiency and time wasted. In this sense, evaluating the systematization of its occurrence helps to decrease its frequency and improves quality (Ferreira, 2013).

-Efficiency: The maximization of efficiency depends on three factors: material, equipment and human resources. These three are factors common to any organisation, and are directly responsible for efficiency variations. Efficiency will increase if the material waste is minimized, if the equipment availability increases and if the human resources are motivated to increase productivity.
Material waste may be due to last minute cancellations, lack of patients and occurrence of errors, whether by suppliers or employees, or for reasons unrelated to the NMD. Unexpected cancellations can usually not be filled, therefore NM "doses" will be wasted. Equally, material resources waste may be due to a suppliers error (*e.g.* defects in the material purchased), or due to other causes such as the validity expiration of radiopharmaceuticals. All these forms of waste contribute to minimize the internal processes efficiency and to decrease the sustainability of the service by increasing resource expenses (material, financial and human).
The equipment availability should be maximized in order to promote internal processes efficiency, to increase departmental productivity and contribute to a greater sustainability (Ferreira, 2013).

Effective teams will typically be stable, well trained, and enjoy low levels of sickness and turnover (Stevens, 2014).

-Quality improvement meetings: The importance of quality improvement meetings cannot be overemphasized. Quality improvement is everyone's responsibility, and because every member of the staff sees the practice from a different perspective, management needs input from all staff to identify the best ways to improve the practice. In addition, involving all stakeholders helps to ensure buy-in for the change and the results. Therefore, the meetings should involve all parties who might have knowledge about factors affecting the project. Also, everyone must meet periodically to share in the results and the successes. In a large department, a gathering of the full staff might occur only once or twice a year, whereas in a smaller department it might occur every 1–3 months. Sharing the information helps everyone feel part of the improvement process and gets everyone thinking about more ideas for projects. Management must document the key points presented and discussed at the meetings. Minutes are useful to provide evidence of quality improvement activities for accreditation bodies, payers, and Government agencies. Conducting a meeting with all involved staff, reviewing the results of quality measures, documenting findings, and formalizing a plan for improvement increases the likelihood of lasting change and an outcome of significant improvement (Farrell & Abreu, 2012).

-Creating additional imaging capacity: The increase of service flow is firstly achieved, by reducing the waiting time at different stages of the process (scheduling of the procedure, attending to the scan and stay) and also increasing productivity and the number of patients attending in the department. Waiting times reflect, above all, patient satisfaction and operational efficiency of NMD. The increase in the number of patients attending NMD is achieved by increasing the availability of technical and human skills. In this sense it is essential to maximize the equipment occupation rate and employees in order to maximize the NM efficiency (Ferreira, 2013). Examples of this could include: extended day and weekend working to smooth out variation in demand and to improve productivity when the hospital is quieter. It is also offered services at a time that better suit many patients and when travel and parking are often easier. It makes sense to share

capacity between adjacent centres with appropriate agreements in place in order to exploit spare capacity, and share waiting list burdens (NHS Radiology Service Improvement Team, 2011).

-Evaluation of satisfaction: customer satisfaction can come from two different points of view: patients who analyse the quality of service and care and referrers who perceive departmental clinical quality and management. The patients' satisfaction adds credibility for the department. If patients are not satisfied, they will not attend a second time. Without departmental activity, NMD becomes unsustainable. Scans repetition increases the dissatisfaction of the patient but also for the referrer, that may have to wait for a new medical report, which may have consequences for the following treatment/surgery (when the scan repetition is not possible to do on the same day), and for the manager because scan repetition may reflect an extraordinary expenditure for the department. Similarly, medical reports with unclear, unsatisfactory and even wrong information can trigger the need to prescribe further tests or other examinations, leading to waste of resources and patient dissatisfaction (Ferreira, 2013).

Overall, these ideas can be defined and evaluated using key performance indicators. These are a set of standard financial and non-financial metrics that can define and measure the success of a department, and which will ultimately lead to the adoption of best practices. It is important that they are meaningful, scientifically sound and interpretable. Examples include indicators looking at departmental performance (such as report turnaround time), departmental research, patient experience, resource utilisation and productivity, and employee development. It is imperative that there is absolute uniformity of the counting techniques used across different NMD; otherwise the whole system is untenable (Grant, *et al*., 2012).

4.4 Business and strategic planning

For most managers, effective staffing and establishment management is the key to financial control. It is therefore critical that managers at every level have a good understanding of the clinical / administrative areas for which they are responsible (Table 5).

Table 5- Responsabilities of each member in the quality, efficiency and leadership of the Trust

	Manager/budget holder	Divisional/Corporate Directorate	Trust
Quality	Manager has clear oversight of human resources/finance metrics and has the necessary information to support safe staffing levels.	Senior managers are able to Monitor, compare and rank performance on human resources/finance metrics.	Very senior managers are able to Monitor, compare and rank the performance of services at a high level and drill down where necessary.
Efficiency	Manager is aware of budget, the key drivers of spend and is able to explore solutions to issues as they emerge/in year and for business planning.	Senior managers are able to hold budget holders accountable for the responsible use of their financial allocation and staffing as part of business planning.	Very senior managers are able to use management performance indicators data as part of business planning, with regard to setting targets, efficiencies and allocations.
Leadership	Manager is able to discuss current position/challenges with colleagues and engage them in finding solutions.	Senior managers are able to set differential targets at divisional level, monitor performance and target support.	Very senior managers are able to set bespoke divisional/corporate targets and support systemic issues.
Key reports	Integrated workforce report. Budget report.	Business plans. Service strategy.	Annual report . Quality accounts.

Source- Stevens, Robert (2004). Management Performance Indicator (MPI) Report: Guidance for managers. Pag 3.

Business planning is the time when many of these decisions are made for the year ahead. When an idea needs to be taken forward, such as new equipment, staff or even a new technique, it is important that all the evidence is available to take the plan forward and make its possible implementation as smooth as possible.

The types of evidence that should be considered are: financial funding and support; any income revenue or other benefits to the Trust/organisation; capacity and demand data for the NMD; recommendations and audits from recognised professional groups *e.g.* National Institute for Health and Care Excellence, European Association of Nuclear Medicine; impact on the service if the plan is declined (Vara, 2006).

The business case is an essential document, which will allow all the evidence to be placed together and illustrate options to be considered for the business proposal. The business case should be drafted accurately and in conjunction with the Trust accountant.

Once a business case is prepared, it is usually submitted to the Trust Board for approval and implementation (Stevens, 2014).

Knowing the business means understanding where income/revenue comes from, what it depends on, how demand may change, the staffing levels required and the human resources implications of changes in service level activity (Stevens, 2014).

Changes to budget/staffing should always be considered for any potentially adverse departmental/operational impact. It is the responsibility of all levels of management to support this. Indicators that exceed Trust/budgeted targets should be reviewed as potential areas of concern, but should be considered in the context of other performance indicators, contingencies and external factors (Stevens, 2014).

Managers at department/service level will be expected to be able to discuss the indicators for the areas under their responsibility at divisional meetings.

Senior managers will expect cost code (budget) managers to know their management performance indicators and be able to discuss them at their meeting.

Divisional/corporate leads will be expected to be able to discuss the performance of their services with the Chief Operations Officer/Chief Executive (Stevens, 2014).[10]

Business planning in NM is very important, especially when immediate or future changes are required. NM is a growing area in medicine, and services have to be adapted in order to meet the rapid changes that occur.

4.5 Budget

Financial pressure is always a concern for an efficient operation of a NMD, usually associated with overall Health/Trust service pressures. It is important to manage the departmental budget properly in order to have efficiency and flexibility (Vara, 2006).

Service budgets are set annually at the start of the financial year, including a budgeted establishment, which has been departmentally/operationally assessed as sufficient to staff the service (Stevens, 2014).

[10] The size of the team/department will impact on measures that rely on a mean percentage, *e.g.* the sickness absence rate. This does not invalidate the indicator, but should be taken into account when identifying whether there is cause for concern (Stevens, 2014).

Departmental budgets are usually broken down into the three following components: pay, non-pay and income.

The pay budget is allocated for staff. Once staff and their funding have been agreed, the institute accountant will assign an annual budget against each one. Pay budgets should be reviewed regularly especially when a vacancy occurs. This would allow a review of the service needs at the current time and provide an opportunity to prove the need for additional posts and/or restructure staff grading to maximise numbers. Reviews of this kind are essential, as service needs do change and occasionally higher demand areas can be funded within the existing budget (Vara, 2006).

The non-pay budget represents all costs involved in running the NMD. These are usually broken down into individual accounts such as equipment, radiopharmacy, maintenance, provisions etc. Again, the institute accountant will place a budget limit to each account based on an estimate of the true costs from previous years. Good management of this budget is required to prevent overspending (Vara, 2006).

Items should be charged to the correct account so that a review at the end of the year shows a true reflection of where adjustments need to be made for the following year. Regular (monthly) review of each account is important, as during the financial year it may be found that certain accounts are not being used whilst others are at risk of being overspent. By making slight adjustments across accounts, it is possible to balance each account properly, making the end of year review easier. Occasionally, however, it may be found that a budget set against an account is not used at all until a particular month. An example of this would be a contract of some kind, for which a bulk payment is taken in one month only. In these cases, accounting methods can adjust for this so as not to give a false impression of the account (Vara, 2006).

In the UK it is common practice to cross charge for internal and external work. This would account to the income the department will receive. Setting up local trading accounts can achieve this best. Most departments will receive income, mainly for services to outside institutes usually via service level contracts. These budgets are reviewed at the end of every financial year. Managing income is very important. All activity must be logged and cross-charged so that regular income payments are made. Late payments

need to be borne in mind at monthly reviews. If excess income is obtained, this can be used for off-setting any other budgets such as pay or non-pay, but this is rare once annual budgets are set (Vara, 2006).

In the next section, it will be discussed income generated from private patients and Service Level Agreement (SLA).

4.6 Income

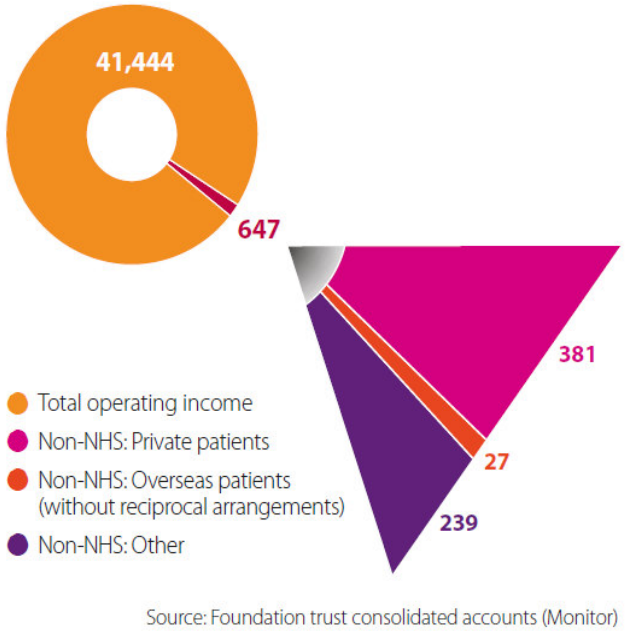
4.6.1 Private Income

The ability of providers to diversify their revenue stream is an important determinant of their financial resilience and sustainability. As transactional cost improvement measures start to dry up but the expectation on providers to continue making year on year savings remains, the flexibility that FT and Trusts currently have to explore revenue generation schemes in the form of non-NHS income is a crucial component in their efforts to stabilise finances and maintain quality. As well as helping their financial security and in turn enabling continued NHS provision, non-NHS income allows Trusts to offer NHS patients services and innovations which might not otherwise be available within the current NHS financial envelope (Foundation Trust Network, 2014).

FTs are currently subject to a cap on the income they can receive from private charges under the Health and Social Care Act (2012). FTs are required to ensure that the income they receive from providing goods and services for the health service in England (principal purpose) is greater than the income from the provision of goods and services for any other purpose (non-NHS income).

In practice, this means that FTs must raise the majority of their income from the provision of NHS services and goods, with a cap of 49 % on non-NHS income (Foundation Trust Network, 2014).

Figure 5- Non-NHS income and private patient income as a proportion of total operating income in £m (FT sector)



Source- Foundation Trust Network (2014). How NHS providers use Non-NHS income to improve patient services. Pag. 2. Fig. 1.

The vast majority of income for NHS providers comes from traditional NHS commissioner sources such as CCG and NHS England. But providers have had additional income streams for many years. The income generated through non-NHS sources varies substantially across the sector. This variation reflects that a provider's capacity and capability to develop non-NHS income sources depends on a number of different factors, including local needs, provider expertise and resource capacity (Foundation Trust Network, 2014).

The most well known non-NHS income stream is private patient income although this makes up only a small proportion of total NHS income for the FTs sector (Figure 5). For the past six years, the proportion the FTs sector received through private patient income has been less than 1 % of the total operating revenue for the sector (Foundation Trust Network, 2014).

The governance structure and local accountability of FTs allows them to make decisions on non-NHS income based on local needs, resources and the populations they serve. Decisions on increasing non-NHS income are approved or not approved by democratically elected governors, rather than being made by a remote regional or national body (Foundation Trust Network, 2014).

Non-private patient income and non-NHS income may: contracts with other parts of the public sector, local authority including social care and with third sector organisations; rental or sale of surplus space no longer required; research and development of medical technologies; commercial development of intellectual property; care for the military (including income from treating UK military personnel overseas), prison services and other centrally commissioned public services; education and training; and services such as car parking, catering and estate management (Foundation Trust Network, 2014).

FTs are NHS organisations committed to serving NHS patients and their priority is high quality care. They are required to focus on delivering the essential services requested by commissioners as a condition of their Monitor licence.

As a result, non-NHS income streams need to be carefully developed and FTs need to work hand-in-hand with their council of governors, who are drawn from NHS patients, the public, staff and stakeholders, to concretely demonstrate how new revenue from sources outside the NHS will support the principal purpose of an FT, which is to provide goods and services for the NHS. Governors exert powerful local accountability and are enshrined in the 2012 Act as a key part of the process as they hold the right to veto any increase in non-NHS income over 5 %. In practice, many Trusts also engage their governors in any proposal to increase the proportion of non-NHS income, even if this is under the 5% threshold (Foundation Trust Network, 2014).

The ability of Trusts to receive non-NHS income is a critical component in the efforts of FTs and Trusts to stabilise their finances and maintain quality, particularly in the current climate. As well as helping their financial security and so enabling continued NHS provision, non-NHS income enables Trusts to offer NHS patients services which might not otherwise be available and the benefits from investment in research and development. The effect on NHS patients should be seen as beneficial rather than detrimental (Foundation Trust Network, 2014).

In maintaining these income streams, FTs are working to enhance the quality of care by increasing funding for NHS patients, managing risk through careful and appropriate diversification, and maximising use of available resources. It is being shown

that income and charitable donations from private patients, underpin the Trust's capital investment (new infrastructures, expansion of NHS services) and innovation (new equipment and therapies) (Foundation Trust Network, 2014).

The importance of non-NHS income streams also need to be considered alongside the immense financial pressures facing FTs and Trusts. With NHS income squeezed, and at times erratic given changing tariffs, efficiency requirements and non-recurrent funding, the availability of non-NHS income can provide a stable and continuous income stream. This can help isolate departmental services from such fluctuations elsewhere in the system (Foundation Trust Network, 2014).

When FTs first came in to existence, there was substantial concern that they would look to substantially increase their non-NHS income streams, in particular private patient income. These concerns were echoed again when the 2012 Act changed the legislative framework applying to non-NHS income.

However, the analysis of Monitor's annual consolidated accounts for the FT sector highlights that private patient income has not increased substantially since the 2012 Act came in to force (Foundation Trust Network, 2014).

In the current financial climate, non-NHS income streams remain a vital mechanism for FTs (NHS Radiology Service Improvement Team, 2011) and Trusts to maintain financial sustainability, high quality care, improvement and innovation (Foundation Trust Network, 2014).

4.6.2 Service level agreement

SLA is the generic term used for agreements/contracts between the Trust and other organisations for the delivery of services. This work may be conducted by Trust employees on Trust premises or on the premises of the contracting organisation (Doak, 2008).

Contracting is a formal process, with formal agreements on service specifications, delivery criteria, monitoring for compliance and mechanisms for payment (Creasey, 2011).

The aim of establishing a SLA is to manage the workload of a department in an orderly and efficient way, which is linked to the facilities and resources available on a

planned rather than a random basis. Pre-planning of work volumes should enable departments to manage the flow of patients and to respond to changes in departmental practice. Commissioning procedures should be developed so that budgets and workload are negotiated in realistic ways, in a way that: the departmental budget should reflect the true cost of the work undertaken and recognised in the contracting process with commissioners and the appropriate funds should be transferred to the department (The Royal College of Radiologists, 1998).

During the initial stages of writing a SLA/Contract, the service manager and the relevant professional lead must be involved, in order to ensure that a detailed service specification is written and departmental standards and professional regulation requirements are met.

Contract arrangements and negotiations should be conducted in an open and significant variance. Service developments or expansions which would be developed through monies provided by the Commissioner should not take place without the consent and agreement of the Commissioners and be in their operating plan as a priority (Creasey, 2011).

The service manager must ensure that all staff involved in the delivery of an SLA are made aware of all relevant provisions (Creasey, 2011). The service manager is also responsible for the overall management of SLAs and will be the point of contact for any issues pertaining to the SLA (Doak, 2008).

There are two main ways of charging services through SLA: direct provider-to-provider agreement and shared services agreement. In the first agreement, an institution pays per patient a cost previously agreed to have a specific procedure done in another institution. The institution that requires the service accepts or not the conditions of the institution that will provide the service.

Shared services agreement is between NHS Trusts. The Trust offering the service, will inform the cost price (no profit involved) of doing a certain amount of patients required by the other Trust. The Trust receiving the service agrees and pays the Trust offering the service his tariff (conditions may apply when the number of patients received

exceeds or is significantly under the agreed amount that the procedure cost is calculated from).

The Trust providing the service then bills the other Trust on a patient by patient basis. The referring Trust can then bill the commissioner for the activity although it is being provided at another organisation.

The Trust providing the scan in theory, only covers the cost to provide the scan and so makes no profit but has an increase in their revenue income (which is offset against the relevant costs). Again in theory, the referring Trust should share any profit they receive from charging the commissioners for the activity (*i.e.* the difference between the inter-Trust charge and whatever the commissioner tariff is). If there is no profit, or even a loss, that stays with the referring Trust.[11]

In annex D there is an example of the SLR prices of two institutions in 2013/14 and the same institution between 2013/14 and 2014/15. It is possible to verify that some prices are equal but others have a big discrepancy.

[11] Information obtained by one of the interviewees (I1).

Chapter 5: Methods and Methodologies

This chapter presents the objectives and research question, research method and methodologies.

5.1. Objectives and research question

Little information is available about this precise theme. Most of the information is disperse and not centred in the NM area. NM is an area that is not well known (even if it began more than 60 years ago) and mostly of the time, misunderstood. It is a very complex and "not straight forward" area. It requires specific knowledge and experience.

This project is important because it aims to contribute to a deeper understanding and comprehension of the economic, political and management variables in the impact of the NMD performance in London, from the service leaders' perspective. So, the research questions of the study are: What specific factors unbalance the departmental budget and management, and what kind of approach are the service leaders following to minimize unwanted effects of these variables in their departments?

Taking these study objectives in consideration, we have decided to interview NM service leaders, given that it represents an opportunity to interact and learn directly with people who carry out these tasks. Additionally, there is the personal motivation of the researcher for learning more and the ambition of later taking a post as service manager.

5.2 Research methods

Qualitative research is a type of scientific research. In general terms, scientific research consists of an investigation that: seeks answers to a question; systematically uses a predefined set of procedures to answer the question; collects evidence; produces findings that were not determined in advance and that are applicable beyond the immediate boundaries of the study.

Qualitative methods are typically more flexible – that is, they allow greater spontaneity and adaptation of the interaction between the researcher and the study participant. For example, qualitative methods ask mostly "open-ended" questions that are not necessarily worded in exactly the same way with each participant. With open-ended questions, participants are free to respond in their own words, and these

responses tend to be more complex than simply “yes” or “no” (Mack, *et al.*, 2005). Participants have the opportunity to respond more elaborately and in greater detail than is typically the case with quantitative methods.

The purpose of the research interview is to explore the views, experiences, beliefs and/or motivations of individuals on specific matters (Gill, *et al.*, 2008). In this case, it is our intention to evaluate the reality experienced and felt by the NM service leaders in their midst and according to their perception. It is noteworthy that in the qualitative approach, the study reality is subjective and it allows us to understand the social world through the point of view of the target. The theory is based on data found and analyzed, and is through data collection that the researcher has a better understanding of people´s experiences in the proposed theme (Sampieri, Collado, & Lúcio, 2006).

The three most common qualitative methods are participant observation, focus groups and in-depth interview. Each method is particularly suited for obtaining a specific type of data. Participant observation is appropriate for collecting data on naturally occurring behaviours in their usual contexts. Focus groups are effective in eliciting data on the cultural norms of a group and in generating broad overviews of issues of concern to the cultural groups or subgroups represented (Mack, *et al.*, 2005).

Individual in-depth interviews are widely used by health care researchers to co-create meaning with interviewees by reconstructing perceptions of events and experiences related to health and health care delivery (DiCicco-Bloom & Crabtree, 2006). In-depth interviews are one of the most common qualitative methods. One reason for their popularity is that they are very effective in giving a human face to research problems. In addition, conducting and participating in interviews can be a rewarding experience for participants and interviewers alike. For participants – whether members of the study population or someone related to the population in a professional capacity – in-depth interviews offer the opportunity to express themselves in a way ordinary life rarely affords them. Many people find it flattering and even cathartic to discuss their opinions and life experiences and to have someone listen with interest. For their part, interviewers engaged in in-depth interviews are offered the privilege of having people who are

virtually strangers entrust them with a glimpse into their personal lives (Mack, *et al.*, 2005).

The primary advantage of in-depth interviews is that it provides much more detailed information than what is available through other data collection methods, such as surveys. Other advantages include: standardisation of at least some of the questions, which increases data reliability; replication is possible; a more relaxed atmosphere (people may feel more comfortable having a conversation as opposed to filling out a survey) (Woods, 2011).

The administration of questionnaires was considered because it would be easier to distribute and less time consuming. However due to the nature and aims of this study, the answers could be poor (incomplete or unnecessary information). The in-depth interviews method was chosen because it allows a better understanding of the interviewee opinion, as well as closest direct contact. In this case, it is achieved by the perception of the reality experienced by each service leader on a personal and professional level. However, this method has some limitations. The study is dependent on the interviewee cooperation, their experience and real opinion (and not what is more appropriate to say). Spontaneous questions asked of some and not of others can be seen as unfair or possibly misleading; the process is time-intensive; the interviewer must be capable of performing reliable interviews; the results are not generalizable and are prone to possible bias (Woods, 2011).

5.2.1 Interview type

Qualitative interviews can range from highly exploratory to addressing specific hypotheses (Clifford, n.d.). There are three fundamental types of research interviews: structured, semi-structured and unstructured. Structured interviews are, essentially, verbally administered questionnaires, in which a list of predetermined questions are asked, with little or no variation and with no scope for follow-up questions to responses that warrant further elaboration (Gill, *et al.*, 2008). More structured interviews increase the likelihood that the findings of the research will be generalizable and/or can be used to test specified hypotheses (Clifford, n.d.).

Conversely, unstructured interviews do not reflect any preconceived theories or ideas and are performed with little or no organisation. These are usually very time-consuming (often lasting several hours) and can be difficult to manage, and to participate in, as the lack of predetermined interview questions provides little guidance on what to talk about (which many participants find confusing and unhelpful) (Gill, *et al.*, 2008). This approach can be valuable in contexts where little is known about the topic (*e.g.* because relatively little previous research exists), making it difficult or impossible to develop testable hypotheses and suggesting that more information-gathering is required (Clifford, n.d.).

Semi-structured interviews consist of several key questions that help to define the areas to be explored, but also allows the interviewer or interviewee to diverge in order to pursue an idea or response in more detail. This interview format is used most frequently in healthcare, as it provides participants with some guidance on what to talk about, which many find helpful. The flexibility of this approach, particularly compared to structured interviews, also allows for the discovery or elaboration of information that is important to participants but may not have previously been thought of as pertinent by the research team (Bates, *et al.*, 2008; Gill, *et al.*, 2008).

5.3 Methodology

The methodology used for this research is based on the qualitative method specifically individual in-depth interviews, being conducted through the use of semi-structured interviews to NMD service leaders.

Semi-structured interview is the most appropriate method because some of the interview questions are fully decided but others may be asked in the interview. The researcher has leeway in asking follow-up questions. This is the ideal compromise; it gives a structure to the interview, but also gives flexibility.

The semi-structured interview was conducted using the face-to-face model. Each interview and interviewee was coded with a number and all questions are numbered.

The interview guide was validated by two technologists. It is divided in four parts (Appendix D). The questions were also made to attract the interest of all groups of professionals involved in the NMD. No specific structured order was fallowed. The

intention of the first part (characterization of the department) is to make the interviewees feel more comfortable and confident, followed by the questions that were considered to be more difficult to answer (financial questions). Because the interview could be longer, the operational management questions were made at the end to not exhaust the interviewee judgment.

A characterization of the department is made in the first part of the interview. This information is relevant because the size of the departments in the study might affect their operational complexity. The second part is used to characterize the interviewees: their job title and their qualifications (the answers may be dependent on the years of experience and knowledge of the department policies), and what job functions they consider important and demanding (these questions provide an insight of the profession responsibilities). The third part consists of financial related questions. The questions no. 12, 13 and 18 are included with the aim of understanding the impact of the PbR model on patient outcomes; quality of the service provided and on the NMD budget. The question no. 14 is to investigate whether NMD are able to cope with demand (if it exists) and if there are any factors that are against the structural changes. Question no. 15 deals with sensitive information (if the budget provided in the last financial year is enough to cover all departmental needs).

Due to this recent economic constraint, we would like to know if the interviewees apply strategies to decrease costs (question no. 16 and 17) or to increase income (and in what areas of NM that is possible) (question no. 19). As previously described (Chapter no. 4.3.1.1), 60-70% of the budget is spent on staff. We seek to know the interviewee's opinion regarding locum/bank staff effect on the budget (question no. 21), as well as the implications of belonging or not to a NHS FT (question no. 22).

NHS England has pledged to start offering a wide range of services on all seven days of the week, in order to improve the care patients receive at weekends and tackle the higher death rate that occurs on Saturdays and Sundays, and also to better fit in with patients' working lives. We want to know the applicability of that measure in the NMD, and the effect that may have on patients in the interviewee´s opinion (question no. 23).

Part four is dedicated to operational management questions. Human resources limitations, research importance, service improvement measures and organizational structure constitute the department related questions. Policies, strategies to decrease the DNA rate and time targets are important measures to increase NMD efficiency (patient related questions). IT practices can also increase productivity. In the end we seek to know the future plans, and the new ideas of how to improve the NMD performance. It is given the opportunity to the interviewees to comment or to ask questions.

5.3.1 Participants

In-depth interviews are used to discover shared understandings of a particular group. The sample of interviewees should be fairly homogenous and share critical similarities related to the research question (DiCicco-Bloom & Crabtree, 2006).

Purposive sampling, one of the most common sampling strategies, groups participants according to preselected criteria relevant to a particular research. Sample sizes, which may or may not be fixed prior to data collection, depend on the resources and time available, as well as the study's objectives. Purposive sample sizes are often determined on the basis of theoretical saturation (the point in data collection when new data no longer bring additional insights to the research questions). Purposive sampling is therefore most successful when data review and analysis are done in conjunction with data collection (Mack, *et al.*, 2005).

Initially, a search was done to find existent NMD within NHS organizations in London. The London area was chosen because it is the region with the greatest number of NMD in NHS Trusts and FT in the UK and some of the hospitals have the high number of scans per year (Steele, 2014). London is a high cost area, so there are different pay costs compared with the rest of the country, thus limiting the study to London, means the data is more uniform and reproducible. In a practical way, it was also more convenient due to the time constraints for developing the current work.

According to obtained data (Annex C, Fig.15) there are 11 NMD belonging to a NHS Trust and 10 belonging to a NHS FT in London. Of the total 21 NHS organizations, 14 service leaders were invited to participate in the study. The person to interview, the service leader is meant to be the managerial head of the NMD. An e-mail was initially sent

with the invitation, a study description and a consent form (Appendix A, B, C, respectively). The e-mail contacts were found in the internet, NHS email contacts and by professional contacts of the interviewer. The 8 remainder were not invited for these reasons: lack of contact information, internal management changes and very small amount of patients per year (normally departments with undefined structure). 11 invitations were positively answered, but only 10 service leaders were interviewed (6 NMD within a FT and 4 NMD within a Trust). One service leader showed interest in participating, but the interview opportunity was dismissed after many contact attempts to schedule it.

The first 9 interviews were held from 16th June 2015 to 8th July 2015. The tenth was held on 11th August 2015. The shortest interview took 00:30 min and the longest 01:41 min. All interviews were done in the NMD of each service leader.

5.3.2 Ethics

Initially, a consent form (Appendix C) was distributed with the purpose of asking permission to record the interview, to use the name of the participant and the respective institution. However, after the first interview it was decided that the institution and interviewee name would not be identified.

Whilst interviewing, the interviewee may share information that could jeopardise his or her position in the respective organisation. Taking that into consideration, this information must remain anonymous and protected from those whose interests might conflict with those of the interviewee. Also the personal and professional opinions are not related to the Trust policies. Confidentiality and anonymity will be kept with the identity of participants always being preserved. All information that respondents provided will not be accessible to others, like the results, which will only be used for the purposes initially indicated.

Still, the consent form was signed by each interviewee and the guaranty of anonymous information was given. Permission to include transcriptions was also requested. After transcription, the interview results were sent back to the interviewees to be approved for publication. The information that was unknown at the time of the interview was again requested by e-mail.

5.4 Thematic analysis of the data

The interview data consists of digital recordings and notes that were transcribed for later analysis.

The focus of the analysis is to look at how all individuals responded to each question or topic for a given time period.

So initially, the data was organized by question to look across all respondents and their answers in order to identify consistencies and differences. All data from each question was put together.

During the data analysis phase of the research, transcripts were coded according to the most salient themes emerging across the set of interviews (thematic approach). The same theme may be identified in different phases/questions of the interview.

After the themes or patterns (ideas, concepts, behaviours, interactions, incidents, terminology or phrases used) being identified, these are then organized into coherent categories that summarize and bring meaning to the text. Category is just a particular theme.

There are two ways to categorize narrative data — using preset or emergent categories. Preset categories are preconceived categories, which were decided previously to the analysis. The themes provide direction for what to search in the data. The second approach allows the categories to emerge from the data (Renner & Taylor-Powell, 2003). The emergent categories are the best approach to analyse the data once categories are defined after analysing the data. Within a category, we are looking to find similarities or differences in people's responses.

A table (Appendix E) was created with all main interview themes organized in three sections: the perspective of the service leaders about their job tasks; the perspective of the PbR system by the service leaders; the perspective of the Trust organization by the service leaders; financial management in the interviewee points of view; operational management policies and future plans.

Within each perspective there are themes, categories and subcategories.

Chapter 6: Results

6.1 Department and interviewees characterization

Table 6- Sample characterization

	Job Title	Band	Years working as [Job Title] in their organisation	Years working as [Job Title]
I1	Service Manager	8c	1.5	1.5
I2	Superintendent Radiographer (with reporting duties)	8a	9	11
I3	Service Manager	8b	1.5	1.5
I4	Acting Joint Chief Technologist	8a	4	4
I5	Professional Lead in NM	8d	13	13
I6	Superintendent Radiographer	8a	20	20
I7	Head of Radiology and NM	8d	5	8
I8	Unit Manager	8c	3	10
I9	Superintendent Radiographer	8a	12	12
I10	Superintendent Radiographer	8a	13	25

Source- Own elaboration.

The study sample is composed by 10 managerial leads in pay bands from 8a to 8d. Some of them were hybrid managers (both with clinical and management functions). The range of years working as [Job Title] is from 1.5 to 25 (mean: 10.6) and in their institution from 1.5 to 13 (mean: 8.2).

The most common scans being performed in the NMD (9 out of 10) are bone scans, Myocardial Perfusion Scan (MPS) (4 out of 10) and PET/CT (2 out of 10).

Table 7- Department characterization

	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10
Staff										
Consultants	5	4	3	7.5	4.3	2	3.3	2	5	3
Technologists										
- Band 5	0.5	1	2	3	2	1	3	0	0	0
- Band 6	4	1	3	11	8	1	10	5	4	0
- Band 7	7	0	3	4	5	1	5	1	7	4
- Band 8	2	1	1	2	2	1	2	1	2	1
Nurses	2	0.5	2	4	0	1	3	0	0	0
Equipment										
Gamma-Camera	1	1	1	2	3	1	4	1	4	1
SPECT-CT	2	0	1	2	1	1	3	0	1	2
PET-CT	2	0	1	1	1	0	1	0	1	0
DEXA	1	1	1	1	1	0	0	1	1	0
Injection rooms	2	1	2	3	2	0	7	1	3	1
Total no. of Patients per Day										
NM	27	13	18	-	-	10	40	9	-	20
DEXA	4	8	13	-	-	0	0	-	20	0
PET	16	0	6	-	-	0	12	0	13	0

Source- Own elaboration.

The mean number of patients per day and per gamma camera/SPECT is 8.2. I2‘ NMD is the one that performs the highest number of patients per day/camera, probably due to longer sessions (two days per week) whereas I6‘ NMD only performs 6. In PET it is possible to perform the maximum of 13 scans per day in one camera.

It is not possible to calculate the amount of staff needed per camera (thus it’s not correct to compare the departments) because of different running times of equipment (especially DEXA).

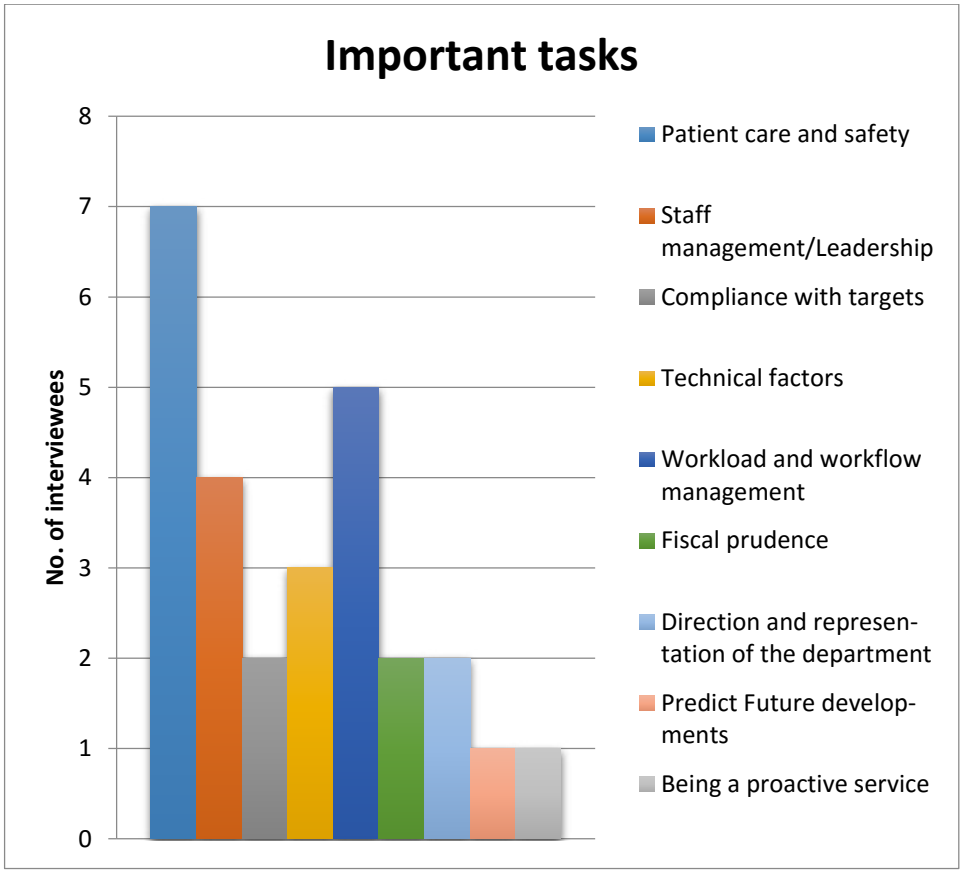
We can see that there are more individuals in the band 6. Only I1, I9 and I10 have more band 7 staff.

6.2 Perspective of the service leaders about their job tasks

Based on the interviewee's professional experience, they consider that their main roles are focused on two main areas: patient care and efficient department management (Figure 6).

Seven out of ten interviewees consider that the department needs to provide conditions to give good patient care (I2, I4, I6, I7, I8, I10Q10) and safety (I2Q10).

Figure 6- Important tasks



Source- Own elaboration.

Efficient department management depends on staff management (*e.g.*: "manage all team [...] match the skills to the tasks [...] staff are up-to-date with their technical training [...] and aware of the basic legislation"-I9Q10); compliance with targets (I3, I9Q10), workload and workflow management (*e.g.*: "making sure that there is all

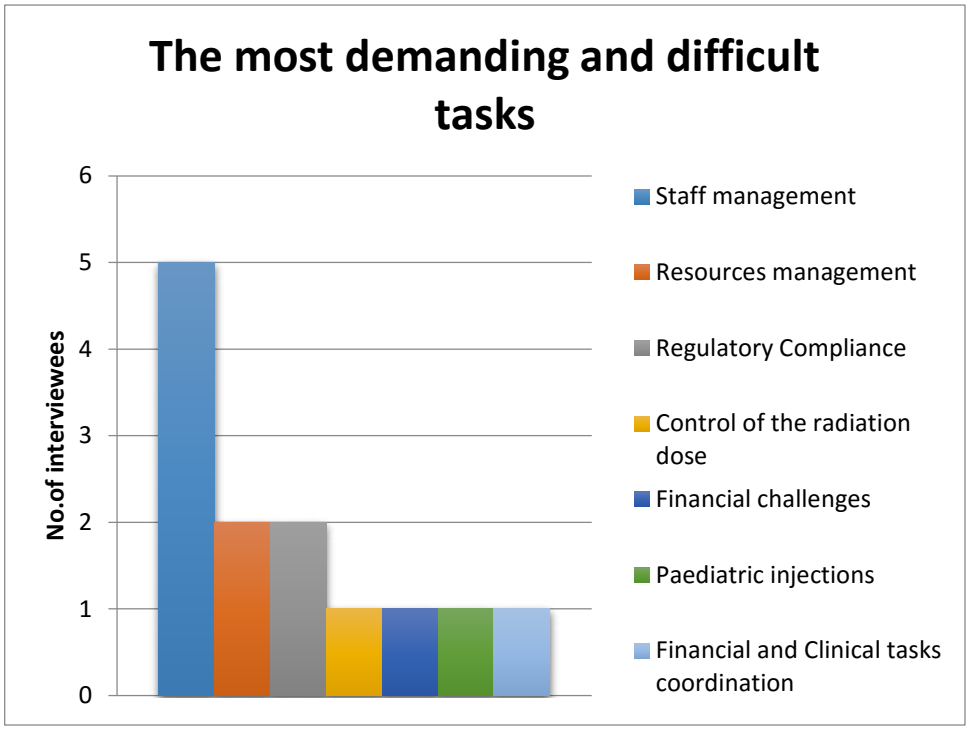
scheduled"-I8Q10), technical factors (*e.g.*: "good imaging"-I9Q10) and fiscal prudence (*e.g.*: "ensuring we have [...] or make enough money"-I7Q10).

To complement, I3 and I5 refer the representation of the department.

Predict future developments (technologies and referral patterns) are clear-signed goals that I1 has to allow the department to be proactive instead of reactive.

The most demanding and difficult tasks were also listed (Figure 7).

Figure 7- The most demanding and difficult tasks



Source- Own elaboration.

One of the most important tasks is also one of the most demanding for the majority of our interviewees: staff management (I1, I2, I3, I4 and I7Q11). Staff management "takes a lot of time" (I1Q11), "people are unpredictable" (I3Q11) and when conflicts happen, the service leader "has to be political to stop difficult relationships between staff" (I7Q11).

I9 and I10 refer that it is difficult to manage the patients flow quickly enough to respect the time targets, taking in consideration all the restrictions felt in the department ("there are no resources, you don't get extra staff, you don't get extra money, you've got old equipment, increase of patients, increase of workload and it continues to increase but there is not an increase of any resources to match that."- I9Q11).

At the moment, for I4 and I5, the most demanding task is regulatory compliance. That means “preparing and keeping all the documentation up to an appropriate level for outside inspection and inside use” (I4Q11) and checking the “radiation dose [...] for staff and patients” (I5Q11).

Other answers include clinical difficulties (*e.g.*: “paediatric injections”-I6Q11); financial challenges, “which is sending like bills and checking invoices” (I5Q11) and coordination between administrative and clinical work (I8Q11).

6.3 Perspective of the PbR system by the service leaders

The question no. 12 and 13 were asked to know the general effects of the PbR system compared with the previous financial model, in terms of patient and financial outcomes, and the effect of the PbR system in the context of radiology (in the patients´ outcome).

Eight out of ten did not know the characteristics of the actual or previous financial system to compare or did not properly answer to the question. Some information was still possible to be extracted.

The interviewees who have answered consider that “PbR is meant to be outcome related” (I1Q12) and it is in place now for about 10 years (I2Q12). “This model asks us to look for more efficiencies within our department because if we are getting paid by the result [...] then we are more productive and [...] more profitable as well” (I2Q12); it didn´t change the way of working (I3, I4Q13) or the amount of work (I1, I3Q13), however there is a “fastest turnaround [...] consistently trying to get higher numbers through because of the various targets” (I4Q12/13). In the same line of thought I2 line manager “wants me to do as many scans within a time frame as possible [...] the only thing it is going to affect in the situation is the patients [...] and the staff morale”. He/She also thinks that “imaging is being utilized much more rather than the clinical argument of the doctors [...] there is not enough stringent boundaries on being able to refer for scans.”

By opposite, I8 and I3 declare that “the number of scans didn´t increase because ultimately whether we do a scan or not, is determined by the ARSAC holder and the ARSAC holder has to abide by the clinical indications approved by college of radiologists’ guidelines” (I3Q13). “I don’t think referrers have any idea about it, the referring

consultants are not aware. If the patients need a scan they need a scan. They are not going to take into consideration any financial model" (I10Q13).

I7 didn´t notice any differences between the previous and the current model, but disagrees with the income compensation once it "is not transparent" or "honest" (there are financial mistakes).

The financial system implications are not felt and not consider as important as other issues by I5.

I8´s answer to this question cannot be considered for analysis because the PbR was described previously attending to the interviewee request. However in his/her personal opinion

> If you are being paid in proportion to the work that you do then that sounds more reasonable [...] because [...] that means that you are being compensated for the capacity and the amount of patients you should do. So obviously if we do more we get more money but that means that you don't have to cut corners because you get money from the actual jump that you do. (I8Q13)

I9 thinks that "we get money for the number of patients that we did. [...] In the past, not too long ago [...] different departments would have to pay for their imaging so there was a cross charging. I am not sure if that was everywhere."

I9 further considers that now "PbR is a better system [...] because you're not then restricted by what you do, what patients are referred for what tests. Consultants are not reluctant to send patients for certain tests."

According to I1, "we are kind of moving back potentially towards block contract."

Regarding patients´ outcomes in radiology (including NM), "there isn´t any incentive to improve patient experience due to the way the tariff is used, no incentive to the department providing the service, so there is no quality/benefit. There is no tariff uplifts [...] because there is no measure of patient experience or quality of the study" (I1Q13). I2 thinks that

> It's making it potentially worse because of the fact that we are looking for efficiencies, a workflow, how many patients we do per session. It's finding that balance between the patients' safety so that we are able to give each patient

> the right amount of attention and that we are working effectively by doing as many patients as we can. (I2Q13)

I4 doesn´t know, however he/she thinks that the time that the patients are seen is quicker.

Even if the practice is being reviewed constantly, the service approach was not changed and is "patient focused irrespective of whatever the background is" (I4Q12, I3Q13, I7Q13), so the patient experience didn´t change (I3Q13).

The tariff — also known as the national tariff — is a fixed standard price list for English hospital NHS treatments, interventions and operations which is part of the PbR (Wellards, 2012).

It was asked the opinion about the current tariff for NM procedures.

I4 believes that the tariff "actually corresponded reasonably well [...] if we worked more efficiently". I7 agrees: "It corresponds well for many things". "Bone scans and MAG3 you cover your costs" (I10Q18).

All of them agreed that the tariff is underestimated in some cases. In some exams the radiopharmaceutical cost overweighs the tariff value (*e.g.*: DATScan; HMPAO; HIDA; Octreotide) because, from I5´s point of view, the tariff doesn´t respond quickly when a radiopharmaceutical company changes its own price. Also the scan duration and the resources used in each exam aren´t covered by the tariff (I2, I4, I9, I10Q18). Adding to that, London area has got higher banding (I10Q18). The complexity of the nuclear medicine procedures is not fully represented in the RIS system (I3, I4, I8Q18).

By contrary, there are also "profitable" scans, like bone scans (I1, I3Q18) where "the dose costs £15 or something" (I3Q18). I1 confirms that "for NHS there are a number of scans that we get more money in from tariff than it costs us to perform the scan".

I1 believes that "there aren't enough HRGs to specifically group nuclear medicine studies" and so "these are being grouped in lower cost procedures". I4 affirms that "it's certainly better than it was because they've increased the tariffs recently, we're undergoing a change. [...] There are 60 new HRG codes at site but you've got at least that amount of codes within the bone scan coding in the national coding." Still "we are better than we were a few years ago because we had an awful load of let goes".

I1 adds that

> The recharge is actually being internal for the imaging cost so you don't actually see the tariff money coming in. The only tariff that we see coming in to the department here is from the PET/CT scans, so we don´t see any of tariff coming in from any of NM work, that all goes centrally. One way of potentially set the tariff up is to take into consideration the radiation dose to the patients for a combination of scans and you could influence referring patterns in that way. (I1Q12)

According to the response of each interviewee, it was also asked if they ever considered stopping or reducing the number of exams that are significantly more expensive than the tariff reimbursement. I1 defends that

> There is a clinical need for them and there is no other test that could replace those high cost exams [...] however more senior managers than me have asked the question and asked why we are performing studies that are significantly more expensive than tariff reimbursement. But the idea should be that hopefully those scans that are cheaper than the tariff to perform we are doing lots of, the things that are more expensive than tariff we do relatively few of and hopefully it balances out. So from a budgetary point of view there is no problem. (I1Q18)

I2 has "never based what we do on comparing the tariff costs to what it costs to do", but to remove the studies that are not possible to be effectively done ("very labour intensive in terms of scanning"). I3 declares that even if the "finances get worse" the Trust will not stop PET/CT scanning once patient care is "their top priority and finances comes second".

I5 and I10 assert that is needed to do what the referrer requires. I7 claims "that's morally bad so I will never stop something, but for new expensive therapies or diagnostics I will not start them until the referring department ensures me that they have money to transfer to".

A comparison between the tariff prices and the real cost is made every year by I1; I2 checked the tariffs 5/6 years ago; I3 and I10 have not done personally "but there are cost accountants in the Trust who analyse how much it costs the department to do a specific exam" (I3Q19) and managers that discuss that at different meetings; I9 discharges

that responsibility from his job tasks; I6, I7 and I8 didn´t; I5 did not answer directly to the question.

6.4 Perspective of the Trust organization by the service leaders

FT have some managerial and financial freedom when compared to NHS Trusts. The purpose of the question nº24 is to know if the NMD service leaders within FT feel or felt any difference in a budgetary level or operational management when the institution became a FT. The same question was asked to the remaining service leaders to know what effects they think the department would have.

At a department level, I1, I2, I7 did not feel any impact given that (according with I1Q24) the ability to go and attract additional work did not improve.

I4, I5 and I9 do not know. For I4 there were changes (with uncertain cause) “due to the wider finances being cut or else remaining the same [...] the Trust is faced with a different savings plan every year which obviously filters down towards to us.” For I5, “people that deal with the commissioning” give now more emphasis in the institution nature “rather than the NHS nature of the place as part of a bigger organisation”, emphasizing that “the Trust finances are tricky [...] regardless if you are in NHS or not or if you have FT or not.” I10 realizes that “there is more pressure to save money but there is no increase of income”.

For I3, belonging to a FT allows more control over the budget and the way of spending it. “The flip side of that is that most FT now are in financial difficulties whereas if you are not a FT you are less likely to be in financial difficulties.”

I8 was not sure about the answer but “with the FT you get more money for it, you get more support financially.”

I7 adds that “the organization benefits” by doing businesses.

The delivery of seven day services across England is a priority for NHS England and the NHS Improving Quality partnership (NHS Improving Quality, 2013).

The viability and challenges of a department working 7 days per week was enquired.

All interviewers agreed that it’s not necessary to have NMD working 7 days per week because nuclear medicine procedures are not acute examinations apart probably

from Ventilation/Perfusion Scan (V/Q) (I3, I5Q25) and there is not enough demand (I1, I3, I8Q25). “The cost associated with going to 7 days working would far out way any additional income.”(I1Q25). There is a high cost involved to provide the service (I2, I6Q25). “It might not be beneficial cost wise” (I2Q25) and the income would not be necessarily greater (I10Q25). “If they increase the tariffs, then yes, of course there would be a call for it” (I2Q25).

At the moment, the problems associated with this measure would be: staff fees (*e.g.:* “staff pay changes on social hours (I think its double time that you are paying per staff member)”-I2Q25); “we pay overtime as time plus a half”-I3Q25); radiopharmacy fees (I2Q25); availability of the radiopharmaceuticals suppliers (*e.g.:* “reliant on the manufactures supplying that service”-I1Q25; “we need larger generators to be able to guarantee the amount of work that you do over a week long”-I4Q25); lack of staff (*e.g.:* “a bigger team of staff to be able to rotate”-I2Q25), “extra staff to be able to do that” I4Q25), “you need more staff to cover the shifts”-I8Q25); disproportional patients appointments schedules (“most people would like to come on a Saturday”-I4Q25)).

I4 and I5 wish to have enough and good quality staff to cover for 5 days a week. “That’s much better than having a 7 day week thing [...] we may not get the quality of staff diluting the quality over the 7 days rather than producing high quality over 5 days” (I5Q25).

There would be advantages for the patients (I1, I2, I4, I7, I9Q25) and for the service. The patients “would be seen in a time of their manners” (I9Q25); “they could have scans outside of working hours” (I1Q25); and so, “they have an opportunity then to be seen on a Saturday” (I2Q25).

For a department with higher demand, it “would allow for more capacity” (I2Q25), so it would bring the waiting times down (I3, I4, I6, I10Q25). The “service would benefit, we would use our technetium generators better” (I7Q25).

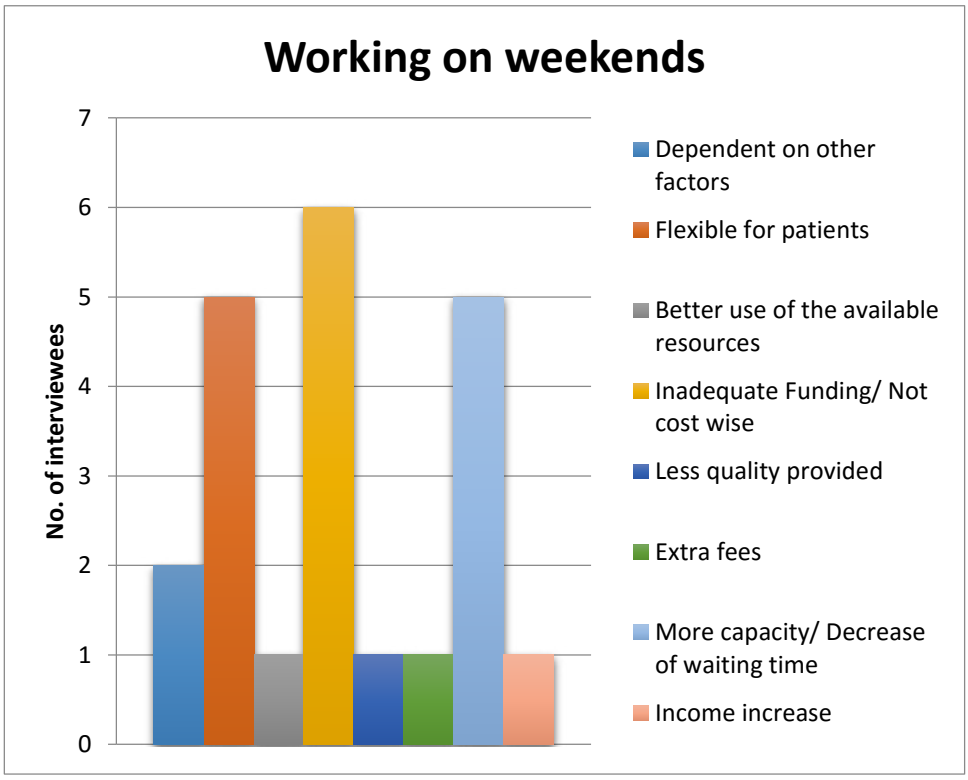
Due to a higher demand, I3 decided to do DEXA sessions on Saturdays, to prevent getting fined if the patients wait would breach six weeks. “I haven’t got figures to prove that, I just think that we are saving” (I3Q25). I9 agrees: “It could possibly increase

the income because you could increase the number of patients that you are doing [...] and therefore money from those patients to cover the costs of the increased staff."

I7 and I8 came with solutions. "Schedule some people that they work Wednesday to Sunday and have two days off. But you still need more normal staff to fill that gap. 7 days working, one needs an uplift of, I don't know, 35 % on your staffing budget" (I7Q25). I8 prefers "to extend the hours rather than to add more days and which is what we've done here".

A graph was done to demonstrate the number of interviewees that answered the in the same category (Figure 8).

Figure 8- Working on weeekends



Source- Own elaboration.

6.5 Financial Management in the interviewees points of view

This section is divided in four themes: Financial reporting; Factors that may influence the budget; Costs reduction strategies and Revenue.

The financial reporting theme was divided in two categories: financial information and department budget status.

I3 and I5 reported that the service line reporting (SLR) is a financial programme guide that provides financial monitoring. It tells “how much the nuclear medicine department charges another department within the hospital for carrying out something” (I3Q19), *i.e.* “about what we charge to our clinical teams, our referral base”(I5Q13). More information about this system will be written in the discussion.

It was enquired if the NMD´s budget is in surplus or on deficit.

The costs were covered by the budget in the I1, I3 and I10 departments.

I2, I4 and I8 were not so sure. I2 thinks that "if there was a problem with the figures" he/she "would be pointed out", so he/she believes that the budget is covering the expenses. I4 adds that the status is dependent of "whether the flow cash can be rightly recouped". I8 doesn't go "to the budget meeting" but "probably is not".

For I7, even if the department "gives up a lot of money to the central finance", when the department over-performs, "the most part" of the budget "covers all of our demands". I5 claims that the department "last year we were in surplus, we made more that we spent". By opposite, I9's department is always overspending due to the fact that the department budget "doesn't take into account the increases" once "the money that is given for the patients for a year is based on the last year [...] so there is always a shortfall".

Theoretically, there are three important factors that may influence positively (private income and research) or negatively (locum/bank staff) the budget. The questions no. 22 and 23 were done to know the effect of those factors in each department.

Everyone agrees that private patient income contributes, in a different level, for the funding of NHS: “It allows for the improvement in NHS service because it funds additional practice that the NHS tariff wouldn’t cover” (I1Q22); “does supplement it in a way that compensates the departmental budget” (I2Q22); there is “money to spend on the department” which “has allowed us to add additional staff” (I3Q22); “brings money in [...] and it is worth to the Trust” (I4Q22); “the quality is improved” (I8Q22).

In the beginning of the conversation, I2 does not “think there is any effect. That money [...] tends to be swallowed up by the CIP, by the savings that the Trust is putting in the radiology department. So I don’t think it really benefits the NHS patients in any way. I

think it's just absorbed by what our budget is every year, which is reduced every year. The government is reducing the budget. We have to think of ways to generate income to try and supplement that saving".

I3 claims that his/her department could not "survive without our private patient income. If we didn't have private patient income we wouldn't be able to have the number of staff that we have".

The effects of the private patients' income in the I5 and I7´s hospitals are regarded by them as minimal.

> Private work is a small component [...] the people who benefit from that is the private patient unit [...] we don't get a profit from the private patients. [...] Obviously extra work is good work for us because anything is part of our SLR but we just pass the costs onto the private patients. So private patients don't gain me…I charge the private patient the same amount as I charge a NHS patient, it's no benefit to me. The hospital charges more and the private patient unit gets that money. The prices are significantly higher but the costs are the same so I only can pass on costs, I can't pass on price. [...]So as a department we don't benefit except in the money that comes from the donations to the chargeable fund from the doctors (I5Q22).

I8 complements his/her answer by saying that "with the state of the NHS at the moment [...], any money that you can get from anywhere as a source of income will be beneficial to everyone who benefits, may that be private or may that be a NHS patient". Sufficient staff "can be provided by the money funded by the private sector coming into the department".

I9 does not get involved in finance and "personally I believe that the NHS should be able to stand on its own feet without the income from the private patients. But I think as it stands at the moment the private patients do provide significantly more income. It does make a difference to the NHS but I don't think it should be like that".

According to I10, NHS loses money (in patients that are not entitled to studies) and the private patients income helps to pay. There is a lack of incentive to do private patients because the income does not go to the department. Adding to that it is not possible to do private sessions due to the limited working hours and lack of resources.

In terms of research, all interviewees consider that there are benefits in doing it: more income; it is a source of knowledge and improvement of the department profile.

The research

> Doesn't have any implication that we can see at a department level. It has implications at an organisation level because the income is held centrally. We get an allocation within our budget supposedly based on the previous year's research activity. But we don't see that income so it's very difficult to determine the actual amount received. It makes it very difficult when making business cases to say: "Our research work has increased, therefore we need an additional member of staff" because we don't have a direct link to that income to show that there is a surplus of money coming in from research that could fund another post (I1Q27).

The income from research in the I7's department "goes to our own lead department and then hopefully at some point it comes back into our budget". It would also return to the I5´s department, "because that is outside of SLR." Still, "I think one of our failings is we don't do enough research and I don't think we publish as much as we should".

I2 believes that the fact that the hospital is a district general, does not give the correct environment for the consultants. "The type of consultants that are working here are the ones that are not necessarily pushing the boundaries of the profession. They are more interested or concerned with the patient care as it is". Also, "departments that already do research tend to be approached for more research as well because they have the reputation and it's almost a self-fulfilling thing [...] but it would be great to have research as a source of income". I10 thinks similarly: "I think we don't have more because it's the nature of the department and also the Trust. [...] Our consultants do loads of other things [...] so they are not purely nuclear medicine so they are not involved in anything".

For I3 and I4, it is an important source of income and department profile.

I4, I8, I9 and I10 add staff benefits: "for the knowledge and educational learning of the techs" (I4Q27), "you tend to be exposed to things that you don't normally do and

makes you think" (I8Q27), "you keep them on the ball, it makes the job more interesting" (I9Q27); "suppose you learn, you gain information" (I10Q27).

I6 and I8 have not had any proposal for a while, because "nobody has come along and made a request for us to do anything" (I6Q27); "As long as we can cope with the amount of work I don't see any reason why we shouldn't." (I8Q27).

I7 and I9 refer benefits to the patients: "recruits treatment" (I9Q27).

I9 does not know how much financial contribution does the research provides neither "what difference it makes to the budget."

The opinions diverge regarding the effect of the locum/bank staff in the budget.

I1 and I3 share the same experience. I1 has got one locum staff at the moment (first time in 10 years) because "had people leave and other people not starting [...] The vacant posts are more than enough to cover the salary of the locum so in actual fact there hasn't been an effect; it has been covered within the budget."

I3´s department is "under pressure to not use bank staff or locum staff or minimise their use because they are expensive. For us, for a small nuclear medicine department, we can't justify using lots of locum staff." When the department had locums, the budget was not overspend "because we also had other posts which were vacant and weren't filled, so it´s a balance."

I2 never had a locum staff for the 9 years that he/she has worked at that Trust but "if we had it would send us over our budget". To "mitigate the need […] we have set up a training programme for any band-5 radiographer within the radiology department to come through and have nuclear medicine training".

I4 thinks that "it's a drain. You are paying on average more for a bank/locum staff than you would for an equivalent substantive person [...] if you have got a band 5 post, the locum that comes will be paid as a band 7 to cover that. But [...] you have them because you really need them but you don't really want them because they cost so much."

I5 also believes that "it is a cost. [...] It's not the forefront of my mind, it's the forefront of the Trust's mind [...]. But it is a pressure."

I6 and I7 do not have locums anymore. I7 “only hire[s] bank staff when that particular need is not budgeted for and that’s a way to get staff to get the work done”.

According to I8, locum staff are needed when “someone had an operation or a maternity cover” but because they stay short periods of time “you end up teaching them instead of them helping you. They’re actually making your work double [...] so you don’t really benefit”. There are benefits “if they stay longer than 6 months [...] even if you pay them extra money”. He/she also refers that

> You have a department that requires a certain number of staff but you don’t have the budget to provide that number of staff. Now when you fall short then you get the locum to work in your department where you pay them almost the double of the price of what you should have been paying for in the first place, which would eat your budget anyway [...] so I think it can be avoided. (I8Q23)

I9 thinks that “if you get agency staff, although the cost is initially very expensive, you then don´t have to cover sick leave, holiday leave, pension and stuff like that. So in terms of the budget I think long term it’s cheaper but short term it’s probably more expensive.”

I10 referred the same problems: “They take it all away [but] they are essential to be able to run the department but I think the agencies now have priced themselves out of the market. [...] They are paid twice as much as a normal member of staff and half of the time they can’t actually do the full job because they don’t know what happens.”

Following, we will describe the cost reduction strategies taken by the interviewees.

Seven out of ten interviewees referred that their institution has its own cost improvement programme (CIP) and that they have to comply with the institution targets. I1 referred that "the division has a cost saving programme and any benefit that any department can act to that improves the divisional position". I2: “over the last five years the radiology department has had a CIP plan [...] we have had to reduce some budget by 5 % every year”. I3's CIP target is "8 % over the next financial year" so "each department has been asked to come up with ideas for CIP within its own department". I7's CIP target is 6 %, so according to him/her, he/she has to give up every year approximately 6 % of the

department budget. I4, I5 and I7 refer that they are always under pressure to save costs. I4 defends that "preferably, service managers shouldn't have to take that burden".

Additionally to CIP plans, I4 refers the "fit for the future" plan and I5 the "Quality improvement Plans". I9 was "told not necessarily to reduce but we are advised to be as economical as you can".

The actions taken to reduce expenditure were categorized in three levels: human resources, equipment and consumables (including radiopharmaceuticals).

Some service leaders have changed the staff grades by hiring staff in lower wages (*e.g.:* "if it's a band 7 that moved, it was filled by a band 6 and so there is a cost differential between the salary of the person that moved and the one that was hired"-I1Q17a; we have changed some staff in grades but it is usually cost neutral. By taking a one and a half band 8b and turning them into two band 7s we were taking the total cost and increasing the number of staff so we were more efficient in terms of the amount of staff we had for the same amount of money. [...] it wasn't sufficient to buy more than half a technologist so we went to a band 3, associate technologist-I5Q17a).

By doing this, the service leaders need to wage in the skill mix, *i.e*, to give the necessary competencies to perform the necessary job tasks.

The service leaders also "replaced locum staff with permanent staff" (I3Q17a) or even ended all agency staff (I6, I7Q16, I10Q17a). However, I7 allows exceptions by "having people belonging to staff bank and then using those for overtime", only hiring them "when that particular need is not budgeted for and that's a way to get staff to get the work done." I10's department policy does not allow overtime payments.

The creation of new job posts is favourable to minimize the agency expense (I7Q17) and to "increase the work group" by spending the same amount of money on staff belonging to lower bands.

I2, I4 and I8 have not decreased costs in staff. In the I9's department, the "staffing was reduced", because "it was felt that we didn't need that amount of staff because of the workload".

In the equipment, the measures were few: no scanners replacing (I1 and I9) to "wait and see how long it last for" (I1Q17b) and negotiate lower price contracts by

extending the years of contract (I3Q17b). The other interviewees did not apply any action. I7 excludes that responsibility, because it has a managed equipment service so "It's not part of my budget anymore". I10 just replaced recently three cameras. "We get increased income because SPECT-CT is a higher tariff so you actually increase the income [...] You just spend money to make money."

One of the most common measure to decrease lab consumables costs is changing the radiopharmaceutical supplier to a cheaper one, by lowering the price of the contracts (I1, I2, I3, I9Q17c). I3 is looking "to save about £40.000 over the course of a year by switching the provider". I10's radiopharmacy is always reviewing "which is the cheapest but only with the major manufactures [...] due to quality and reproducibility and stuff. Because we have contracts with them we get better deals". I2 only orders "the vial and not individual doses" and I9 tries to get the same studies together to use only one vial.

Three interviewees substituted the radiopharmaceutical or chemical component within the same study. I5 and I9 are trying to reduce the use of Krypton and use more technegas (I5 and I9) or DTPA (I9) for the ventilation and perfusion lung scans. I9 also explained that "technegas has got quite a big outlay in the beginning, because of the units. So technegas can initially be quite expensive whereas DTPA we don't pay for the units, we only need to pay for the kits and they're quite cheap and then you just pay for the radiopharmaceuticals. […] Also it only becomes cost effective depending on how many patients you do but that must be taking in account the quality of the images because some people say that DTPA images are not as good and are not as easy of acquiring". Still, I5 confirmed that this measure caused savings of "tens of thousands".

I8 started using regadenoson as pharmacologic agent to repatriate the asthmatic patients back to the department. "Although the regadenoson is slightly more expensive […] sending them to another hospital would cost at least £500 and the regadenoson is much cheaper than that" (I8Q17c).

To save costs and to prevent unnecessary radiation exposure of staff and patients, I5's polices is to "try to inject half the radiation dose that most of the people do".

Other measures were equally put in practice.

I4 introduces the concept: “just-in-time”. His/her order system moved from a “just-in-case” to a “just-in-time” system, once in “just-in-case you have different people ordering, you’ll build up stock, you might not use it as efficiently but that I mean that might use stuff that it’s going to pass the sell by”. In the “just-in-time scenario everything is barcoded [...] they’ve got a price on it so everybody knows what the prices are. […] At the moment everything [...] has got a price on it just to try to jog people memories of what they do before attempting to throw things away”.

I4 uses a “smart order system” to “bulk ordering”. In his/her opinion, buying a more sophisticated (and safer) device, even if more expensive than the one in use, pays off by: not purchasing other additional devices (*e.g.:* “it’s up against the fact that you don’t have to buy as many peripherals like three-way taps”) or pays for itself (*e.g.:* “newer printers they cost less, they use up less consumables so you’d obviously go for those and hope that actually the initial lump of cost, once its finished it will start paying for themselves”).

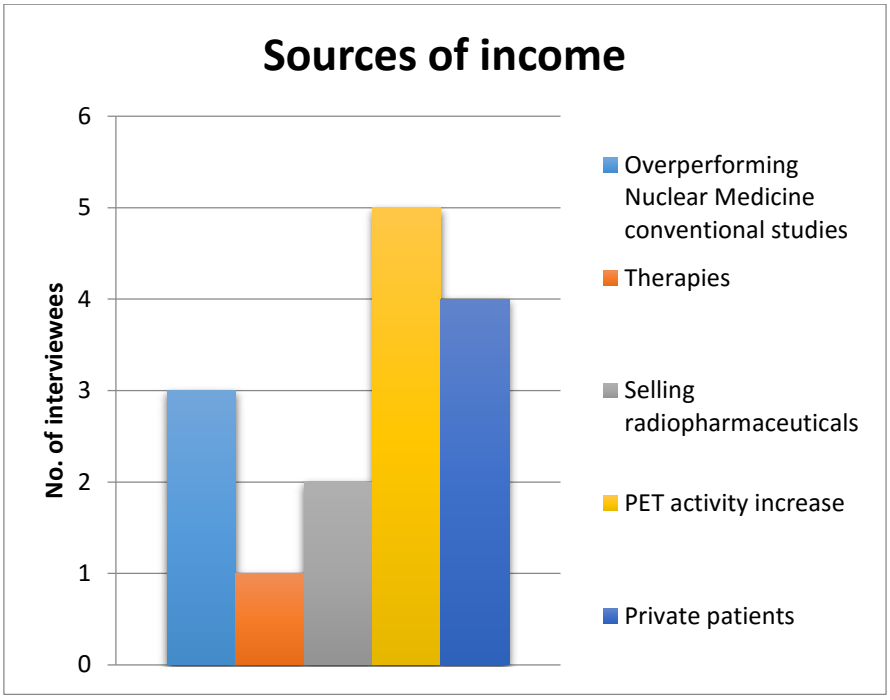
Sharing with other departments might reduce the costs of delivers and consumables (*e.g.*: “instead of nuclear medicine have their own deliveries, we now order through the rest of imaging so we’ve reduced our delivering costs”- I9Q17c).

I8 extended the working hours for cardiac scans (once the radioactivity is much higher in the morning, it is possible to inject more patients). That way, he/she managed to take off a day of sessions saving “£250 a week which is £13000 a year”.

Three interviewees considered that repatriating work back to the department is being a successful measure to save money. Two of them decided to re-start cardiac sessions (I1 and I8) and one decided to start a new modality in the department: PET/CT (I3). According to them, it is more expensive to send patients to other hospitals than having the necessary resources to perform it in the department.

As part of the Revenue theme we will describe which areas can increase income (Figure 9), and what strategies are implemented to attract investment.

Figure 9- Sources of income



Source- Own elaboration.

I1 receives higher income coming from NHS and private sector on the "majority of PET-CT, bone scans, but in this department MUGA probably, thyroids".

I3 is "PET private patients and PET patients from other Trusts and therapies as well". I4 is radiopharmacy ("it's the biggest cost and the biggest income"). I5 is by increasing the PET/CT and therapies. I7 is "rather good at generating income, by selling radiopharmaceuticals, over-performing in PET and some private clinical services".

I8 is "cardiacs possibly because that should be at least a category 4".

I9 is PET-CT and I10 is sentinel node studies, defecating proctograms and colon transit (which other places don't do) privately.

The major source of income for I2 is the private cardiac scans for the Driver and Vehicle Licensing Agency (DVLA). Even if "it's not a full private tariff because I believe the private tariff for a MPS is about £600 and we charge £550 to do it but in actual, the cost is significantly less than that for us to actually do it [...] we do make a profit out to it". The department also has a SLA to perform bone scans for two private hospitals (which share the same consultants) that have "links with our consultant radiologists here".

I3 affirms that therapies are also very costly and so “for a provider-to-provider it’s something like £15000, for private patients we can charge about £25000 for a therapy”. Their

> Private patient income is definitely gone up significantly, not exclusively in PET though, across the whole board. [...] It might be that referrers are more aware of the potential of the nuclear medicine examinations that we provide as a result of more visible representation in the Trust, from me and from the consultants [...] by consultants attending MDT meetings and discussing patient cases [...] But the Trust also has a strategy to increase it, the private patient work anyway as a mean to get out of its financial difficulties. (I3Q20)

I4 shares the opinion that

> The consultants would constantly try and increase the profile at MDTs and to make sure that nothing slips off. Anybody who has worked in nuclear medicine will sometimes see that some scans are almost fashionable but in a lot of cases it depends on the consultant who was in charge of the referrals is aware of it. [...] We have private patients but that depends on the referral patterns. I couldn’t give you a degree of how actively we seek those out. (I4Q20)

To attract income, I1 contacted “referrers of private hospitals to refer more private patients”; I2 does not have any strategy in place (the only action done was a letter written to the DVLA); I3 communicates “with clinical trials office to encourage more clinical trials”, has “links with the private patients office”, and has “sent out brochures to potential PET referrers [...], photographs in magazines within the hospital to advertise the PET service”. However “it’s not had much of an effect, I don’t think. Any additional referrals that we’ve received as a result of advertising are difficult to quantify”. I4 believes that the “fame of the institution”, “level of specialisation, our level of expertise” and setting competitive prices for the selling of radiopharmaceuticals will do the work. I5: “main sort of attraction is giving a high quality service and trying to find areas which other people don’t do or don’t do as well (“SPECT-CT doesn´t exist in every place”). It’s just contacts and hopefully word of mouth”. To contribute to that, there is an “excellent radiologist” that receives private referrals endorsed to her.

I6's and I9's service leaders do not have any particular strategy that acknowledged of. I7 invites consultants and "has a little display of a new technique [...] and then we hope they will refer their private patients to us". I8 wants to increase the number of DEXA scans (because the scan is cheap and "gets a lot of money for that") by increasing the number of "choose and book" slots available for GPs to book their patients' appointments without big waiting lists.

I10 has two factors in his/her favour: new equipment (that was advertised in the intranet) and specialists' consultants.

6.6 Operational management policies

In this section we have analysed the opinion, the current managerial situation and the department policies in effect specifically in the areas of: departmental assistance; service improvement; workload configuration; demand control; patients´ DNA; human resources mistakes and IT system.

We will start to describe the opinion of each department assistance method.

I2 and I9 like the system of sharing the porters with radiology because it is a "more efficient service".

Previously, in the I2 department, there was such a big pool of porters "that if a porter did not do their job for us it did take a very long time and we found there was nobody taking responsibility for it". Like I2, I9 thinks that central portering "doesn't work because you get delays and [...] the porters have to go everywhere else [...] they don't have appreciation of getting patients here on time". The easy access to the radiology porters allows a better communication, the instructions are well followed, and the waiting time is reduced (I2, I4Q26).

I4 and I8 do not share the same opinion as I2 and I9. "The radiology is [...] a bigger department, [...] so they will take priority [...] it would benefit us if we would have our own porter [...] (not necessarily a porter designated entire to us but somebody who was there for part of the time [...] or somebody with a dual role). We would have that controlled" (I4Q26).

I8 would like to have at his/her disposal a porter if there would be "enough work for that porter so that he is just not sitting there all the time [...] To centralise, take the

radiology porters out and just put one central, I think that is even more complicated. [An] advantage of sharing "is that the communication with our porter is much better because they are just outside and it's a smaller group to handle basically".

I3 recognizes advantages in having own porter because "he understands nuclear medicine procedures and the importance of getting patients down at specific times and if we would share him with the rest of radiology he would probably spend more time fetching patients for plain X-ray."

I1 doesn´t see advantages in having own porter because "there aren't enough inpatients". The same happens with I5, I6 and I8.

I5 "couldn't justify more than one" porter, and the "main porters will not help out when your portering isn't up to scratch if you have sickness or absence or whatever". His/her department has "a portering system and it's all online and you book the porter online. [...] The technologists [...] love it. [...] I don't think the online system causes the problem and I don't think that the centralised nature of it causes the problem".

I10 hospital has an online service: "*TeleTracking*" that allows to track the porter and the patient. The "disadvantages are that you don't have a one-to-one communication". With the own porters, there would be "close communications [but] you are limited to one or two porters so if you need two beds at the same time you can't have them".

I6 recognizes that having their own porter "would be quicker" but "the central system works very well for us compared with many other hospitals [...] if a patient hasn't arrived within 30 minutes from requesting it, that's unusual. [...] we know we need to ring maybe half an hour to an hour in advance".

Given that the hospital has got only six porters, they also suffer constrains when someone is sick or on annual leave.

I7 is "proponent of central portering". When his/her department "had a great need for porters the one or two porters we had couldn't do everything and then there were times they just sat and do nothing. Central portering's biggest weakness is time delays to get to the patient.**"**

Next, we describe if the service leaders have done department improvements using the methodologies proposed by the NFSIR and if the departments have any time target policies.

I1 recognizes that being leaner "could be used to better effects within the department" and that there are modifications to be done: "There is a lot of documentation of steps that happen within the department that are potentially unnecessary. [...] The Trust has just approved an electronic document management system which will allow us to have electronic forms as well". That will allow them to "add in a mandatory field to say if patients are having other studies and then it would highlight to the person that is receiving that referral that there is another scan. […] I think process mapping would be really helpful to assess how that works and the impact that could have. So currently I would say those techniques haven't been fully utilized.

Processing mapping was not done in any of the departments, with the exception of I2. The MPS workflow was analysed, with the support of a consultant that knew the process, to determine "how long each stage takes and what we could do to try to minimise the time taken in those stages. Actually in the end once we did that (because it worked so well) we decided to process map everything so basely our entire nuclear medicine workflow".

I3 knew the concept but has never applied it.

I4 believes that

> Comes back to like governance and audit which is always looking what you do and thinking that you can improve what you do [...] looking at the workload how it's changed, looking at it over a couple of years and looking at what we need anymore and within that setting up to book appropriately. So it's good scheduling; […] the booking staff [...] now we have a booking hub [...] we've got somebody whose prime duty was to schedule and prepare all of our cardiac patients, that it moved more smoothly [...] we have introduced text messaging or whatever to try and decrease our DNA rates. (I4Q28)

I5 also never applied those methodologies. His/her department has a "number of meetings organised that focus on those sorts of things like audit and a quality manager system".

I6 considers that lean thinking “is doing everything as efficiently as possible which is what we do. Process mapping you could probably bring in an external assessable consultant to look at what we do […] we have minimum waiting times, we’re meeting demands”. A procedure that improved the way of doing a SEHCAT scan (a scan which the results are very sensitive to the radiation coming from other exams running at the same time) was moving the patients of other examinations to X-ray waiting area.

I7 did not notice big advantages in looking to the booking system and taking that through lean. “It was forced upon us and it probably changed our staff hierarchy a bit.”

I8, I9 and I10 do not know the concepts, but they gave examples of applied enhanced processes: dedicated “technologists vet certain scans based on a protocol […] we could give an appointment straight away right there. […] The advantage is obviously the waiting time. […] At the moment with the way we are working sometimes we do them on the same day, so no need to wait” (I8Q28); “we will check the referral list regularly […] So we have processes in place that will allow as soon a request comes on, someone will look at that request and schedule that patient” (I9Q28); “If they have got scans in radiology we always try and book them on the same day so the patient only has one trip to the hospital. We’ve just recently changed our colonic transits so the patients don´t have a 15 minute image so they just have a capsule and come back in 6 hours” (I10Q28).

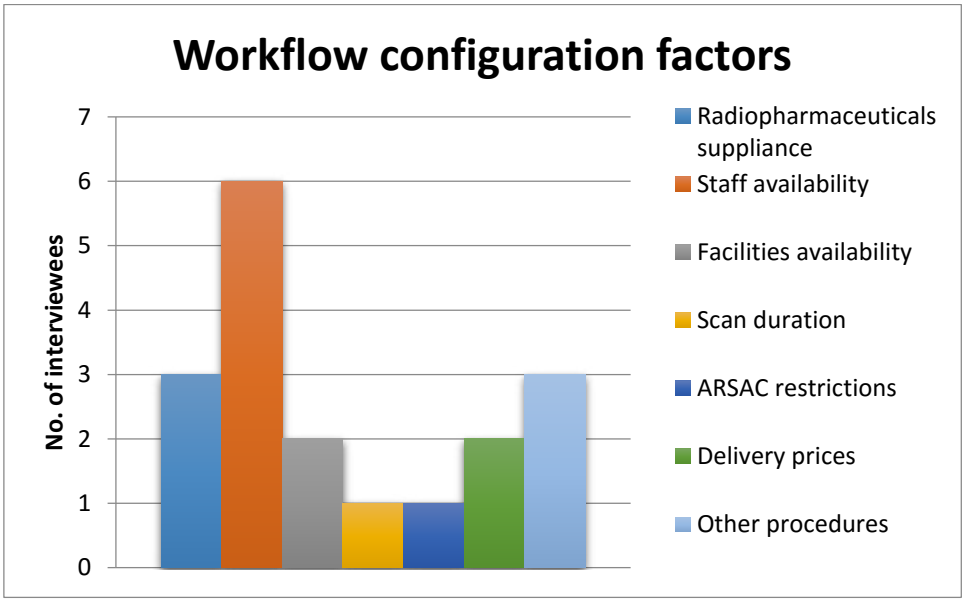
Regarding the time between patient arrival and being seen, I1 and I10 departments have got 30 min time target. For I3, I6 and I8 ideally it would be 15 min. I7 and I9 referred as soon as the patient comes. I2, I4, I5 do not have a time target. “The way that the workflow is being done here, it works really well in terms of how we deal with each of the patients.” (I2Q33). “If there are delays, the patient needs to know as soon as possible and to be given a realistic figure. We get a good feedback in our patient surveys. We have got a patient experience survey that is constantly ongoing and we get reasonable feedback by waiting times and that they are being kept informed all the time.” (I4Q33).

I9 says that “the problem is when they are coming back for the scans [...] because if you had a patient that took a little bit longer in the toilet or took a little bit

getting up or getting on, 10 minutes, and by the end of the day you'll be one hour late after 6 patients".

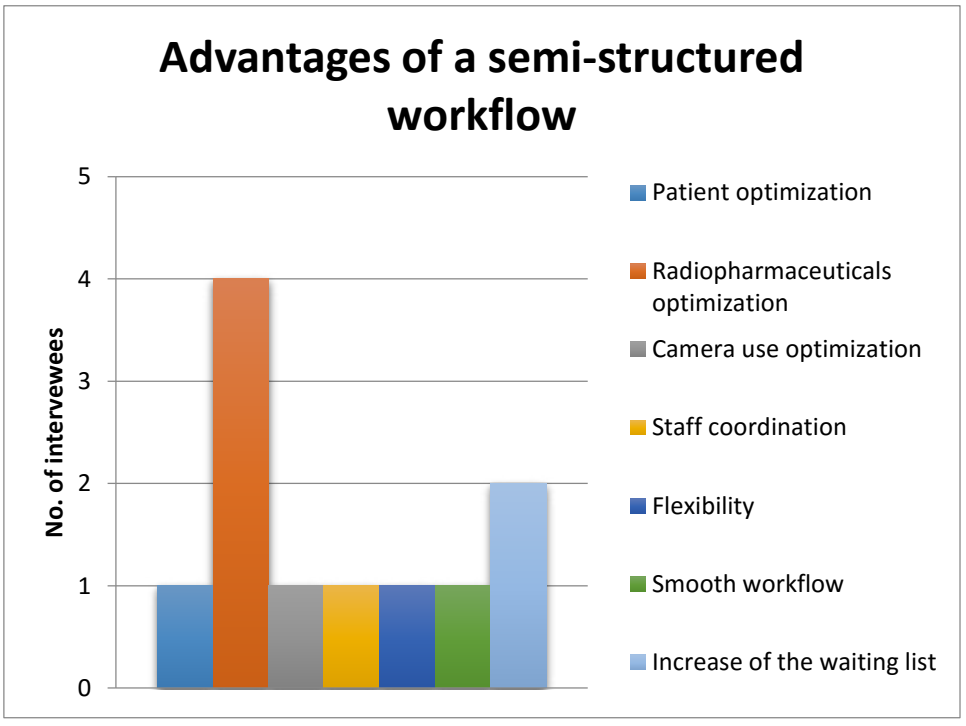
In relation to the question 29, all of the interviewees have a fully or semi structured workweek, with specific exams in each day.

Figure 10- Workflow configuration factors



Source- Own elaboration.

Figure 11- Advantages of a semi-structured workflow



Source- Own elaboration

The scan day is dependent on the supply of radiopharmaceuticals (I1, I5Q29); generator arrival (I5, I10Q29); availability of the consultants and nurses (I4, I5, I6, I7, I8, I10Q29); availability of the facilities (I4, I9Q29); scan duration (I5Q29); license to hold specific radioisotopes (ARSAC) (I8Q29); price of delivery (I8, I9Q29) and other limitations related with other procedures (I4, I5, I10) (Figure 10).

It can bring advantages: “the number of patients we are able to do by organizing the list” (I2Q29); maximization of the use of radioisotopes (I2, I4Q, I7, I10Q29) maximization of the camera (by doing sequential types of scans) and the staff operating the camera (I2, I3, I5, I9Q29); staff coordination (I7Q29); flexibility (I5Q29); smooth workflow (I9Q29) (Figure 11).

I1 has a semi structure but “we basely scan everything on any day because of the speciality of the hospital is not so much for an effect”. The same for I6 that has tried “to group things together for efficiency, particularly in times in the past when there were technetium shortages. [...] The nature of our demands is such that it’s actually quite difficult to group patients [...] because we actually don’t have sufficient numbers”.

I3 does not organize all scans in each day because “it is a very inefficient way of using your scan slots”. The waiting list would increase for some scans and decrease for others.

Regarding the department capacity, currently, three interviewees (I1, I2, I5) do not need to increase it. I2's department is managing the demand but is still possible to increase the number of scans currently done ("20-30 extra bone scans" or "10-15 cardiac scans"). By opposite "different type of test requires restructuring our actual work" and "wouldn't have that capacity on the scanner" (I2Q14a; c). I5's department is "pretty stable now" however "PET/CT is becoming quite busy [...] and SPECT-CT is busy", but there is not enough demand to apply for additional actions.

I4 defends that capacity limitations exist with longer scans, once it is possible to fit quick exams or the ones that can run in parallel to the actual scanning. In his/her point of view, the effect of the capacity should take into consideration the "element of staff". Because "one third of the staff" is locum (and they cannot do overtime), the capacity increase is inhibited by that factor.

I3 and I6 would like to increase the SPECT/CT capacity. I3 "can't get a new scanner" because "there is no money to buy equipment". I6 expects that the camera will be replaced soon.

I7 would like to increase the number of scans for PET/CT due to the high demand but “the commissioners only pay a certain amount per annum” so there is the possibility of not being paid if the scan numbers increase.

I8 created “ad hoc sessions to cope with” the high demand for DEXA scans. However, these sessions are only opened when there is enough staff available and as noticed a reduction of scans in NM. In the interviewee opinion, the solution would be to contract new radiographers, but “if the Trust is already in deficit, [...] they won’t have that money to provide a radiographer”.

Similar to the previous opinion, I9 and I10 would like to increase cardiac scans and SeHCATs, respectively, but they cannot because there isn´t funding for additional staff or weekend working.

There are different policies within the departments, regarding DNA policies. I1 and I4 policy is: if a patient DNA, he is contacted and if not located, the referrer is contacted to know if the scan is still needed. If the patient had a plausible excuse, the appointment is re-booked by phone. If the patient DNA for a second time, the request is returned to the referrer.

The referral is also sent back after the second DNA in the I7 department.

I2 policy is: the appointment is automatically rebooked after the first DNA. In the second DNA the patient is contacted and if he/she gives a plausible excuse, an appointment is booked by phone. If the patient is not located, or fails the third time the referral is sent back.

I3 and I10 policy is returning the referral back to the referrer if the patient does not contact back in the first DNA.

Officially the I5 policy is equal to I3 and I10 but, practically is equal to I1 and I4. It depends on the patient excuse and the availability of the reception staff. “It’s sometimes more cost effective for us to proactively seek out the reason.” (I5Q30).

To generate a new request after the first DNA, the patient needs to contact the referrer and inform the situation. That is the basic line of I6.

I8 department re-schedules the appointment depending on the patient situation, but if the patient does not show up or calls, “the referrals are put on hold until we get another referral or until the doctor calls”.

I9’s department sends letters to the patient and referrer stating that the patient DNA. The referrer then needs to refer the patient again. If the patient is paediatric or a cancer patient the appointment is re-schedule two and one more time, respectively.

To decrease the patients DNS rate, all departments send letters after scheduling an appointment.

The departments call (or try) to: remind the patients about their appointments and discuss the preparation for patients undergoing expensive scans (*e.g.*: MPS (I2, I5, I6, I7Q31); PET/CT patients (I1, I3, I5, I9Q31)); patients which their appointments booked less than 5 working days to the scan date (I1Q31); everyone (due to the shifts flexibility) (I8Q31).

Booking choice is a method that I4, I9 and I10 would like to do to every patient, but at the moment is only being done to expensive exams (non-technetium scans). “Is not always practical” says I9.

I6, I9 and I10 department instructs the patient to call to confirm as soon as they receive the letter.

SMS are sent when the appointment is scheduled and a text reminder is sent to all patients one or two days before (I4Q31) and DEXA patients (I3Q31). I10 are in talks to have that system.

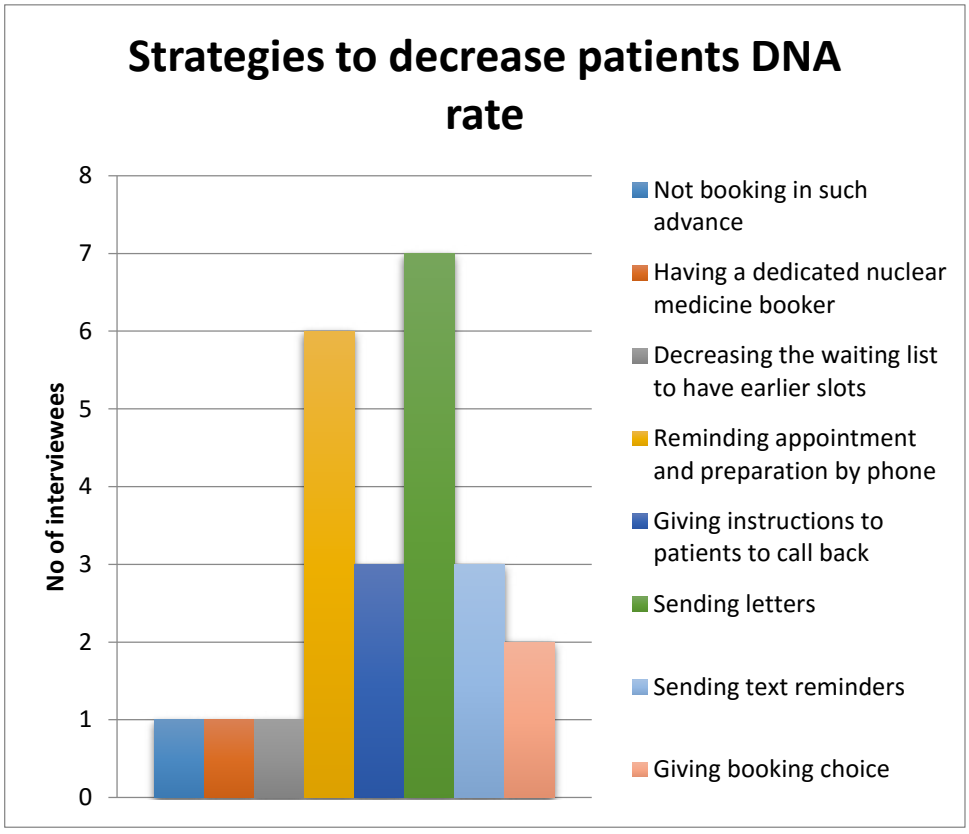
I5 blamed the bookings (that were planned much in advance) and the long waiting list as the reasons for DEXA and cardiacs DNA rates.

I2’s

> Aim is always to call all the patients but we just do not have the administrative staff to do that volume of calling [...] I have one clerical member of staff [...] I don’t think it’s fair to expect our clinical members of staff to be doing administrative duties. [...] Calling the patients definitely works because we can

identify the patients that we can't get hold of. At that point we don't order their dose, we don't do their test. (I2Q31)

Figure 12- Strategies to decrease patients DNA rate



Source- Own elaboration.

To minimize the cancelation of PET/CT inpatients due to incorrect preparation, the ward receives a letter, is phoned at the time of booking, previous evening and in the morning of the scan. "I think it minimizes the number of cancellations that we have because we always call first thing in the morning. If a patient is eating breakfast we can delay them to later on in the day (we don't have the flexibility but we make it)" (I1Q32).

I2 does not have reasons to complain. "The connection works well. Typically it would require a clinician from the ward to come down and speak with us. If they wouldn´t contact us then we would contact them [...] they know they are not going to get the scan if it's not being discussed anyway." Also says that the department does not do inpatients that require preparation, namely MPS. That decision was taken among the consultants due to the fact that it was a problem that could not be resolved, "here is such high turnover of staff". The inpatients that can wait to be discharged are done as outpatients

and if the referral is urgent, they are done in another NHS institution: “So the (another NHS institution) takes some of our work but a very, very small, awkward difficult proportion of work and we get the full value for money out of it.”

I3 reports the same problem, the “ward staff changes periodically [...] it is a teaching issue”.

I4’s department logs the incidents on an online platform: DATIX and they “keep a good record”. The night before the scan, “we’ll ring them and we will try and get a nurse to go up and assess the patient”.

I5’s department also uses DATIX because it “has been the avenue to produce those answers to the clinical teams [...] so I think it’s just education and [...] communication”. I5 affirms that this problems will not finish and “it’s a human resources issue, a particular crisis on a particular ward”.

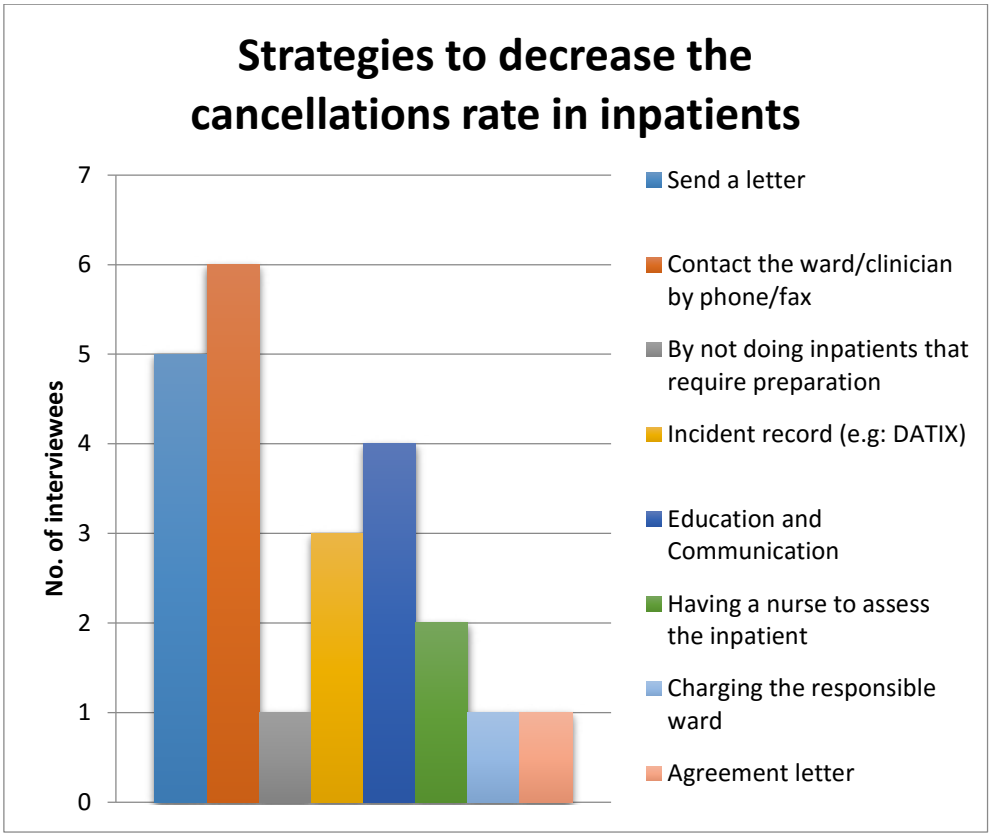
I6’s department “send information letters up to the ward” and rings to the ward to make sure “the nurse looking after the patient is aware of the preparation prior to the appointment”. The ward is also contacted “the day before the examination to check that the examination is still required [...]. If it’s for a cardiac scan, one of the cardiac nurses will physically go up to ward and talk to either the patient or staff looking after the patient”.

I7 takes an innovative approach and charges the ward (from their own institution) “especially in PET [...], if they missed to prepare the patient”.

I8 complains that it’s still an unresolved problem. He/she contacts the responsible doctor and emphasizes the importance of getting the patient correctly prepared, due to the high costs involved in the process. The department also gives a “paper with instructions [...]. We are slowly educating the wards that they need to prepare the patients”.

I10 affirms that this situation does not affect so much the department. The policy is to “send an appointment information up to the ward [and then] ring the ward a day before to check what’s happening”. The cardiacs inpatients are not done but when they were done the preparation was never accomplished.

Figure 13- Strategies to decrease the cancellations rate in inpatients



Source- Own elaboration.

The last section of our analysis is about the IT system used in each department.

Mostly of the interviewed departments are semi-computerized.

I1's department referrals come in on paper. They have tablets to insert the patient and study details but "is not necessarily the most efficient system. From a staff point of view I think it's reasonable for them to use on a regular basis" (I1Q34).

I4's department's referrals are on paper "in the sense that it's printed out when it comes out via CRIS" to be vetted by the doctor and signed by the patient. "We intend to move over to electronic vetting. That would mean that they can be vetted from anywhere [...]. Once that happens it's a see-change with mentality as well. Some people are very used to paper." However, the paper form is still important to take notes and to ask for informed consent, but the difference is that it will be scanned and disposed after. "I don't think you'll be able to eliminate it all, you become paper-light. People will still print" (I4Q34).

I5's department has the same system and the same goals. His/her department future IT system will allow electronic vetting.

I2 does not "find advantageous a system fully computerized. [...] We have designed our own questionnaire [because] it's still useful to be able to get clinical information [...] so when the consultant comes to report, he will have the request form and this questionnaire so [...] it's all there sequentially".

I8's staff scans the referral into the electronic system, "but there are certain doctors who still write the request form on the forms that they have. [...] We shouldn't accept non-electronic referrals and vetting should be electronic".

I9's department receives the referral that also gets vetted electronically, but is also printed to be vetted and to be used to write the patient details and the necessary information. That document is scanned back to the IT system. The system is not all computerized because the radiologists still need education and training to feel accustomed. However I9 admits that "we have to rely on the radiologist to be at the site and you are printing it to vet it so that can cause delays". I10 system has everything online but the department does not fully use the system because "you lose all your flexibility if you go completely to the computer, also our radiologists aren't always around so they don't want to vet electronically." They print the request form, it gets vetted by one of the consultants and the appointment is made.

Some interviewees enumerated some of the advantages of a computerized IT system: auditing (I5, I6, I7, I8, I10Q34) efficiency (I2, I3, I6, I7Q34); better accessibility (I2, I4, I7, I9Q34); safe storage (I1, I2, I8, I9Q34); confidentiality protection (I1, I9Q34) and paper-light (I4Q34). The disadvantages are: if the RIS or PACS system fails for some reason it is not possible to do anything (I3, I8Q34) and inflexibility (I10Q34).

Even if paper is "actually easy to work with during the day" (I4Q34) and "useful to be able to get clinical information" (I2Q34), it is "a space, it's an expense that you don't need both in printing consumables and paper, also in staff time consumption (which would be the administration and clerical staff spending time managing and moving it around)" (I4Q34). Being computerized eliminates the storage problem (I4, I5Q34).

I1 refers that it is "more expensive to run parallel paper and electronic systems".

In terms of reporting, the imaging (excluding specific software to process cardiac scans) can be accessed anywhere (I2Q34). The same for I5 and I4, where the images "are reviewed either a mixture of PACS and Hermes workstation which is practical platform for all of our machines to feed into" (I4Q35).

I2's, I8's and I10's departments do not have NM information in the website. I1's, I4's, I6's, I9's departments have out-of-date information; I3's and I5's information is incomplete and I7 does not know. I10 claims that "it's only as useful as how often it is updated, how often it's managed. It would be nice to have a website that people could look".

I5 refers that the department created two videos explaining the thyroid therapy to reduce the explanation time duration. "In practice we spend quite a long time explaining."

The website lack of information is of the responsibility of interviewee (I1, I3, I4); senior staff (I4); IT team (I6); communications department (I7).

The prices information for private patients are "commercially sensitive" (I1, I3Q36) or of the responsibility of the private unit (I2, I3, I5, I6, I9, I10Q36).

6.7 Future plans

The future plans for the departments involve: trying to reduce radiopharmaceuticals and consumable costs (I1, I4Q37); attract new customers for the radiopharmacy (I7Q37); sell specific radiopharmaceuticals (I6Q37); skill mix (more professional opportunity and cost decrease) (I2, I8Q37); work on staff retention (I4Q37); quicker employment process (I4Q37); increase the number of staff (I10Q37); new equipment (I2, I5, I6, I8, I9Q37); computerise all of the ordering system but also the actual referral system (I4Q37); expand the therapies (I5, I7Q37); more research (I5Q37); improving the department standing (I5Q37), running more courses (I5Q37); slots optimization (I8Q37); extend working hours (I9, I10Q37) increasing income by increasing patient throughput (I1Q37), ensuring that all the referrals are clinically appropriate (I1Q37) and no overspend (I2Q37).

Chapter 7: Discussion

NMD are very complex organizations that provide diagnostic examinations and therapies using radioactivity. According to the interviewees, providing patient care and safety is the top priority of the service. However, the management of many factors is crucial for the proper functioning of the departments: workload and workflow, staff management, budget management and resources management. Some of the most important and difficult tasks include compliance with the waiting targets and radiation regulations, and having sufficient staff with the necessary skills to perform the required job tasks.

Financial control is a major contributory factor to business survival. NMD that are in the NHS are paid by the PbR system.

PbR uses a nationally fixed diagnosis-related case-based tariff to reimburse hospitals for the amount and type of care provided, making a link between both the volume and case-mix of hospital activity and income. This method involves less bundling than capitation payments, as reimbursement is for an episode of care, rather than a period which may or may not include activity. The aim is to effect changes in the efficiency and quality of care in English NHS hospitals, and to increase activity at a time of long and growing waiting times for elective care. This move away from block budgets to activity-based payment approaches, have improved provider productivity (Marshall*, et al.*, 2014).

I2 confirms:

> Since [PbR implementation, the financial system] has developed into a way that asks us to look for more efficiencies within our department because if we are getting paid by the result and we are able to be more efficient then we are more productive and we are more profitable as well as a department. That seems a bit of a strange concept as a part of the NHS to be profitable but if we are able to do more work with the same resource then we are therefore profitable. (I2Q12)

PbR meant money would 'follow' the patient and, because prices were fixed, competition for patients would be on the basis of quality rather than price (Marshall, *et al.*, 2014).

I1, I4, I5 and I10 defend that the quality of their procedures and specialization of the department is what makes patients coming back; the quality is a good advertising.

A concern with activity-based payment such as PbR is that quality may suffer if providers cut costs to remain at or below the price paid. This becomes particularly pertinent with reductions to tariff. Prices paid are now being reduced in an attempt to promote further provider productivity improvements. If the prices are insufficient to cover cost, the quality can be compromised (Marshall, *et al.*, 2014).

According to some of the interviewees the quality or the way of working is not influenced by the financial model. However, all of them agree that NM tariff is low for some procedures (the cost of radiopharmaceutical is not taken into consideration (*e.g.*: "The drug [for DATScan] alone is £800 and through PbR I receive £193."- I7Q13).

The solution can be to perform more profitable scans (*e.g.* bone scans and therapies), trying to reduce the costs associated to the radiopharmaceutical (cheapest delivery day or by doing the study to the maximum number of patients in a day) or being compensated internally by the Trust.

Currently, the predominance of activity-based payment for acute and emergency care in theory incentivises increased activity in this sector.

Increased activity was an intention of PbR, to reduce waiting times for elective care, which at the time were long and growing. However, as other policies including waiting time targets were also introduced, an effect from these cannot be precluded (Marshall, *et al.*, 2014).

The interviewees stated the need to become more efficient by seeing more patients in the shortest period of time, when possible. There are national waiting targets to accomplish. Two week maximum wait from 'Urgent 2WW Suspected Cancer' GP referral to first outpatient appointment and the remainder patients need to be seen within 6 weeks. 18 weeks is the maximum time allowed after a patient being referred and start treatment (DH, 2013).

The interviewees are convinced that the number of patients didn´t increase in NM because of the financial model. The consultants always vet and give the confirmation to go ahead with scan bearing in mind the clinical history of the patient. I2 is the only

interviewee that thinks that “imaging is being utilized much more rather than the clinical argument of the doctors. [...] There is not enough stringent boundaries on being able to refer for scans. [...] There is a severe over-requesting of imaging on patients that possibly do not need scans. [...] Maybe they have pressures to see a set of number of patients in the clinic at one time and therefore they do not have the time to assess the patient clinically as well.”

According to Marshall, *et al.* (2014), the evidence that there was no deterioration in the quality of care, with limited evidence of small improvements, suggests that reductions in costs were achieved as intended; through improved productivity in the delivery of care, rather than sacrifices to quality. Other evidence suggests that PbR has led to some improvements in quality through enabling patient choice, although there is no evidence to suggest PbR has improved quality in the absence of this mechanism.

Even if it was agreed that the quality did not change, I1 is certain that there are no financial incentives to improve the quality and gives an example. In surgery, a hospital will be paid more if a patient stays in for less time. In NM, there are no incentives for either a fast turnaround or patient experience measures (I1Q13).

Taking into consideration all interviewees opinions and published literature, it seems that the departments are trying to do their best to innovate and improve the patient experience. However to be more productive they are over-performing, and that means spending less time with each patient which may decrease the level of understanding from the patients, leading to dissatisfaction.

In contrast, if there is no income production, there is no funding to improve the service and the quality provided.

The knowledge of the interviewees about this matter is somewhat limited. The vast majority of the interviewees did not know which financial model was in operation previously or the characteristics of the current one. They do not consider it to be their responsibility to know this subject, because it is a senior manager´s task.

SLR is the system that supports (at least) I3 and I5 in their day-to-day financial decisions. SLR aims to improve the level of financial and performance information available to managers of service functions. It brings together the income generated by

services and the costs associated with providing that service, reporting this for each operational unit. This allows managers to fully understand the financial position of their services, and make decisions that can improve the performance of the individual service unit, the service line and the wider organisation.

Practically, the service leader informs the Trust accountants about the cost of every procedure (that includes time taken, cost of the professionals involved and resources spent). Each test is assigned a band and a price, depending on the complexity and resources used in the study. Taking into consideration the number and type of tests from the previous financial year, the budget is calculated (I3, I5). I5 added that the finances "scale down the bandings" and so the department receives less money for each banding than what it is supposed to. SLR is also used to calculate how much the NMD charge other departments within the institution for scans provided (I3).

Even with so many variables to consider, all department budgets (with the exception of one and excluding the ones that did not know) covered the expenditure. Still there are some departments that compensate radiology for its over-spend, when a divisional account exists (I2). The service leader that admitted overspending the budget, blames the increase of referrals and the unwavering budget over the years.

Three interviewees didn´t know the budget status (I2, I4 and I8). The first two are band 8a (Superintendent Radiologist and Chief Technologist) and the third is band 8c (Unit Manager). At the moment of the interview, the service manager of the I4 department left and there was a new person to start, so probably is the reason why I4 was not sure. The other two have divisional managers who they report to, so probably it is not their responsibility to deal with that, even if others (8a, b and c) answered to that question.

For the system to be effective the budget status must also be known by middle managers, which does not seem to happen to everyone.

To save costs, many of the Trusts have CIPs, which in turn the departments have to meet. The service leaders have to put in practice actions to decrease the expenditure: in staff (changing the grades, providing skill mix, not hiring agency staff, not allowing overtime payment); in equipment (no early replacement, lowering the price of

maintenance contracts, seek to commission new services); in consumables (lowering cost contracts for radiopharmaceuticals, buying vials and not individual “doses”, decreasing the amount of injected radioactivity, changing types of radiopharmaceuticals or chemical agents in the same study and group the same studies in the same day) and by doing other actions (bulk ordering, acknowledging staff of the prices, inter-departmental sharing, working time extension and repatriating work back to the department).

Some of these strategies are in line with what was described in the Chapter no.4.

New concepts were added. I4 inventory management changed from “just-in-case” to “just-in-time”. These strategies are opposite of each other, in that “just-in-time” strives to keep as little inventory as possible and the other relies on having plenty of surplus inventory. The “just-in-time method uses the capital more efficiently and therefore has more cash on hand to invest. Is highly efficient and frees up capital, but it is not ideal due to the uncertainties of the needs (Halliday, 2014).

Repatriating work back to the department or not sending patients elsewhere represents a huge saving for the institution (I2, I3, I8). I3 PET/CT service is still not commissioned but the financial consultant advised that it would be better to not receive money for patients (from their own institution) than send them to the closest NHS institution.

Besides reducing costs, there are expenses to be avoided.

In this last couple of years, locum staff agencies overpriced themselves because there aren´t enough specialists in this area. The lack of personnel is due to migration flow, educational and training courses alterations and lack of incentive to work in the area (I4).

Locum staff are needed when a department is short-staffed and the service quality offered is in risk. They need to be taught of how to perform their tasks to achieve an appropriate level of responsibility and commitment. If the locum stays for a short period of time, that may not compensate the time spent teaching and that person may not be conversant with the policies of the department.

In the long term it is cheaper because “although the cost is initially very expensive, you then do not have to cover sick leave, holiday leave, pension and stuff like

that. So in terms of the budget I think long term it's cheaper but short term it's probably more expensive" (I9Q23).

New equipment and new techniques may be seen as an expense but it also an investment that will generate a new demand and thus more income to the department.

To compensate the overspend in human and material resources, the services leaders can generate income by over-performing lower cost scans, increasing PET and therapies activities ("Therapies, we can charge a lot of money for, for a provider-to-provider it's something like £15000, for private patients we can charge about £25000 for a therapy"- I3Q21) and sell radiopharmaceuticals. This is done by having a SLA with other Trusts, private units or consultants that referrer private patients.

A SLA enables the clinically requesting group and the deliverer of the service to agree the amount of work that is possible for an agreed budget and, in particular, to agree the quality of the service that is to be provided. More fundamentally, it also contains an agreed mechanism whereby a shift in the workload, or a change in the case mix, will result in a variation of either: (i) the amount of income transferred from the commissioner of the service to the department; or (ii) the agreed workload (The Royal College of Radiologists, 1998).

In some Trusts, the private income is held by the private unit. The department receives the cost of performing an exam but does not receive the private income. Potentially, if the department requires, they can request funding for developments. Nevertheless, it does not give an incentive to do more private patients or to create strategies to attract that type of work. I10 argues that "the NHS is not quick enough to give an answer".

Others add that the income is such a small percentage that it is insignificant (I7) or is taken by the CIP, so not applied to any department improvements (I2).

In this study, the nature of the Trust and size of the department seem to influence the strategies to cope with the budgetary deficit. Trusts with more recognition and with modern departments that can offer more resources, find it easier to entice more private patients and research. Small departments that are inserted in general Trusts do not have so much opportunity and resources to "sell" the potentialities of the

department. Monitoring the costs and reviewing all expenses are the main strategies to stay on budget.

Being a FT has not provided any financial contribute to the departments according to I1, I2, I7 and I10. However I3 reports a greater control over the budget and I8 thinks that if her/his department would be in a NHS FT, it would have more financial support.

Unlike current NHS Trusts, a FT is able to borrow and invest funds and has minimum three year contracts with commissioners rather that the annual contracts that are otherwise implemented. This allows the FT Trust to make decisions about how services are run with the benefit of known funding (5 Boroughs Partnership NHS Foundation Trust, n.d.). The board has the authority to run its FT as it judges best, but is accountable for the success or failure of the organisation (NHS, n.d.).

FT can enter formal partnerships and joint ventures with other organisations outside the NHS – such as voluntary organisations or housing providers. FT are able to re-invest savings in their own services without having to seek approval from the DH or local NHS commissioners. However, the financial autonomy has its 'pros and cons' (5 Boroughs Partnership NHS Foundation Trust, n.d.).

A personal opinion is given by I8 about the NHS economic situation:

> NHS is a very big company or institution and it is failing so much at the moment. [...] The way for the NHS to go more forward is by making it semi-private", [where individuals with more monetary capacities could pay a small fee to keep or improve the health system]. "I do not think it´s going to hang on like this for a long time [...] If you want to keep it as it is, nice and cheap, not free anymore but still nice and cheap compared to other European countries then you have got to keep an open mind and be prepared to give some money back (I8Q22).

Even with this health economic crisis, the patient is still the main focus, they need to be looked after, and diagnostics and treatments need to be made.

In the last one to two years, some interviewees have noticed that the number of patients have increased due to innovative developments in the area (new techniques and new therapies) and that is also "driven by the main interest of the consultant in charge, which itself has changed" (I4).

The service leaders that would like to increase the capacity cannot because of financial constrains that do not allow them to hire sufficient staff or buy new equipment. If they over-perform (in PET/CT) they may not receive from the commissioners. The only proposed solutions for this problem are: slots optimization, work time extension and ad hoc sessions (*e.g.:* "if it is quiet in nuclear medicine we open ad hoc sessions"-I8Q15).

Working seven days per week is a proposal that the government has been discussing.

Some departments have been working on Saturdays to meet the demand and decrease the waiting list. NM is not an urgent diagnostic modality, therefore the service leaders believe that the benefits would not compensate the costs and at the moment they would not have enough funding. Still, there would be benefits. The patients would be able to choose a time of their convenience and the resources could be better used.

Diagnostic imaging equipment is one of the most significant capital investments for the NHS so it is imperative that it is used efficiently. Seven day working can optimise use of this expensive resource. Any proposal for seven day working should include an assessment of equipment usage, replacement plans and workflow. There are significant cost savings in high value equipment overall if it is utilised for a greater percentage of working time (Group, 2012). "80 % is a reasonable figure to try and guess when it comes to overall utilization of a machine per day" (I4Q13). As previously referred to, the use of the PET/CT by CT staff (radiologists) out of the NM working time, can optimize the use of the camera. Renting the facilities to a private company would also be an idea.

However as imaging equipment ages it becomes increasingly expensive to maintain, with more downtime and less reliable performance. The use of equipment for seven days a week will necessitate more frequent servicing and replacement (Group, 2012).

Specially, with NM and PET/CT services there are issues of complexity around shortages of radioisotope (involving additional fees) and shortfalls of wide ranging technical staff.

If the policy was implemented at the moment, with the current inadequate funding and lack of additional staff, the quality provided would be diluted over the seven

days (I5Q25).

With all the difficulties of working seven days per week, it is imperative to work competently and efficiently during the working time.

A department that has a specific day for certain type of studies maximizes the use of the radiopharmaceutical vial, the camera and all the human resources involved (with the inconvenience referred to by I3: disproportional waiting list).

> If we wanted to do one cardiac test on one patient on one day the tariff would be quite high because you obviously have to buy a vial of *Myoview*, and then you have to use all the resources [human, equipment and consumables] to do that one patient. [...] So you pay all those things for one scan, then I bet you will come very close to the tariff price. If not we might even be higher than the tariff price. However, if you do 16 patients [...] your cost overall has dropped dramatically because you are still paying for [all the resources previously mention] you are now doing 16 patients divided by all of that costs. So therefore the tariff is no longer an issue because you are able to easy target the tariff, the number of patients compensates the cost because the tariff is based per patient. So therefore, if I can do 9 patients on the same cost as I can do 5 patients then guess what: the overall saving to the department is better (I2Q18).

Departmental senior management should specify and document the responsibility, authority and inter-relation of all personnel who manage, perform or verify work affecting quality of the final results (SWEDAC, 2000). Knowing each ones roles and having a good communication between staff makes the department work flowing smoothly. There are no delays and if there are, the patients need to be informed.

Having the correct portering system also improves the flow of the department. All of them have advantages and disadvantages. Having many inpatients means that an own porter would be busy all the time but it would not be possible to bring patients at the same time if the appointment time would be the same. Having a central portering system, it would be easier to have inpatients coming down at the same time, but the communication and priority level wouldn't probably be the quite good as having a person that is in the department at all the time. Sharing the porters with radiology means that they are more available but it seems to exit an unbalance priority. Each system can be

effective if it matches with the demand and needs of each department.

On a patient level, decreasing the DNA rate also improves efficiency, and in this case, prevention is a good motto to follow. I8 department has a rate of “3% and mostly those are the patients that have the wrong telephone numbers on the system.” He/she saved the hospital “at least £1000 a month” by having a dedicated NM booker that schedules appointments by phone and also goes through the scan contraindications and preparation for the most expensive scans. I2 department DNA rate decreased from 12% to 6.3% in this last six months. Those results are sporadic, and attributed to a technologist that calls patients in their spare time. A patient that DNA spends the same resources as if he would have had the exam. As consequence, the consultant will not have results, the patient will not receive treatment and an opportunity was lost for another patient to have the scan. These are reasons why it is important to keep the DNA rate low. The same problems happen when inpatients are not correctly prepared. Some departments opt to not do them, others emphasize the costs involved to the person responsible for the patient and others send a nurse to assess and give preparation the day before. One particular department charges the wards that do not follow the instructions. As a solution three departments use Incident reporting/risk management database (*e.g.*: DATIX) to report incidents, and in that way an investigation will be done to ascertain why the ward in charge didn´t follow the instructions.

Regarding IT systems, these seem not to be completely optimized for NM, especially dealing with the complexity of the procedures. From the point of view of the interviewer, optimal system would be able to receive the referral online (attached to the account of the patient), being vetted by the doctors electronically, and having a “diary” with all the appointments distributed to each day. When a patient would attend, that attendance would show up in the room that the patient is booked on. For example, if a patient needs an injection and then the scan later on, initially the patient details would appear in the injection room tab and only after completion of that activity, his “folder” would be available for the professional responsible for the scanner room. The notes or any question made would also be registered in the system. Each screen would be optimized to each user and the appointment diary could be changed to meet the

necessary alterations during the day. The interviewed departments that use a paper system do so because the paper is practical to move around the department, write notes on and because people are not accustomed to changes. More training and education is needed.

The most successful organisations embrace change. Such organisations seek to develop a culture in which all staff are encouraged to find ways of improving the service, both in terms of efficient ways of working and patient satisfaction (NHS Radiology Service Improvement Team, 2011)

Service Improvement seeks to support clinical excellence with administrative excellence, by continuously adapting and refining processes and pathways (eliminating activities that add no value), for the benefit of patients, carers, and staff.

Mapping of the patients' pathway on a much wider scale is promoted, with an emphasis on quality and the elimination of poor and wasteful practices (The Royal College of Radiologists and the Society and College of Radiographers, 2012).

The lean approach, which emphasizes process analysis, has particular relevance to NM departments, which depend on a smooth flow of patients and uninterrupted equipment function for efficient operation (Kruskal, *et al.*, 2012).

These methodologies can potentially reduce the number of studies that need to be repeated because of poor quality, increase diagnostic accuracy, reduce radiation exposure, increase patient satisfaction, and save resources.

Just two interviewees applied the described methodologies. The reminder didn´t have that much knowledge about lean and process mapping methodologies. Yet, they have described some improved practices in the IT system, workflow and workload, work environment, patient pathway, booking and vetting system optimization.

There will be always improvements to be made and in the future: I2 wants to save costs

> We could look again at our expenditure, on our consumables but how much money are we really going to save per year? Probably not a significant amount. The real area if you look at any hospital's budget or any department's budget, 80 % is on salary, 20 % is on what you use, so really why are we hammering the 20 % over and over again when actually the real pays we need to be looking at

> (where the saving is), it is the 80 % of the costs…that's really where we are going to start [realistically] saving money now. So basically again if we break that 80% out and you look at radiology I think it's something like 70% of the wage is spent on only 15% of the staff, the consultants. So consultant radiologists take approximately 60-70 % of the entire radiology budget and they only account for 10 % of the staff. It doesn't take a rocket scientist to work out where we are going to save the money (I2Q37).

I4 wants more permanent staff and if

> We do have to have locums, continue making sure that they work at the level that they are paid for and that we are not paying something for work that they are not doing just because there is a shortage. Also to work on staff retention, to keep the good workers and not get to many bad people in, to make sure that your employment and recruitment is robust so that you pick the best person available not just because they are the only option, which I think is obvious a problem (I4Q37).

I8 wishes "to get a business proposal". A business case is something to be done when there is an additional request not included in the budget. So far, I8 didn't request a business case because "I know that there is no available money for me anyway. [...]Some of the major manager thinks if we can get the DNA rate down then we could actually cope better so we do not need an ad hoc session. That's what they think… I do not think that [...] DNA rates are quite big because it is an elderly populations" (I8Q37).

In general, the service leaders want to increase their income, recruit more professionals (giving them more reasons to be motivated), new equipment and rise productivity (by extending the working time and slots optimization).

For all of this to be possible, it is important that each Trust supports every department fulfilling their needs, and that the tariff can be enhanced to demonstrate the complexity and costs associated with performing NM scans.

7.1 Study Limitations

This study has got design and data limitations. It is limited to the analysis of 10 service leaders´ opinions. It was not possible to gather more participants.

All data analysis and interpretation is dependent on the degree of importance

that the researcher gives to the topics answered by the interviewees. All transcribed interviews are in the Appendix F, to provide opportunity for readers´ interpretation.

Due to the fact that all Trusts are individual organizations with different policies where each service manager has a specific way of working, it is not possible to translate the conclusions of the study to all NMD.

There are no correct or incorrect opinions. All expressed information is personal and from the point of view of the service leaders correct at the time of the interview.

In practical terms, the lack of experience from the interviewer, may have conditioned the interviewee answers. Transcribing the interviews was sometimes difficult because of the background noise and the various interviewee accents (what makes difficult for the interviewer, when English is not her mother language).

Some of the questions were not answered during the interview (mostly the department characterization questions), what made the analysis and comparisons difficult to be made.

Chapter 8: Conclusion

NMD are affected by many factors such as patient behaviour, staff experience, service time variability, equipment failures, and radiopharmaceuticals management, which have an impact on the way the appointment systems perform. To successfully perform a NM test, all the resources needed for each step of the test must be available at specific times. If the test is not completed successfully, the patient must be re-scheduled for another day. Therefore, scheduling patients, radiopharmaceuticals and resources to accommodate unforeseen disruptions (no-shows, late radiopharmaceutical delivery, breakdown of equipment, etc) is a very challenging problem for NMD. The schedule for radiopharmaceutical delivery, injecting the patient, and scanning must adhere to a specified protocol since radioactivity decays over time. Patients are concerned with the level of service offered by the department while managers are also concerned with using their limited resources effectively. For example, a higher demand for service can negatively affect the level of service provided to the patient if resources are not managed efficiently. Thus it is up to the NMD to alter their resource capacity for a given demand and patient preferences in order to maintain a high level of service (Pérez, *et al.*, 2010).

Bearing in mind the current constrained budgets of the interviewees departments, it is very difficult to meet the demand and increase the capacity by acquiring new equipment or more staff. To minimize the expenditure, the service leaders decrease costs in staff, equipment and consumables; repatriate work back to the department and extend the work time.

It is recognized that having more patients means more money (especially examinations with higher profit: therapies and PET/CT patients). Research means in some cases, income that returns to the department, by opposite of private patients, where the profit returns to the private unit. That benefits the Trust, but doesn´t give the correct incentive for the service leaders to find strategies to attract private income.

Each Trust can set their budgets however they wish to – they may show the income in the departmental budget or they may not. In some departments, true income (as in from the commissioner or private patients) has not been shown in the departmental budget (I1).

The main goal of this study is to understand how service leaders increase efficiency and productivity, in such environment of financial austerity.

From their answers is correct to say that over-performing exams; reduction of waiting times; appointments, radiopharmaceuticals and equipment optimization, are all factors that contribute to productivity. The only inconvenient is that the service quality may be compromised because staff spend less time with the patient, inducing to further misunderstandings and delays.

Efficiency is improved by applying the best optimized practices for each department. All processes need to be reviewed constantly and alterations should be made when a step of a procedure can be optimized.

In sum, service improvement activities in NM should focus on patient safety, the accuracy of results, the patient's experience, and the efficiency of processes across all aspects of the practice (Farrell & Abreu, 2012).

In a financial perspective, according to HSCIC (2014), PbR provides a transparent, rules-based system for paying NHS funded care in England. It rewards efficiency, supports patient choice and diversity and encourages activity for sustainable waiting time reductions.

Tariff prices have traditionally been based on the average cost of services reported by NHS providers in the mandatory annual reference costs collection (HSCIC, 2015b). In practice, various adjustments are made to the average of reference costs, so final tariff prices may not reflect published national averages. The reference costs from which the tariff is produced are three years in arrears. Therefore an uplift is applied which reflects pay and price pressures in the NHS, and includes an efficiency requirement. The tariff received by the provider is multiplied by a nationally determined MFF. This is unique to each provider and reflects the fact that it is more expensive to provide services in some parts of the country than in others (HSCIC, 2014b).

The participants of this study agree that the tariff matches for some procedures, however others don´t reflect the high cost of the radiopharmaceuticals. Maybe it is the reason why the tariff value for higher categories increased this financial year, compared to 2014/2015 (Table 2).

It is important that the Tariff matches with the real costs, but because that does not happen completely, the service leaders need to over-perform the lower cost scans to compensate the ones that are more expensive.

Some service leaders referred that they don´t see the tariff value, that that money goes centrally, so only financial accountants have knowledge of the current tariff values. That knowledge would provide more conscience and incentives for the service leaders to save costs.

According to Lewis (2014), the previous budgets are rolled forward and adjusted for non recurring items and full year effects. Pay and non-pay budgets are re-aligned within Divisions and reconciled to baseline budgets plus business cases and posts approved in establishment review. Clinical supplies and drugs budgets are rebased using recurring outturn position. Internal cost pressures and service developments are approved and added to budgets. Once CIP targets are issued and plans submitted, the CIP value is removed from the overall budget. SLR Recharges rebased to out-turn and budgets amended. When contracts are finalised for each financial year, the income budgets are then adjusted.

I1 budget is also set from the previous year plus any expected increases in activity, along with any cost pressures requested (such as unfunded staff posts or new techniques that the commissioners have not or will not fund).

An important tool also referred by the service leaders is SLR. SLR is an accounting tool that is also used to define how much to charge the referring department for the scan *i.e.* orthopaedics/obstetrics/oncology/urology etc. However, this is only a representation of budgetary money moving through the Trust. The actual income (*i.e.* the tariff) will still be the same and will only be shown at the divisional/directorate or Trust level (I1).

After analysing all the results, it is possible to notice that the financial and budget management related questions were the ones that most participants struggled in answering.

None of the participants have quality, economy or finances studies. I1 is currently doing a MSc in health care leadership, I4 and I8 had short NHS courses of

management and leadership. All of them have qualifications in scientific areas, having at least post-graduation diplomas.

With this, NHS needs to incentive and provide the necessary support for service leaders to have more knowledge in economic and financial areas. Attending financial meetings, acknowledge of the budget status and having the opportunity to take more financial decisions (*e.g.*: attract private work) are important factors that would allow the service leaders to improve the efficiency, productivity and quality of the departments.

New studies can be developed, following the same thematic. Interviews to financial accountants could give a better insight of how the OPCD-4 codes are converted in HRG codes and how accurate the HRG codes are expressing the complexity and costs of the procedures. To know how the NM budget is calculated in each Trust would be a valuable information. Divisional managers could also add another perspective of the divisional financial management, when NM and radiology have the same budget.

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Images in the cover:

Upper image: The Post. (2012) *HEA-Camera-Nuclear-Medicine* [image] http://cedarspringspost.com/wp-content/uploads/2012/03/HEA-Camera-Nuclear-Medicine.jpg [Accessed 2 May 2015]

Lower image: DiagnosticImaging. (2009) CT, PET and PET/CT of lung cancer with adrenal metastases. [image] http://www.diagnosticimaging.com/articles/fdg-petct-provides-added-value-routine-multiple-imaging-scans [Accessed 2 May 2015]

Left picture: NHS England. (2015) NHS England. [logo]http://www.england.nhs.uk/[Accessed 2 May 2015]

Right picture: depositphotos. (2015) *Homem de negócios, apoiando-se sobre o signo de libra* [image] http://pt.depositphotos.com/6770494/stock-photo-business-man-leaning-on-the.html?qview=6770494 [Accessed 2 May 2015]

Annex

A. HRG data

Table 8- HRG Data for NM in 2013/14

Currency	Currency Description	Activity	Unit Cost	Total Cost
RA35Z	Nuclear Medicine, Category 1	37.813	£183	£6.919.845
RA36Z	Nuclear Medicine, Category 2	187.034	£206	£38.484.480
RA37Z	Nuclear Medicine, Category 3	76.840	£234	£17.963.676
RA38Z	Nuclear Medicine, Category 4	52.105	£309	£16.074.626
RA39Z	Nuclear Medicine, Category 5	43.088	£348	£14.980.632
RA40Z	Nuclear Medicine, Category 6	11.363	£444	£5.049.007
RA42Z	Nuclear Medicine, Category 8 (PET-CT)	12.943	£649	£8.398.990
RA15Z	Dexa Scan	254.005	£69	£17.534.516

Source- National Schedule of Reference Costs Year: 2013-14 - All NHS trusts and NHS foundation trusts - HRG Data.

Table 9- TFC – Outpatient Attendance Data

		Total			**Consultant Led Outpatient Attendances**			**Non Consultant Led Outpatient Attendances**		
Service code	**Service description**	**Activity**	**Unit Cost**	**Total Cost**	**Activi -ty**	**Unit Cost**	**Total Cost**	**Activi -ty**	**Unit Cost**	**Total Cost**
371	Nuclear Medicine	**11.859**	**£179**	**£2.117. 190**	10.32 9	£196	£2.020 .371	1.530	£63	£96.820

Source- National Schedule of Reference Costs Year: 2013-14 - All NHS trusts and NHS foundation trusts - Outpatient Attendances Data.

B. OPCS-4.4 codes

Table 10- The OPCS-4.4 codes that group to the Nuclear Medicine HRGs.

OPCS-4.4 codes	Label
B16.4	Parathyroid washout
T91.2	Scanning of sentinel lymph node
U01.8	Other specified diagnostic imaging of whole body
U06.2	Dacryoscintigraphy

U06.5	Scanning of thyroid gland NEC
U10.1	Cardiac computed tomography for calcium scoring
U10.4	Myocardial positron emission tomography
U10.5	Radionuclide angiocardiography
U10.6	MPS
U10.7	Cardiac multiple gated acquisition scan
U11.5	Thallium stress test
U12.5	Static renogram
U12.6	Mercaptoacetyltriglycine renogram
U12.7	Nuclear cystography
U14.1	Nuclear bone scan of whole body
U14.2	Nuclear bone scan - special views
U14.3	Nuclear bone scan - three phase
U14.4	Nuclear bone scan - two phase
U14.8	Other specified nuclear bone scan
U14.9	Unspecified nuclear bone scan
U15.1	Lung perfusion scanning NEC
U15.2	Lung ventilation scanning NEC
U15.3	Ventilation perfusion quotient scan
U16.1	Hepatobiliary nuclear scan
U17.1	Meckels scan
U17.2	Selenium 75 homocholic acid taurine study
U18.1	Scintimammography
U21.3	Positron emission tomography NEC
U21.4	Single photon emission computed tomography NEC
U23.1	Red cell mass studies
U23.2	White cell scan using indium 111
U23.4	Ferrokinetic studies
U25.1	C14 urea helicobacter pylori breath test
U25.2	C14 glycocholic acid breath test
U25.3	Hydrogen breath test
U25.4	Urea helicobacter pylori breath test NEC
U25.8	Other specified breath tests
U25.9	Unspecified breath test
U26.1	Glomerular filtration rate testing
U26.5	Schilling test
U23.3	White cell scan using technetium 99
Y94.1	Dopamine transporter scan
Y94.2	Octreotide imaging
Y94.3	Metaiodobenzylguanidine imaging

Source- Casemix Service (2008). RA. Diagnostic Imaging.doc. Pag. 6/7.

C. NM statistics in England

NHS England Analytical Services recently published a provisional monthly experimental statistics, based on the Diagnostic Imaging Dataset (DID), dated from January 2014 to January 2015.

The DH requires a count of all Imaging or Radiodiagnostic Events carried out in hospital departments. The data is collected to implement a requirement of the Council of the European Union. *Council Directives 80/836/Euratom* and *96/29/Euratom* require the health surveillance of the population, through assessment of radiation dose. *Council Directive 97/43/Euratom* takes this further by placing a specific requirement in relation to doses from medical exposures (HSCIC, 2015a).

The DID is a monthly data collection covering data of diagnostic imaging tests on NHS patients in England.

These data are collated from RIS, which are hospital administrative systems used to manage the workflow of radiology departments, and uploaded into a database maintained by the HSCIC.

In terms of NM importance, this study published data in which our graphs were based on. It is demonstrated in the graphs the number of radiodiagnostic scans performed in England from 1995 to 2014 (Figure no. 14) and in each NHS.

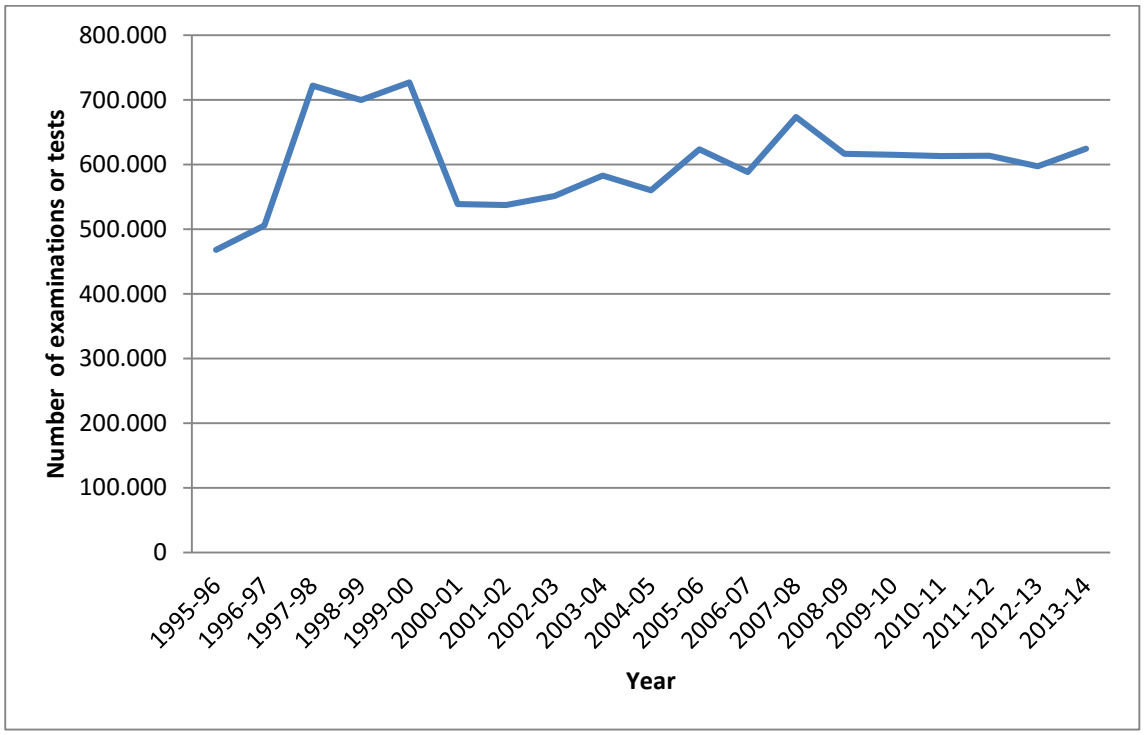
During the study period, NM, SPECT and PET registered 417250, 86175 and 19395 scans, respectively.

The median period for the report to be issued after the test in January 2015 was one day for Nuclear Medicine and SPECT Scan, and two days for PET/CT Scan (NHS England Analytical Services (Operations), 2015).

Because it is not possible to drill down into the data, there are significant questions about how it is being acquired (whether individual Trusts are following the same methodology). The analyst responsible for producing this report was contacted to clarify some doubts. He was asked if PET-CT scans were included in the count for radiodiagnostic exams. He was unsure of the answer. Due to the fact that some NM tests need to be performed on different days, it was also asked if the tests (performed on two days) counts as one activity or two activities. According to the author “scans done at

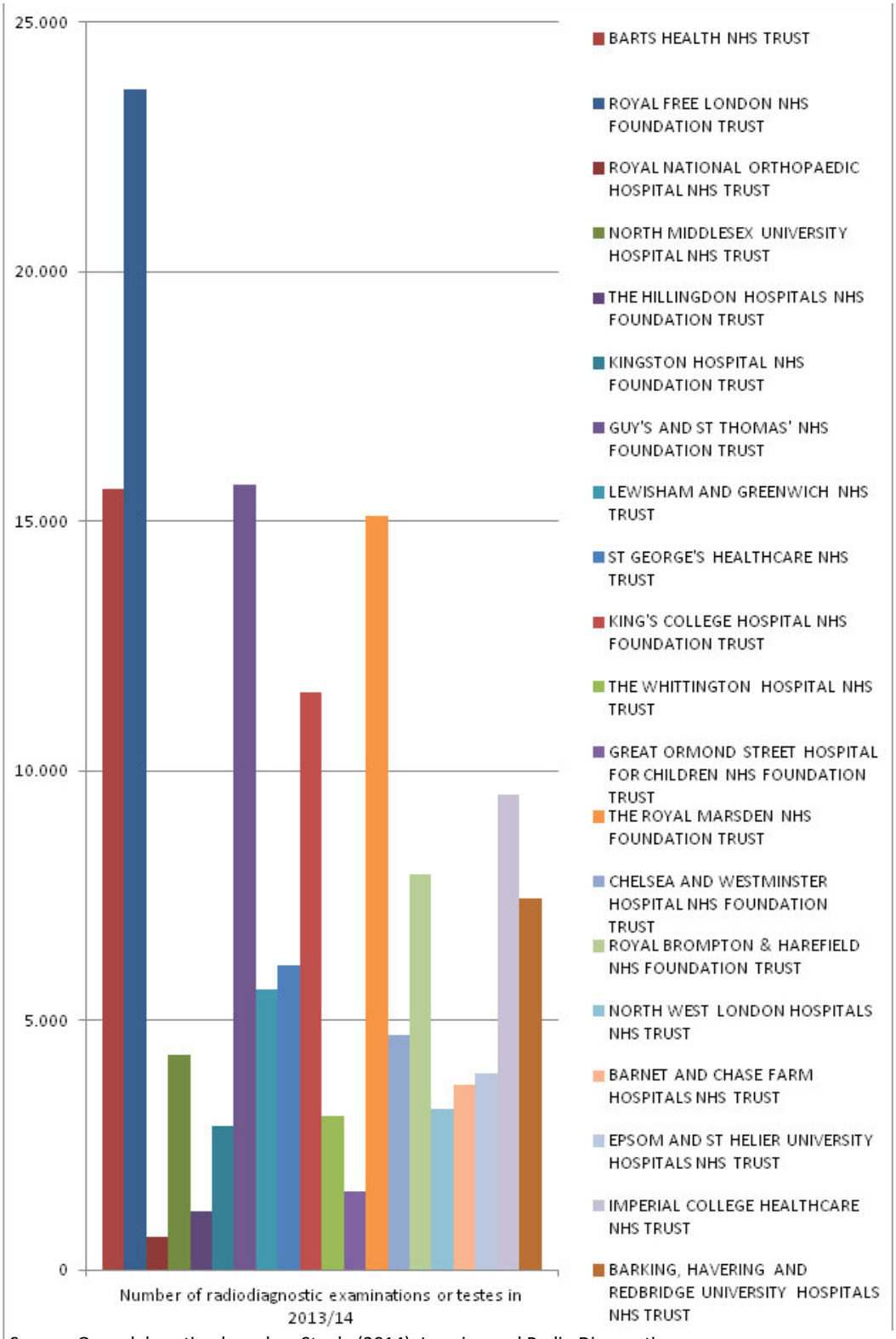
different times would be classed as two counts of activity rather than one". This contrasts with published guidance (HSCIC, 2015a) which states "an imaging or radiodiagnostic event is a test or examination performed using one imaging modality, in response to one diagnostic test request and relating to one anatomical site. A test counts as one test if one report is issued regardless of the number of radioactive substances used and the number of days on which counting takes place". This contradiction suggests overall that the data may be insufficiently robust to provide any meaningful results due to the fact that the data may not have been acquired using the same methods.

Figure 14- Total number of radiodiagnostic examinations or tests in England from 1995-96 to 2013-14



Source- Own elaboration based on Steele (2014). Imaging and Radio Diagnostics.

Figure 15- Number of radiodiagnostic examinations or tests in 2013/14 performed in NMD in London



Source- Own elaboration based on Steele (2014). Imaging and Radio Diagnostics.

Note: University College London Hospitals NHS FT did not provide any data referring to the year 2013/14.

D. SLR prices

Table 11 SLR prices of 2 NHS institutions in 2013/14 and 2014/15 financial year

Exam Name	SLR Prices (£) 13/14		SLR Prices (£) 14/15
Description	**Institution A**	**Institution B**	**Institution B**
BONE			
Bone localised	153,02	-	375,00
Bone localised SPECT CT	368,14	-	440,00
Bone marrow scan	152,19	-	-
Bone SPECT	254,86	-	-
Bone whole body	153,02	299,00	320,00
Bone whole body SPECT CT	254,86	375,00	375,00
F- PET/CT (Bone)	-	998,00	-
BONE DENSITY			
Bone Densitometry DXA	158,11	120,00	110,00
Bone Density Total Body	158,11	-	180,00
BRAIN			
Brain Ioflupane DaTSCAN	804,78	1.400,00	2.100,00
Brain perfusion imaging SPECT	641,54	-	-
Brain Imaging (Thallium) for tumour	-	650	650,00
Cerebral Spinal Fluid (CSF)	-	1100	-
Brain Imaging (Choline) for Tumour	-	2963	-
Amyloid Brain PET	1.200,00	-	1.870,00
CARDIAC			

Cardiac iodine 123 MIBG SPECT	510,71	-	-
Cardiac ventriculography rest	260,95	280,00	280,00
MPS MIBI/Tf rest gated	407,43	660,00	660,00
Myocard Rest Stress(1day MIBI, Gated)	810,30	1.320,00	1.320,00
Cardiac Amyloid whole body	-	-	1.000,00
ENDOCRINE			
Thyroid Scan with uptake Technetium	186,60	335,00	335,00
123-I Thyroid Uptake and Imaging	-	525,00	812,00
Adrenal Imaging	-	890,00	3.458,00
Iodocholesterol adrenal study	2.000,00	-	-
Octreotide scan	899,23	-	-
Octreotide scan SPECT CT	942,26	-	-
Parathyroid MIBI SPECT CT	745,46	660,00	660,00
GASTRO-INTESTINAL			
Gastric emptying study single	382,94	457,00	457,00
Gastrointestinal bleed scan	402,12	485,00	485,00
Hepatobiliary function	387,18	480,00	480,00
Hepatobiliary function scan & Stim	454,81	-	-
Hepatobiliary function transplant	387,18	-	-
Meckels scan	204,78	393,00	393,00
Radionuclide SeHCAT bile study	493,86	959,00	1.223,00
LUNG			
Lung perfusion scan Q	265,93	-	-
Lung Shunt (MAA only)	208,42	-	-
Lung ventilation and perfusion	182,62	371,00	371,00

Lung ventilation scan V	170,26	-	-
LYMPH			
Lymphoscintigram	545,34	683,00	683,00
SLN Study Breast	-	310,00	-
SLN Study Melanoma	-	733,00	-
SLN Study Penile	-	733,00	-
SLN Study Vulva	-	733,00	-
PAEDIATRICS			
Paed DMSA	163,03	-	-
Paed MAG3	214,05	-	-
Paediatric Hepatobiliary	400,69	-	-
PET/CT			
Total body FDG PET CT	750,00	998,00	1.071,00
F18 choline whole body PET CT	750,00	2.963,00	1.399,00
Ga Citrate PET/CT	-	1.469,00	-
Ga68 DOTATATE whole body PET CT	555,59	1.513,00	1.658,00
Paediatric F- PET/CT (Bone)	-	1.201,00	-
Paediatric FDGPET/CT	-	1.201,00	-
Rubidium PET CT	-	-	1.320,00
F/Naf PET CT	-	-	1.083,00
PET/MR			
PET/MR	-	1.343,00	1.343,00
RENAL			
GFR estimation 3 & late sample	191,33	172,00	172,00

Renal DMSA	138,15	302,00	302,00
Renogram	186,03	332,00	332,00
Renogram MAG3 Reflux	265,86	942,00	942,00
Renogram with diuretic	190,44	-	-
INFECTION SCANS			
Gallium scan SPECT CT	479,20	-	-
Gallium scan whole body	364,89	-	-
White cell HMPAO whole body SPECT CT	794,06	-	-
White cell Indium 111 scan SPECT CT	750,04	899,00	1.118,00
THERAPIES			
Iodine-131 Therapy for Thyroid Cancer	1.091,23	-	-
Iodine-131 Whole Body Scan Only	-	365,00	-
Iodine-131 Therapy for Thyrotoxicosis	235,00	370,00	370,00
Iodine-131 MIBG therapy	6.648,97	POA	POA
Lu-177 Dotatate Therapy	5.578,25	-	-
Ca Thyroid Therapy with RhTSH	1.515,24	-	-
Y-90 SIR spheres therapy	8.174,30	-	-
OTHERS			
Liver and spleen SPECT CT	380,88	-	-
Pre-Sirtex MAA Shunt Scan	208,42	-	-
Spleen scan	402,12	592,00	592,00
MIBG Iodine 123 scan whole body SPECT CT	1.135,96	1.389,00	1.389,00
Lacrimal Scan (Dacroscintigraphy)	-	391,00	391,00
Salivary Gland Imaging	-	322,00	339,00

Red cell mass & plasma volume	658,01	706,00	900,00

Source- Own elaboration.

Note: Price on application (POA).

Appendix

A. E-mail sent to all possible candidates

Dear (Candidate name)

My name is Sara Soares and I am a Nuclear Medicine Technologist doing a Master´s degree in Health Economy and Management. As part of my studies, I decided to do my dissertation about financial and operational management of Nuclear Medicine departments in the NHS within the London area. I am contacting you to ask if you would be willing to participate in an informal interview in your place of work. This interview will last for approximately 30 minutes.

Attached is the invitation letter containing more details about my project.

I would be very grateful if you would be willing to contribute. Please feel free to contact me if you have any further questions.

I look forward to hearing from you.

Kindest Regards,

Sara Soares

B. Invitation Letter

Invitation Letter to participate in the research project titled: Financial and operational management of Nuclear Medicine departments in the NHS England within the London Area

Dear (Candidate Name)

This letter is an invitation to consider participating in a study I am conducting as part of my Master´s degree in Health Economy and Management at the University of Coimbra, Portugal, under the supervision of Drª Carlota Quintal. I would like to provide you with more information about this project and what your involvement would entail if you decide to take part.

Study Description:

As one of the Nuclear Medicine Service Managers of a NHS hospital in London, you are invited to participate in a research study about financial and operational management of Nuclear Medicine departments (NMDs) in NHS hospitals within the London Area. This study is designed to better understand the implications of economic constraints in the NMD´s management, the inter variation of internal policies and the commonly characteristics of all departments.

Each interview will take approximately 30 min. Ideally the interviews will be schedule from 15-19 June 2015, however this date is subject to alteration at your convenience.

With your permission, the interview will be tape-recorded to facilitate collection of information, and later transcribed for analysis. Shortly after the interview has been completed, I will send you a copy of the transcript to give you an opportunity to confirm the accuracy of our conversation and to add or clarify any points that you wish.

Confidentiality:

The results of this study will be used as part of a dissertation project inserted in a Health Economics and Management MSc degree of the University of Coimbra, Portugal. You are welcome to contact the study investigator for more information.

If wished, the information you provide can be kept strictly confidential (your name and institution identification will not be identified). The information obtained in this study may be published in scientific journals and presented at professional meetings.

Your participation in this study is valuable and crucial to help NM/Radiology staff (managers, radiographers, technologists, nurses, and students) to better understand how political, economic and management factors can affect the normal functioning of NMD. As there are only few NMDs in London, your participation is important for the success of this study because it will increase the data variety.

Attached to this invitation you can find a consent form regarding audio recording and disclosure of data.

Thank you very much for reading this letter,

Yours sincerely,

Sara Soares

C. Consent Form

Consent Form

I have read the information presented in the information letter about a study being conducted by Sara Soares of the Department of Economy and Management at the University of Coimbra. I have had the opportunity to ask any questions related to this study, to receive satisfactory answers to my questions, and any additional details I wanted.

I am aware that I have the option of allowing my interview to be tape recorded to ensure an accurate recording of my responses.

I am also aware that excerpts from the interview may be included in the dissertation and/or publications to come from this research, with the understanding that the quotations can be anonymous.

I was informed that I may withdraw my consent at any time without penalty by advising the researcher.

I agree to have my interview tape recorded.

☐ YES ☐ NO

I agree to the use of non anonymous quotations in any thesis or publication that comes of this research.

☐ YES ☐ NO

I agree to the use of the institution name only as institution participant in this study without being associated with any quotations.

☐ YES ☐ NO

Participant's Name (please print) _____

Participant's Signature _____Date _____

Researcher's Signature _____ Date _____

Researcher's Title _____Department _____

D. Interview structure

Guide

Part 1- Department Characterization

1. What divisional group does your department belong to?
2. Which scans are the most common?
3. How many:

a) Gamma-Cameras- b) PET/CT- c) DEXA d) Injection Rooms-

e) Consultants- f) Technologists/Radiographers (Band5-) (Band 6-)

(Band 7-) (Band 8-) g) Nurses-

4. What is the mean number of patients per day?
5. Opening time:

Part 2- Interviewee Characterization

6. Job title:
7. Qualifications:
8. How long have you been working as (job title) in this organization?
9. How long have you been working as (job title)?
10. What do you consider to be the most important tasks of a (job title)?
11. What do you consider to be the most demanding tasks that you carry out and why?

Part 3- Financial related questions

12. In your opinion, what has PbR introduced compared with the previous financial model in terms of patient and financial outcomes?
13. In the context of Radiology, is the PbR system improving or worsening the patients´ outcome?
14. According to the amount of requests that your department receives...

a) Is there any area that you may think that your department may need to increase the capacity?

b) Or decrease the offer?

c) If yes, which factors are against those changes?

15. Is the department budget covering all the expenses?
16. Do you feel the need to save/ reduce expenses?
17. Since you have been working at this Trust, have you put in practice any measure to decrease costs...

a) In staff?
b) In equipment?
c) In consumables?

18. Do you consider that the tariff for NM procedures corresponds to the reference costs and why?
19. Have you ever done any analysis on the real cost of a specific exam against the cost paid for the exam?
20. What strategies do you put in action to attract income?
21. In which activities does the department receive higher income?
22. In your opinion, what is the effect of non NHS income in NHS patients?
23. In your opinion, what implications does the bank/locum staff have on the budget?
24. What implications on the budget/management would your department have if it belonged/not belonged to an NHS FT?
25. In your opinion, what advantages and disadvantages would your department have if it worked 7 days per week?

Part 4: Operational management related questions

Departmental level:

26. What are the advantages or disadvantages of having an own porter/central portering system?
27. Is your dep. involved in research studies with external institutions? (If not, what is the importance that you give to research?) (If yes, what are the implications in the budget and importance to the department?)
28. According to National Framework for Service Improvement in Radiology (NFSIR) there are two important methodologies for service improvement: ‘‘lean’’ thinking and process mapping. Is the patient pathway according to these practices?

29. Do you have specific weekdays for determined exams and why do you have that structure?

Patient level:

30. What measures are taken when patients do not attend?
31. What measures are done to decrease the rate of DNA?
32. What measures are you taking to decrease the cancellation rate in inpatients due to human resources mistakes (*e.g.*: wrong preparation, late transport)?
33. What time targets do you have for the time between the patient arrival and then being seen?

IT level:

34. What are the advantages/disadvantages of your IT system?
35. Does the NMD website have updated information for referrers/patients?
36. Does the NMD website contain the prices for private services?

Final Questions:

37. What are your future steps to improve the budget/operational management for the department?
38. Do you have any questions or comments?

E. Thematic analysis method

Theme	Category	Subcategory	Transcriptions
Perspective of the service leaders about their job tasks			
Important tasks	Nursing and Patient Care	Patient care and safety	I2Q10: “Patient care and safety.” I4Q10: “Ensuring that the patients are well cared.” I6Q10: “everything is gear to be looking after patients.” I7Q10: “my department gives good and efficient patient care” I8Q10: “looking after your patient clinically” I9Q10: “patients are kept informed” I10Q10:“Ensuring that the patients get the best service.”
	Efficient management of the department	Staff management / Leadership	I2Q10: “managing the staff” I3Q10: “Leadership” I7Q10: “staff […] are adequate” I9Q10: “manage all team [...] match the skills to the tasks [...] staff are up-to-date with their technical training [...] and aware of the basic legislation”
		Compliance with targets	I3Q10: “compliance with waiting targets” I9Q10: “stick to the targets”
		Technical factors	I6Q10: “safe handling of radioactive materials” I7Q10: “equipment are adequate” I9Q10: “good imaging”
		Workload and workflow management	I4Q10: “keep organised [...] practically” I6Q10: “making sure that the department runs efficiently” I8Q10: “admin work [...] making sure that there is all scheduled; everyone is doing the right thing.” I9Q10: “manage the workload [...] create an environment

			that is confident to work [...] patients appointments are up to the time and manner and patients are kept informed” I10Q10:“day-to-day running is efficient”
		Fiscal prudence	I4Q10: “keep organised [...] financially” I7Q10: “ensuring we have [...] or make enough money”
		Direction and represen-tation of the department	I3Q10: “representation of the department within the larger Trust” I5Q10: “to give a certain direction [...] and to represent the department”
	Clear-signed goals	Predict Future develop-ments	I1Q10: “look to [...] future developments, to start trying to predict referral patterns and changes in technology”
		Being a proactive service	I1Q10: “to make sure that we’ve got good links with manufactures and other departments so that we are able to be proactive in developing our service”
Demanding and difficult tasks	Management	Staff management	I1Q11: “Staff management [...] takes a lot of time.” I2Q11: “Managing the staff.” I3Q11: “Managing people because people are unpredictable.” I4Q11: “discipline rule with people [...] Human Resources tasks because of the amount of time that takes up.” I7Q11: “being the person who has to be political to stop difficult relationships between staff”
		Resources management	I9Q11: “managing patients with the resources that you have” I10Q11: “it’s managing to fit everything in according to the current schedules [...] to get the patients in as quickly as you’d like to given with the current staff team and restrictions”
	Laws	Regulatory Compliance	I4Q11: “preparing management cases [...] preparing and keeping all the documentation”

			I5Q11: “regulations”
		Control of the radiation dose	I5Q11: “radiation dose for instance for staff and patients”
	Financial Control	Financial challenges	I5Q11: “sending bills and checking invoices”
	Clinical speciality	Paediatric injections	I6Q11: “paediatric injections [...] are more demanding”
	Organi-zation	Financial and Clinical tasks coordination	I8Q11: “two tasks and having enough time to do it”
Perspective of the PbR system by the service leaders			
PbR system viewpoint	Actual Financial Model Characteristics	Outcome related	I1Q12: “PbR is meant to be outcome related”
		More efficient, productive and profitable than the previous model	I2Q12: “look for more efficiencies [...] we are more productive [...] more profitable”
		No alterations in the way of work, scans number or type	I1Q13: “The tariff doesn’t influence the decision of increasing the number of scans.” I3Q13: “I don’t think PbR has changed the work we do or the numbers of different types of scans we do.” I4Q12/13: “not changed the way we work [...] It’s not the financial model.” I8Q13: “With nuclear medicine it’s not…the doctors can refer and refer and refer but they get vetted anyway.” I9Q13: “I haven’t really noticed any difference [...] impact

			is the scans referred to us and not necessarily the financial system." I10Q13: "costings haven't effected the referrals or what we do"
		Quicker turnaround	I2Q13: "to do as many scans within a time frame as possible" I4Q12: "fastest turnaround [...] consistently trying to get higher numbers through because of the various targets"
		Not transparent or honest	I7Q13: "income for patient work is not transparent [...] or honest [...] by honest I mean there is no financial mistakes"
		Less restrictions	I9Q13: "PbR is a better system [...] because you're not then restricted by what you do, what patients are referred for what tests. Consultants are not reluctant to send patients for certain tests."
		Department effects not felt	I5Q12: "We don't feel it here"
		Direction change	I1Q12: "moving back potentially towards block contracts"
	NM tariff	Unblunded for imaging	I1Q12: "unbundled so it is a separate tariff [...] depends on the Trust [...] the recharge is actually being internal for the imaging cost so you don't actually see the tariff money coming in"
		Matches with the costs	I4Q18: "actually corresponded reasonably well" I7Q18: "it corresponds well for many things" I10Q18: "Bone scans and MAG3 you cover your costs."
		Outdated	I7Q18: "for other things it's clearly outdated"

		Underestimation (it does not reflect the cost of the radiopharma-ceuticals and resources; is grouped in lower cost procedures)	I1Q18: “grouped in lower cost procedures [...] nuclear medicine tariff is not reflecting the high cost rate of the radiopharmaceuticals” I2Q18: “big fluctuation between certain tests [...] the tariff was particularly low” I3Q18: “tariffs don’t take into account differences in radiopharmaceutical” I5Q18: “they don’t take into account the pharmaceutical cost very well [...] the total cost for a DATscan was less than the cost of the pharmaceutical” I7Q18: “I don’t know why the tariff is so low [...] inaccuracies in the tariffs.” I8Q18: “DATscan that sounds like simple to do but because the isotope is very expensive something doesn’t get into consideration” I9Q18: “Some of the studies are put into tariffs and it’s undercharged.” I10Q12: “doesn’t actually even cover the cost of the radiopharmaceutical”
		Overesti-mation	I1Q21: “For NHS there are a number of scans that we get more money in from tariff than it costs us to perform the scan.” I2Q18: “was overpriced, the tariff was higher compared to what the scan would cost to do” I3Q18: “the ones that are profitable are things like bone scans”
		Insufficient HRGs	I1Q18: “There aren’t enough HRGs to specifically group nuclear medicine studies” I4Q18: “The complexity of what we do isn’t fully captured by them” I8Q18: “the tariffs sometimes, for certain scans the

			complexity of it is not considered"
	Effects in the patient	Unnecessary scans	I2Q12: "imaging is being utilized much more rather than the clinical argument of the doctors [...] I think there is not enough stringent boundaries on being able to refer for scans"
		No incentives or factors to measure	I1Q13: "there isn´t any incentive to improve patient experience due to the way the tariff is used [...] there is no measure of patient experience or quality of the study"
		Worse outcomes	I2Q13: "it potentially worse it could be because of the fact that we are looking for efficiencies, a workflow, how many patients we do per session"
		No financial influence in the quality of the service provided or patient experience	I3Q13: "The quality is not affected by the financial model." I4Q12: "We haven't changed the way we approach patients because we've always got to be patient focused irrespective of whatever the background is." I7Q13: "we should take care of patients independently of the financial model" I9Q13: "when they come to the department they don´t notice much difference at all"
Perspective of the Trust organization by the service leaders			
Organizational Changes	FT status	Monetary benefits	I7Q24: "the organisation it benefits: Have you handled your estate? Can you sell this land? Can you charge for parking?"
Departmental changes	FT status	No income improvement	I1Q24: "I don't think that the ability to go and attract additional work has been improved" I2Q24: "there hasn't been any change" I7Q24: "I was head of a nuclear medicine at a FT department and I don't see any benefits [...]. There is no effect on the budget for small departments." I10Q24: "there is no increase of income"
		Monetary	I8Q24: "with the Foundation status you get more money

		benefits	for it, you get more support financially"
		More budget control	I3Q24: "if we weren't a FT we wouldn't have so much control over our own budget and how we spend money"
		More pressure to save money	I10Q24: "there is more pressure to save money"
Possible political changes	Working on weekends	Dependent on other factors	I1Q25: "PET than that's going to be reliant on the manufactures supplying that service" I2Q25: "Part of it is what is your workforce size, what capacity do you need, how much is it going to cost for all of your consumables, radioisotope, staff costs…"
		Flexible for patients	I1Q25: "they could have scans outside of working hours" I2Q25: "nice option to have particularly for some patients that are working because they have an opportunity then to be seen on a Saturday" I4Q25: "Obviously lots of people would want to come." I9Q25: "is the patients that would be seen in a time of their manners" I10Q25: "more flexibility for both us and patients in booking appointments"
		Better use of the available resources	I7Q25: "service would benefit, we will use our technetium generators better"
		Inadequate Funding/ Not cost wise	I1Q25: "the cost associated with going to 7 days working would far out way any additional income" I2Q25: "it might not be beneficial cost wise [...] it's quite a high cost" I6Q25: "disadvantages would be increased cost" I7Q25: "7 days working, one needs an uplift of, I don't know, 35 % on your staffing budget" I8Q25: "We would lose money, you need more staff to cover the shifts"

			I10Q25: “I don’t think the income would necessarily be any greater [...] the budget wouldn’t cover staff”
		Less quality provided	I5Q25: “have to have more people, therefore we may not get the quality of staff [...] diluting the quality over the 7 days rather than producing high quality over 5 days”
		Extra fees	I2Q25: “staff pay changes on social hours (it’s double time that you are paying per staff member) [...] pay additional fee to the radiopharmacy”
		More capacity/ Decrease of waiting time	I2Q25: “would allow for more capacity” I3Q25: “bring the waiting times down” I4Q25: “waiting list-wise there might be a couple of scans that build up” I6Q25: “sufficient demand that we would needed to meet waiting list targets” I10Q25: “turnaround time would be much quicker”
		Income increase	I9Q25: “It could possibly increase the income because you could increase the number of patients that you are doing”
Financial Management in the interviewee points of view			
Financial reporting	Financial Information	Service line reporting (SLR)	I5Q12: “We are really focus on Service Line Reporting what happens here and just our mean outcomes at the end of the year.” Q13: “about what we charge to our clinical teams, our referral base” Q19: “We just compensate on the fact that the Trust pays us for the cost internally…SLR is a funny sort of thing.” Q22: “extra work is good work for us because anything is part of our SLR” I3Q19: “SLR which stands up for service line reporting but that’s how much the nuclear medicine department charges another department within the hospital for carrying out something.”
	Department budget status	Enough	I1Q15, I3Q15,I10Q15: “Yes” I7Q15: “the most part it covers all our demands [...] we give up a lot of money to central finance of things we over perform”

		Surplus	I5Q15: “we made more than we spent”
		Insufficient	I9Q15: “We always overspend [...] there is always a shortfall.”
		Uncertain	I2Q15: “If there was a problem with the figures it would have been pointed out to me” I4Q15: “whether the flow cash can be rightly recouped” I8Q15: “I don’t know. Probably not. But I don’t go to the budget meetings.”
Factors that may influence the budget	Private patients contribution	Additional funding	I1Q22: “improvement in NHS service because it funds additional practice that the NHS tariff wouldn’t cover" I3Q22: “we’ve got more money to spend on the department”. I4Q22: “it will bring money in” I5Q22: “a minimal effect I think in this hospital. […] the hospital gets a profit. […] So as a department we don’t benefit except in the money that comes from the donations to the chargeable fund from the doctors.” I8Q22: “which can be provided by the money funded by the private sector coming into the department [...] the quality is improved because it helps with the money” I9Q22: “it stands at the moment the private patients do provide significantly more income. It does make a difference to the NHS” I10Q22: “they all bring in income”
		Taken by the CIP	I2Q22: “tends to be swallowed up by the CIP”
		Small contribution	I7Q22: “Private patients are such a small percentage, that it’s insignificant.”

	Research	More income	I1Q27: "doesn't have any implication that we can see at a department level. It has implications as an organisation level because the income is held centrally." I2Q27: "it would be great to have research as a source of income […] would increase our budget" I3Q27: "It's important as a source of income" I4Q27: "if it's an external they will provide the money. So it is a source of income" I5Q27: "We would charge them more [...] that money would come to us, to the department, because that is outside of SLR" I7Q27: "there are financial benefits [...] comes back into our budget"
		Improves department profile	I3Q27: "general standing of the department" I4Q27: "department profile"
		Educational	I4Q27: "for the knowledge and educational learning of the techs" I8Q27: "you tend to be exposed to things that you don't normally do and makes you think" I9Q27:"you keep them on the ball, it makes the job more interesting" I10Q27: "suppose you learn, you gain information"
	Agency Staff	Costs covered by vacant posts	I1Q23: "The vacant posts are more than enough to cover the salary of the locum so in actual fact there hasn't been an effect; it has been covered within the budget." I3Q23: "we also had other posts which were vacant and weren't filled, so it´s a balance"
		Costly	I2Q23: "send us over our budget" I3Q23: "Because locum staff are more expensive than permanent staff it does affect our pay." I4Q23: "It's a drain. You are paying on average more for a

			bank/locum staff than you would for an equivalent substantive person" I5Q23: "It is a cost [...] it's the forefront of the Trust's mind" I6Q23: "Locum staff are expensive." I8Q23: "you pay more money, you pay the agency and you pay money for the locum person as well, compared to your regular staff" I9Q23: "the cost is initially very expensive [...] long term it's cheaper but short term it's probably more expensive" I10Q23: "They take it all away […] They are paid twice as much as a normal member of staff and half"
Costs reduction strategies	Plans	Cost Improvement plan	I1Q16: "The division has a cost saving programme and any benefit that any department can act to that improves the divisional position." I2Q22: "all radiology department has a CIP, we have had to reduce some budget by 5 %" I3Q16: "The Trust has set a CIP target [...] at 8 % over the next financial year." I4Q16: "the Trust has got something called "fit for the future" where it looks at ways of which the actual running cost can be reduced. You have always got your CIPs" I5Q16: "cost improvement plans [...] so we are always under pressure for those" I7Q16: "cost improvement plans. Every year I have to give up approximately 6 % of my budget." I10Q16: "Every meeting is always cost reduction programme"
		Quality Improvement Program Planning System	I5Q16: "Quality Improvement Plans [...] qualitative and patients' initiative things"

	Human resources saving costs actions	Staff grades alterations	I1Q17a: “if it’s a band 7 that moved, it was filled by a band 6 and so there is a cost differential between the salary of the person that moved and the one that was hired [...] such if someone resigns we can replace him with a lower banded member of staff” I5Q17a: “we have changed some staff in grades but it is usually cost neutral [...] we were more efficient in terms of the amount of staff we had for the same amount of money [...] wasn’t sufficient to buy more than half a technologist so we went to a band 3, associate technologist”
		Skill mix	I1Q17a: “skill mix within the department” I4Q16 “skill mixing” I5Q16 “skill mixing”
		Agency staff cessation	I3Q17a: “replaced locum staff with permanent staff” I5Q17a: “we ideally have no locums” I6Q17a: “Not using Agency Staff to cover staff shortages.” I7Q16: “Stopping all agency staff.” I10Q17a: “We are not allowed agency staff”
		No overtime payment	I10Q17a: “no overtime payments”
		Only hiring staff bank when needed	I7Q17a: “Having people belonging to staff bank and then using those for overtime. Q23: “only hire bank staff when that particular need is not budgeted for and that’s a way to get staff to get the work done”
		Creation of new jobs posts	I5Q17a: “increase our work group” I7Q17a: “the most important aspect is by honestly creating new jobs [...] so that there is no agency expense”

	Equipment saving costs actions	No replacement of equipment	I1Q17b: “a move to save money by not replacing that straight away”
		Lower price maintenance contracts	I3Q16: “Reducing the price of the maintenance contracts for the PET scanner and extending the lease from 7 to 10 years at a reduced annual cost.”
		PET/CT commissio-ning	I3Q16: “PET-CT commissioned which obviously hasn’t happened”
	Consumables saving costs actions	Looking for the lowest cost contracts for radiopharma-ceuticals	I1Q16: “agree contracts where we have got a lower cost” I2Q17c: “changed the kits supplier to decrease costs” I3Q16: “changing our radiopharmaceutical provider to a cheaper one” I9Q16: “try to get the cheapest supplier” I10Q16: “which is the cheapest but only with the major manufactures [...] due to quality and reproducibility and stuff. Because we have contracts with them we get better deals.”
		Buying vials and not individual doses	I2Q17c: “order the vial and not individual doses”
		Decreasing the amount of injected dose	I5Q16: “try to inject half the radiation dose that most of the people do”
		Changing types of radiopharma ceuticals or agents in the same study	I5Q17c: “switching from Chromium to DTPA for GFR [...] we went to a technegas as supposed to use 5 days of krypton” I8Q17c: “we used to send the cardiac asthmatic patients to other hospitals to do their dobutamine scans and what we’ve done is we’ve developed the pharmacologic stress with regadenoson”

			I9Q17c: “krypton [...] we can move to DTPA and that will reduce the costs”
		Grouping the same studies in the same day	I9Q16: “try to get the studies together so you can use only a kit”
	Other department policies	Bulk ordering	I4Q17c: “bulk ordering”
		Staff acknowledge of the prices	I4Q17c: “everybody knows what the prices are”
		Just-in-time concept	I4Q17c: “just-in-time rather than just-in-case basis because obviously in just-in-case you have different people ordering, you’ll build up stock, you might not use it as efficiently but that I mean that might use stuff that it’s going to pass the sell by”
		Inter-departmental sharing	I7Q17c: “to get the cheapest consumables whether it’s sharing with another department” I9Q17c: “instead of nuclear medicine have their own deliveries, we now order through the rest of imaging so we’ve reduced our delivering costs”
		Working time extension	I8Q16: “we changed our working hours to save money”
		Repatriating work back to the department	I2Q16: “is the saving year-on-year that we are making by doing the cardiacs here” I3Q16: “we can do it cheaper here than sending patients to go to” I8Q17c: “so that way we don’t have to send them to another hospital”
Revenue	Sources of income	Overperfor-ming Nuclear Medicine conventional studies	I1Q21: “Bone scans [...] *MUGA*, thyroids” I8Q21: “cardiacs possibly because that should be at least a category 4“ I10Q21: “The sentinel node studies.”

		Therapies	I5Q21: “Therapies would be our biggest.”
		Selling radiopharma-ceuticals	I4Q21: “radiopharmacy. It’s the biggest cost and the biggest income.” I7Q20: “By selling radiopharmaceuticals”
		PET activity increase	I1Q21: “majority of PET-CT” I3Q21: “PET private patients and [...] from other Trusts” I5Q16: “increasing the PET recently” I7Q20: “over-performing in PET” I9Q21: “PET-CT”
		Private patients	I2Q21: “Private cardiacs [...] Bone scans” I5Q20: “private referrers to her” I7Q20: “some private clinical services” I10Q21: “defecating proctograms and colon transit which other places don’t do so we do a lot of private patients for those”
	Strategies	High quality and specialization of the department	I4Q20: “our level of specialisation, our level of expertise as well in a way over a wide range of field [...] fame of the institution” I5Q20: “giving a high quality service [...] excellent radiologist” I10Q20: “because they are the specialists in their area”
		Providing competitive prices	I4Q20: “supply radiopharmaceuticals at a good and competitive rate”
		Establishing new procedures	I5Q20: “trying to find areas which other people don’t do or don’t do as well [...] SPECT-CT doesn´t exist in every place [...] should be doing in advance of other people” I10Q20: “SPECT-CT so new equipment attracts new referrals”
		Contacts and word of	I1Q20: “contact referrers of private hospitals”

		mouth	I3Q20: “communication with clinical trials office to encourage more clinical trials” I5Q20: “It’s just contacts and hopefully word of mouth”
		Brochures /Letter/ Magazines/Intranet	I2Q20: “would have written the DVLA saying that we now offer this service” I3Q20: “we have sent out brochures to potential PET referrers [...] photographs in magazines with the hospital to advertise the PET service” I10Q20: “on the local intranet”
		Invitation	I7Q20: “After work we are inviting consultants [...] and we have a little display of a new technique.”
		Choose and book slots	I8Q20: “allow them to choose and book whenever they want. It makes it more flexible to them”
Operational management policies			
Department assistance	Dedicated Porters	Not optimized	I5Q26: “we couldn’t justify more than one” I6Q26: “no way we could justify having a porter sitting around purely for nuclear medicine” I7Q26: “porters we had couldn’t do everything and then there were times they just sat and do nothing” I8Q26: “to have enough work for that porter so that he is just not sitting there all the time” I10Q26: “you are limited to one or two porters so if you need two beds at the same time you can’t have them”
		More knowledge of the NM procedures	I3Q26: “he understands nuclear medicine procedures and the importance of getting patients down at specific times” I4Q26: “the level of priority”
		Difficult management in case of absence	I5Q26: “the main porters will not help out when your portering isn’t up to scratch if you have sickness or absence or whatever”

		Quicker and immediately available	I6Q26: “it would be quicker” I8Q26: “at your disposal”
		Better communica-tion	I10Q26: “close communications”
	Shared with radiology	Efficient	I2Q26: “is more efficient” I9Q26: “So it’s a better service and more efficient service”
		Unbalance priority	I3Q26: “he would probably spend more time fetching patients for plain X-ray” I4Q26: “will take priority over us” I8Q26: “wait for another half an hour before you can get your own patient for nuclear medicine”
		Better communica-tion	I8Q26: “communication with our porter is much better”
	Central portering system	Easier with online booking	I5Q26: “you book the porter online” I10Q26: “*TeleTracking*” [...] it’s all online and trackable”
		Unstructured / Delays and unequal priority	I2Q26: “the pool of porters were so big that if a porter did not do their job for us it did take a very long time and we found there was nobody taking responsibility for it” I7Q26: “Central portering’s biggest weakness is time delays to get to the patient.” I9Q26: “that doesn’t work because you get delays and because the porters have to go everywhere else [...] they don’t have appreciation of getting patients here on time”
		Difficult management in case of absence	I6Q26: “staff sickness or leave or anything of that the number of porters goes down then you get bottlenecks”
		Worse communi-	I10Q26: “disadvantages are that you don’t have a one-to-

		cation	one communication”
Service Improvement	Policies	Quality Improvement Plans	I5Q16: “qualitative and patients’ initiative things”
	Lean thinking	Booking system	I4Q28: “So it’s good scheduling” I7Q28: “booking system [...] some advantage but not huge [...] probably changed our staff hierarchy”
		Unnecessary documentati-on	I2Q28: “documentation of steps that happen within the department that are potentially unnecessary. We have removed some of those such as the patient log that was been kept, the paper log that has been kept in nuclear medicine.”
		Convenient environment	I4Q28: “the booking staff [...] now we have a booking hub”
		Workflow optimization	I4Q28: “we had somebody whose prime duty was to schedule and prepare all of our cardiac patients, that it moved more smoothly” I5Q28: “adjusting the way that we performed the tests, baring in mind limitations that we have with other examinations going on at the same time”
	Process mapping	Workflow optimization	I2Q28:“how long each stage takes and what we could do to try to minimise the time taken in those stages. Actually in the end once we did that (because it worked so well) we decided to process map everything so basely our entire nuclear medicine workflow.”
	Time Targets	As soon as possible	I7Q33: “Normally as soon as they come.” I9Q33: “As soon as possible.”
		Unspecified	I2Q33: “But there are no time targets.” I4Q33: “We don’t have time targets.” I5Q33: “We don’t really have.”
		Specified	I1Q33: “Within 30 min.”

			I3Q33: “15 min.” I6Q33: “unofficially no more than 15 minutes.” I8Q33: “within the next 10-15 minutes.” I10Q33: “30 min.”
Workflow configuration	Dependent on:	Radiophar-maceuticals suppliance	I1Q29: “supply of radiopharmaceuticals” I5Q29: “partly availability of the radioactivity [...] generator arrives” I10Q29: “due to radiopharmacy when the technetium generator comes”
		Staff availability	I4Q29: “availability of the consultants” I5Q29: “availability of doctors” I6Q29: “when we have cardiac stress nurses” I7Q29: “availability of special staff” I8Q29: “availability of the consultant” I10Q29: “can be due to consultant availability”
		Facilities availability	I4Q29: “limiting factor would be our therapy rooms” I9Q29: “just having one waiting area”
		Scan duration	I5Q29: “takes us a lot of our gamma camera time”
		ARSAC restrictions	I8Q29: “license to hold Iodine-123”
		Delivery prices	I8Q29: “save some money with the delivery” I9Q29: “we have to pay the delivery cost”
		Other procedures	I4Q29: “surgeries” I5Q29: “therapy day” I10Q29: “that is what fits in the theatre lists”

	Advantages of a semi structural workflow	Patient optimization	I2Q29: “the number of patients we are able to do by organizing the list”
		Radiophar-maceuticals optimization	I2Q29: “maximize the use of our radioisotopes” I4Q29: “not making the same radiopharmaceuticals several times during the week” I7Q29: “up a vial of radiopharmaceutical” I10Q29: “block booking [...] making things more cost effective”
		Camera use optimization	I2Q29: “maximize the use of our camera and the staff operating the camera” I3Q29: “they can do sequential types of scans” I5Q29: “we put the Pinhole collimator on a Monday and try and do all the thyroids [...] practicality” I9Q29: “you don’t have to swap between collimators all the time”
		Staff coordination	I5Q29: “has benefits for the consultants staffing group”
		Flexibility	I5Q29: “if we needed to do an urgent [...] scan [...] we would still try and fit them in”
		Smooth workflow	I5Q29: “probably makes the department run a bit smoother”
	Disadvantages	Increase of the waiting list	I3Q29: “inefficient way of using your scan slots, you end up with separated waiting lists next to each other” I6Q29: “it’s actually quite difficult to group patients [...] because we actually don’t have sufficient numbers”

Structural problems/Demand control	Capacity problems	Scanner limitations	I2Q14c: “We wouldn’t have that capacity on the scanner.”
		Inexistence of permanent staff/flexible timings	I4Q14a: “we’ve got financial mandate that locum staff cannot overtime. That actually inhibits our capacity in that aspect...” I10Q14c: “There is no funding for additional staff or weekend working.”
		No financial incentives	I3Q14c: “Because we can’t get a new scanner. We can’t afford it. There’s no money to buy a new equipment.” I8Q14c: “If the Trust is already in deficit, they own money already, they won’t have that money to provide a radiographer for me.” I9Q14c: “No money, no staff.” I10Q14c: “Financial restraints.”
		Unpaid work	I7Q14a: “commissioners only pay a certain amount per annum. Although the demand is fairly high, I am concerned that I don’t get paid. PET-CT is not a part of PbR so it’s locally agreed and as a high cost treatment.”
		Type of exams that could be replaced	I5Q14a: “SPECT-CT is the thing that’s a pressure [...] MPSs [...] it’s a very high dose. [...] Cardiac CT is promising very low dose.”
Patients’ DNA	Policies	Patient contacted after the 1ºDNA (I1, I4, I9); after 2ºDNA (I2)	I1Q30: “So the patients are contacted by the admin or clinical staff and asked why they failed to attend.” I2Q30: “Two DNA, we would call the patient and if they say “I’m sorry, I didn’t get it” we agree an appointment over the phone.” I4Q30: “hopefully we can ring and get the patient to agree” I9Q30: “do not attend a letter goes out to the patient”
		Referrer contacted (if	I1Q30: “contact the referrer to let them know that the patient has DNA and ask them whether they needed to be

		patients not located (I1, I4))	re-booked” I3Q30: “Referrers are informed.” I5Q30: “we will send a letter to the referring consultant” I9Q30: ”letter goes also out to the referrer”
		Patient rebooked automatically after 1ºDNA, or just specific patients (I9)	I2Q30: “One DNA, we will offer another appointment.” I9Q30: “paediatric patient would be automatically re-booked twice, they have two more chances. If it’s a cancer patient they get one more re-booking automatically.”
		Patient re-booked 2ºtime with plausible excuse	I1Q30: “we would re-book another appointment” I3Q30: “unless the patient contacts us” I4Q30: “It depends on how they don’t attend.” I5Q30: “if they have a reasonable excuse we might say: “Ok, we will re-book you for this.” “ I9Q30: “Obviously it depends on the situation.”
		Referral returned after 1º DNA (I3,I6,I9, I10) 2ºDNA (I1,I4,I7), 3ºDNA (I2)	I1Q30: “If we can’t contact the referrer or the patient [...] If they DNA for a second time then we would return the request back.” I2Q30: “If there is no response or the patient fails a third time we send the referral back to the consultant.” I3Q30: “Patients aren’t given an additional appointment” I4Q30: “we will give them a second opportunity [...] if they have agreed and they don’t turn up back to the referrer” I6Q30: “patient then has to go back to the referring consultant for them to generate a new request” I7Q30: “After the second DNA we send the referral back to the referrer.” I9Q30: “If they want another appointment they have to go back to the referrer and he/she needs to refer them again

			and then we will book it." I10Q30: "The forms get send back to the referring clinician after the first time."
		Referral put on hold after 1ºDNA	I8Q30: "the referrals are put on hold until we get another referral or until the doctor calls"
	Strategies to decrease the patients DNA rate	Not booking in such advance	I5Q31: "patients were being booked along"
		Having a dedicated nuclear medicine booker	I8Q17c: "I made the DNA lower for the DATScan patients by getting one of the admin people to be a dedicated nuclear medicine appointment booker and that way she can, with the DATScans and the more expensive radioisotopes, call and confirm the patients before their appointment."
		Decreasing the waiting list to have earlier slots	I5Q31: "waiting list was long"
		Reminding appointment and preparation by phone	I1Q31: "Patients are called the day before PET-CT scans. For bookings that are less than 5 working days we contact all patients by telephone." I2Q31: "to call the patients a few days prior to the scan, mainly the expensive ones" I5Q31: "cardiacs we phone up the day before to remind them of coming [...] not to take caffeine [...] PET get phoned a lot because of the preparation" I6Q31: "the expensive examinations [...] we make every attempt to contact the patient" I7Q31: "For expensive and cardiac studies we sort of remind people of their appointments by telephone." I8Q31: "We call for everyone two days before."

		Giving instructions to patients to call back	I6Q31: “we instruct all our patients to telephone us as soon as they have received the appointment to confirm” I9Q31: “encourage patients to call us to confirm their appointments” I10Q31: “We get patients to ring to confirm that they are coming [...] we give them the option to e-mail”
		Sending letters	I1Q31: “we would send a letter” I2Q31: “Letters are send to all patients.” I3Q31: “So letters are sent out when the appointment is made.” I5Q32: “we would send a letter” I6Q31: “as they have received the appointment” I9Q31: “We always send a letter by first class” I10Q31: “appointment letter”
		Sending text reminders	I3Q31: “DEXA patients receive text reminders.” I4Q31: “we have introduced a text SMS service” I10Q31: “There is also a talk of implementing a texting service to remind patients”
		Giving booking choice	I4Q31: “we will try and get patient agreed bookings so that people are less likely not to turn up” I10Q31: “an agreed booking over the phone”

Human resources mistakes	Incorrect patient preparation: strategies to decrease cancellations	Send a letter	I1Q32: “contact the ward by sending a letter” I2Q32: “would send an information leaflet up to the ward” I6Q32: “send information letters up to the ward” I9Q32: “we would give a paper with instructions” I10Q32: “we send an appointment information up to the ward”
		Contact the ward/clinician by phone/fax	I1Q32: “by phoning them to pass over the patient preparation at the time of booking [...] the evening before if it’s not a same day appointment to re-confirm [...] we call first thing in the morning to let the ward know” I2Q32: “require a clinician from the ward to come down and speak with us. [...] If they wouldn´t contact us then we would contact them” I4Q32: “we’ll ring them” I6Q32: “the nurse looking after the patient is aware of the preparation prior to the appointment and we ring them [...] we will contact the ward the day before the examination to check that the examination is still required” I9Q32: “call the ward, we normally fax the details to them” I10Q32: “ring the ward a day before to check what’s happening and when the patient goes back to the ward”
		By not doing inpatients that require preparation	I2Q32: “we only do inpatients that don´t require preparation”
		Incident record (*e.g*: DATIX)	I4Q32: “DATIX [...] which is an efficient log” I5Q32: “DATIX system has been the avenue to produce those answers to the clinical teams [...] became more knowledgeable as the PET became more familiar to them.” I9Q32: “we put an incident form”

		Education and Communica-tion	I3Q32: “Liaising with ward staff [...] teaching kind of issue.” I5Q32: “it’s just education and [...] communication” I8Q32: “just emphasise to the doctors and to the nurses, whoever we are talking to” I9Q32: “We are slowly educating the wards that they need to prepare the patients.”
		Having a nurse to assess the inpatient	I4Q32: “we will try and get a nurse to go up and assess the patient” I5Q32: “if it’s for a cardiac scan, one of the cardiac nurses will physically go up to ward and talk to either the patient or staff looking after the patient”
		Charging the responsible ward	I7Q32: “Especially in PET we now charge the ward”
		Agreement letter	I9Q32: “For our PET patients now in addition we will send them a letter [...] you need to fax this back to us”
IT system	Computerized system: advantages	Information available in many sites of the hospital	I2Q34: “other imaging you can access anywhere” I4Q34: “they can be vetted from anywhere” I7Q34: “It’s a huge advantage to be computerised because we are on so many sites [...] you could find the referral, you can look at the scan and you can find all patient notes.” I9Q34: “you can access that data wherever you are”
		Auditing	I5Q34: “searchability should be better” I6Q34: “auditing” I7Q34: “could find the referral [...] find all patient notes” I8Q34: “a way of checking” I10Q34: “audit trial”
		Efficiency	I2Q34: “made us a lot more efficient” I3Q34: “you are not having so many mistakes [...] you are

			not relying on human error” I6Q34: “efficiency” I7Q34:”It is much more efficient.”
		Confidentiali-ty protection	I1Q34: “information governance issues with who is completing the form when they are on paper” I9Q34: “wrong person may have a piece of paper”
		Safe storage	I1Q34: “paper can get lost” I2Q34: “the request form is not lost” I8Q34: “several referrals getting lost” I9Q34: “are bits of paper that gets lost”
		Paper-light philosophy	I4Q34: “paper-light. People will still print”
	Disadvantages	Incapacita-ting	I3Q34: “if the RIS or PACS system fails for some reason then you can’t do anything” I8Q34: “the only problem is if the system breaks”
		Inflexibility	I10Q34: “you lose all your flexibility if you go completely to the computer, also our radiologists aren’t always around so they don’t want to vet electronically”
	Paper: advantages	Practical	I2Q34: “it´s still useful to be able to get clinical information” I4Q34: “the pregnancy test has got to be signed [...] actually easy to work with during the day” I9Q34: “we use that one to bring the patients in and out and scan the patients and we put details on that” I10Q34: “you can mix and match the appointments”
	Disadvantages	Expensive	I1Q34: “more expensive to run parallel paper and electronic systems” I4Q34: “an expense that you don’t need both in printing consumables and paper”
		Time	I1Q34: “time consuming to fill out paper forms”

		consuming	I4Q34: “staff time consumption” I8Q34: “if we lose a form [...] one member of staff would be looking for it for two hours” I9Q34: “are printing it to vet it so that can cause delays”
		Storage problems	I4Q34: “It’s a space” I5Q34: “storage of paper”
	Website (information for the patients and referrers	Insufficient and out-dated information	I1Q34: “there is some out-of-date information” I3Q34: “a little bit, not much actually” IQ34: “our nuclear medicine website isn’t great” I5Q35: “doesn’t say much so it needs to be improved” I9Q35: “We don’t have an up-to-date website”
		No information	I2Q34: “So there isn’t any freely available information.” I8Q34: “We don’t have a particular website for ourselves.” I10Q34: “We don’t have a website.”
		Descriptive information about scans	I5Q35: “we have got two videos on our website for the thyroid therapy patients so we can teach people the head of the game”
		Private prices concealed/ prices discussed with the private wing of the hospital	I1Q34: “it’s commercially sensitive” I2Q34: “hospital’s private work is delivered via the private health company” I3Q34: “commercial sensitivity” I5Q36: “Prices are a discussion between the private patient unit and the referring doctors and/or the patients themselves.” I3Q34: “The prices are obviously known to the private patients care’s office” I7Q36: “It’s not our policy to put prices on our website.” I9Q34: “Private patients come to us through a private wing.”

			I10Q34: “They are referred to the private patients unit.”
Future Projects			
Income related	Patients	More private patients	I7Q37: “more private patients” I3Q37: “get more PET-CT private patient referrals”
		More patients	I1Q37: “increasing our patient throughput”
	Radiopharmacy	Sell specific radiopharmaceuticals	I5Q37: “sell some fancy radiopharmaceuticals”
		New costumers for the radiopharmacy	I7Q37: “there are always new costumers for the radiopharmacy”
		Reduce radiopharceutical and consumable costs	I1Q37: “trying to reduce radiopharmaceutical [...] other consumable costs” I4Q37: ”Consistently review the spend on consumables costs”
	Research	More research	I5Q37: “trying to monetise some of our expertise in terms of research”
	No overspent		I2Q37: “we are really not looking at making significant debts in our budget”
Staff related	Recruitment	Employment process improvement	I4Q37: “we employ rapidly when somebody leaves”
		More staff	I10Q37: “increase the number of staff”
	Motivation	Staff retention	I4Q37: “work in staff retention”
		Skill mix (to decrease	I2Q36 : “skills mix [...] more professional opportunity [...] cost of a senior consultant would be far higher than the

		costs and to give professional experience)	cost for me to do the reporting" I8Q36 : "is to train more people"
Equipment related	PET/CT, Gamma-Cameras and DEXA	New equipment	I2Q37: "new gamma camera" I5Q37: "would be generating enough stuff to get a second PET scanner" I6Q37: "replacing the existing SPECT camera with a SPECT/CT" I8Q37: "DEXA….. I would like to get a business proposal." I9Q37: "are to get new equipment"
	IT system	Computeri-zation	I4Q37: "computerise all of the ordering system but also the actual referral system"
Patient related	Patient results optimization		I1Q37: "ensuring that the referrals are clinically appropriate"
Department developments	New technology	Innovation	I5Q37: "innovation and doing the things better and differently we do things ahead of other people"
		New therapies	I5Q37: "expand some of our therapy areas" I7Q37: "new therapies in nuclear medicine"
	Recognition	Improving department status	I5Q37: "it's to improve our standing"
		Courses execution	I5Q37: "running more courses"
	Productivity	Optimization of the appoint-ments times	I8Q37: "these slots in the diary a little bit more optimised basically"
		Working time extension	I8Q37: "extend the working hours from 8 to 8, particularly in PET-CT" I10Q37: "reduce the waiting times"

F. All transcribed interviews

Interview no. 1

Duration: 0h40min

Date: 16/06/2015 at 07:50

Part 1- Department Characterization

1. **What divisional group does your department belong to?** Clinical services.
2. **Which scans are the most common?** Bone and FDG PET/CT scans.
3. **How many:**

a) **Gamma-Cameras-** 3 (2 are SPECT/CT) **b) PET/CT-** 2 **c) DEXA-** 1

d) **Injection Rooms-** 2 **e) Consultants-** 5 **f) Technologists/Radiographers (Band5-** 0**) (Band 6-** 4**) (Band 7-** 7**) (Band 8a-** 1; **8c-**1**)** **g) Nurses-** 2

4. **What is the mean number of patients per day?** 16 PET/CT; 27 NM; 4 DEXA.
5. **Opening time:** 9am-5pm.

Part 2- Interviewee Characterization

6. **Job title:** Service Manager.
7. **Qualifications:** BSc (Hons) Neuroscience, MSc Nuclear Medicine Technology, currently completing MSc Health care leadership.
8. **How long have you been working as (job title) in this organization?** February 2014.
9. **How long have you been working as (job title)?** February 2014.

10. What do you consider to be the most important tasks of a (job title)?

So I think probably the most important point of the role that I do is to horizon scan and to look to the future and to future developments, to start trying to predict referral patterns and changes in technology, to make sure that we've got good links with manufactures and other departments so that we are able to be proactive in developing our service as opposed to being reactive once people are demanding things.

11. What do you consider to be the most demanding tasks that you carry out and why?

Staff management, people management, so simple things like proving annual leave, generally staff well-fare, that in terms of the amount of time it takes a lot of time. So I think it depends how you define demanding. I don't find it overbearing but I find that it takes the most time throughout the working day dealing with those kind of issues.

Part 3- Financial related questions

12. In your opinion, what has PbR introduced compared with the previous financial model in terms of patient and financial outcomes?

PbR is meant to be outcome related, so truly in terms of surgery and things like that you have got procedure code and the length of stay and then they are combined to give you a different tariff. For imaging the tariff is only being unbundled so it is a separate tariff for the last 18 months (2 years), where prior to that it was bundled in to the outpatient attendances. It also depends on the Trust as well because although the hospital is paid by PbR, the other places that I have worked the recharge is actually being internal for the imaging cost so you don't actually see the tariff money coming in. The only tariff that we see coming in to the department here is from the PET/CT scans, so we

don´t see any of tariff coming in from any of NM work, that all goes centrally. It is kind of difficult to access.

I have not been working in the NHS until 2005 so block contracts was prior to me working in the NHS. We are kind of moving back potentially towards block contracts although that hasn´t happen yet. In my work experience I cannot answer to the question, I am afraid.

13. **In the context of Radiology, is the PbR system improving or worsening the patients' outcome?**

In terms of radiology, no. I don´t think that has any effect, there isn´t any incentive to improve patient experience due to the way the tariff is used, no incentive to the department providing the service, so there is no quality/benefit. There is no tariff uplifts. For example if one centre performs a study at a higher quality, however it wants to turn on either fast turnaround time from referral to scan or that patient experience measures such as patient satisfaction is higher you get a higher tariff none of that exists. So PbR doesn´t really make sense in terms of radiology because there is no measure of patient experience or quality of the study within that because like surgery if you have a shorter length of stay you potentially are going to get paid more for that patient than if they stay in the hospital for longer, that doesn't exist with radiology and NM. It is a flat rate whatever... The tariff doesn't influence the decision of increasing the number of scans.

PbR does not incentivise medics to refer for more scans. Sometimes, the reason for referring for the scan is slightly unnecessary and it is these that were are trying to push back on. Basically asking the question "Is this really necessary?".

One way of potentially set the tariff up is to take into consideration the radiation dose to the patients for a combination of scans and you could influence referring patterns in that way. But I don´t think the tariff incentivizes any safety issues.

14. **According to the amount of requests...**

a) **Is there any area that you may think that your department may need to increase the capacity?**

Not at this moment.

b) Or decrease the offer?

Not at this moment although we are trying to rationalize the referrals that we are getting to ensure that they are all clinically relevant. But that isn't due to a capacity issue. That is just a financial point of view to ensure that the results have been used as efficiently as possible.

c) If yes, which factors are against those changes?

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15. Is the department budget covering all the expenses?

Yes.

16. Do you feel the need to save/reduce expenses?

Yes. It's more across the division. The division has a cost saving programme and any benefit that any department can act to that improves the divisional position. So a good example is the cost of radiopharmaceuticals: If we can agree contracts where we have got a lower cost although we haven't specifically being target with making that saving, it's the right thing to do if we can save that money.

17. Since you have been working at this Trust, have you put in practice any measure to decrease costs...

a) In staff?

So when we have created posts or add new posts where internal people have moved to, for example a research position for a couple of years, if it's a band 7 that moved, it was filled by a band 6 and so there is a cost differential between the salary of the person that moved and the one that was hired. We are also being asked to consider the skill mix within the department such if someone resigns we can replace him with a lower banded member of staff to make cost savings.

b) In equipment?

We have spent quite a lot of money on new equipment. The DEXA scanner is due for replacement and it's currently termed end-of-life, if it breaks there is no way of fixing it. So there has been a move to save money by not replacing that straight away. The divisional director is aware that this piece of equipment is vulnerable but he has taken the decision that we wait and see how long it lasts for, basically.

c) **In consumables?**

By reducing the radiopharmaceutical costs.

18. **Do you consider that the tariff for NM procedures corresponds to the reference costs and why?**

No. There aren't enough HRGs to specifically group nuclear medicine studies. These are being grouped in lower cost procedures such as ultrasound, where they fall into the same category and therefore that dilutes the average price such that the nuclear medicine tariff is not reflecting the high cost rate of the radiopharmaceuticals.

Is the NHS paying less than what the scans effectively cost?

Not for every procedure. For a bone scan the tariff is definitely higher than the cost to perform. But something like an Octreotide, MIBG or DATScan the tariff is significantly lower than the cost to perform the procedure and that is also the conclusion of the British Nuclear Medicine Society. They performed a country wide analysis and have taken that to the DH to try to address the gap in the tariff.

Have you ever considered decreasing the type of scans whose procedure cost overweighs the earnings?

No. There is a clinical need for them and there is no other test that could replace those high cost exams. So for me, personally, I have never implemented a strategy to try and reduce the use of those exams however more senior managers than me have asked the question and asked why we are performing studies that are significantly more expensive than tariff reimbursement. But the idea should be that hopefully those scans that are cheaper than the tariff to perform we are doing lots of, the things that are more expensive than tariff we do relatively few of and hopefully it balances out. So from a budgetary point of view there is no problem.

19. **Have you ever done any analysis on the real cost of a specific exam against the cost paid for the exam?**

Yes, every year.

20. **What strategies do you put in action to attract income?**

We have attempted to contact referrers of private hospitals to refer more private patients to then offset the scans that are losing us money on the NHS, it's one thing that we have done. Again not to attract scans but to try and limit those that are expensive is to make sure that we have clear guidelines about the use of those scans so that we can challenge any referrals that perhaps aren't clinically relevant.

21. In which activities does the department receive higher income?

Of the top of my head, majority of PET-CT, bone scans, but in this department MUGA probably, thyroids (income coming from NHS and private sector). With private patients we always aim to have a surplus compared to what is paid and what it costs us to perform. For NHS there are a number of scans that we get more money in from tariff than it costs us to perform the scan. For private patients everything we get is a profit.

22. In your opinion, what is the effect of non NHS income in NHS patients?

It allows for the improvement in NHS service because it funds additional practice that the NHS tariff wouldn't cover.

23. In your opinion, what implications does the bank/locum staff have on the budget?

We have got one at the moment. But the reason why we've got somebody is because we have got a short period of about 6-8 weeks where we have had people leave and other people not starting and where we have a number of posts vacant. The vacant posts are more than enough to cover the salary of the locum so in actual fact there hasn't been an effect; it has been covered within the budget. But that's the first time in 10 years that I have been working in the NHS that I have used a locum so it hasn't ever been a problem.

24. What implications on the budget/management would your department have if it belonged/not belonged to a NHS FT?

I don't think that it would have any impact, to be honest with you. I don't think that the ability to go and attract additional work has been improved by being within the foundation trust for NM specifically because it's so limited within hospitals that naturally services have always been provided to other hospitals in terms of nuclear medicine

imaging. So I think that is a practice that has been around for a very long time and there hasn't been a benefit from having foundation trust status to nuclear medicine.

25. **In your opinion, what advantages and disadvantages would your department have if it worked 7 days per week?**

For the department point of view I don't think that there is enough of the demand that we need towards 7 days. I think the cost associated with going to 7 days working would far out way any additional income. There would be obviously patient benefit that they could have scans outside of working hours but from the department point of view I don't think that there would be a benefit doing that at the moment. I think if we went to 7 day working there would be quite a limited number of patients that is probably still working whereby it would be beneficial to them to come on the weekend. I have been thinking probably lymphoma patients where they are younger they might still be out to work. Obviously there are improvements in survival rates but I think because of the number of other appointments that people have everyone is so accepting of the fact that they need to come during working hours. I think if patients knew that they could come on the weekend there would be a percentage that would shift and would go to the weekend. But I don't think that it would be significant enough to start, it's not going to be like 50 % of the patients that want to have the scan on the weekend. The other thing of course is the provision of the radiopharmaceutical so if it was nuclear medicine obviously we could do that internally but if it were PET than that's going to be reliant on the manufactures supplying that service. And currently our supplier only supplies twice a month on a Saturday, they don't supply on Sunday, but if the demand was enough they would probably change.

Part 4: Operational management related questions

Departmental level:

26. **What are the advantages or disadvantages of having an own porter/central portering system?**

There wouldn't be any advantages in having an own porter in this department because there aren't enough inpatients that justify having an own porter.

27. **Is your department involved in research studies with external institutions? (If not, what is the importance that you give to research?) (If yes, what are the implications in the budget and importance to the department?)**

Yes. It doesn't have any implication that we can see at a department level. It has implications as an organisation level because the income is held centrally. We get an allocation within our budget supposedly based on the previous year's research activity. But we don't see that income so it's very difficult to determine the actual amount received. It makes it very difficult when making business cases to say: "Our research work has increased, therefore we need an additional member of staff" because we don't have a direct link to that income to show that there is a surplus of money coming in from research that could fund another post.

28. **According to National Framework for Service Improvement in Radiology (NFSIR) there are two important methodologies for service improvement: ''lean'' thinking and process mapping. Is the patient pathway according to these practices?**

I think we could be leaner in some of the processes that we do, I think there is a lot of documentation of steps that happen within the department that are potentially unnecessary. We have removed some of those such as the patient log that was been kept, the paper log that has been kept in nuclear medicine. We don't keep that anymore. So I think that lean could be used to better effects within the department. Process mapping: We haven't done any process mapping but again I think that would be a useful technique. The Trust has just approved an electronic document management system which will allow us to have electronic forms as well. So it won´t be the ordercomms directly but instead of receiving paper referrals we will receive an electronic referral although it won´t be directly into the RIS.

With the electronic referrals as well hopefully we can then add in a mandatory field to say if patients are having other studies and then it would highlight to the person that is receiving that referral that there is another scan. Because at the moment to book scans in the same day we have to rely on either the secretaries talking to each other when they sit together or we have to rely on the referrer writing on the paper form that

they have also referred for another scan. So if we can have an electronic form where it forces them to say “Are there other scans that you are referring for? Yes or No”, if they put “Yes” they have to say what it is and then we can combine to put those things together.

I think process mapping would be really helpful to assess how that works and the impact that could have. So currently I would say those techniques haven’t been fully utilized.

29. Do you have specific weekdays for determined exams and why do you have that structure?

Yes. That’s mainly down to the supply of radiopharmaceuticals as suppose to a conscious decision to book into those days.

Do you see advantages in terms of equipment productivity?

In this department, no because of the collection of patients that we see we don’t have the pressure that general hospitals have in terms of fitting patients in and therefore having to divide studies into different days. We basely scan everything on any day because of the speciality of the hospital is not so much for an effect.

Patient level:

30. What measures are taken when patients do not attend?

So the patients are contacted by the admin or clinical staff and asked why they failed to attend. If we can’t contact the patient we would contact the referrer to let them know that the patient has DNA and ask them whether they needed to be re-booked. If the patient says: “I forgot. Could I have another appointment?”, we would re-book another appointment. If they DNA for a second time then we would send the request back to the referrer. Or if we can’t contact the referrer or the patient we would return the request back to the referrer and we would ask them to re-refer.

31. What measures are done to decrease the rate of DNA?

Patients are called the day before PET-CT scans. For bookings that are less than 5 working days we contact all patients by telephone. Patients that are outside of this time we would send a letter.

32. **What measures are you taking to decrease the cancellation rate in inpatients due to human resources mistakes (e.g: wrong preparation, late transport)?**

We do have issues in terms of ward staff not preparing patients properly for PET-CT. So we always contact the ward by sending a letter, also by phoning them to pass over the patient preparation at the time of booking. We also phone the evening before if it's not a same day appointment to re-confirm the patient preparation and we call first thing in the morning to let the ward know that the patient needs to be fasted etc. I think it minimizes the number of cancellations that we have because we always call first thing in the morning. If a patient is eating breakfast we can delay them to later on in the day (we don't have the flexibility but we make it). I think that minimizes the number of patients that failed to achieve their appointment on the day. That is meant to for inpatients but obviously there are some patients that we just can't scan. It's minimal.

33. **What time targets do you have for the time between the patient arrival and then being seen?**

Within 30 min.

IT level:

34. **What are the advantages/disadvantages of your IT system?**

We are going to change our system over the next year to 18 months. Our referrals are still on paper but the rest is all computerised. I think that there are technical problems with the tablets, the screens are quite small and that is not necessarily the most efficient system. From a staff point of view I think it's reasonable for them to use on a regular basis. It has developed that way due to historical reasons not least the costs involved. Disadvantages are: time consuming to fill out paper forms, paper can get lost, time consuming to find the appropriate paper forms when the electronic system is down, information governance issues with who is completing the form when they are on paper, more expensive to run parallel paper and electronic systems etc.

35. **Does the NMD website have updated information for referrers/patients?**

I'd say no. I'd say that there is some out-of-date information. It's my responsibility to change and it is a task in progress.

36. Does the NMD website contain the prices for private services?

No. Because it's commercially sensitive so we don't want to give our competitors an advantage by knowing our prices. It's not my decision to publish but private care makes the decision on whether they publish the prices or not.

Final Questions:

37. What are your future steps to improve the budget/operational management for the department?

Trying to reduce radiopharmaceutical costs, trying to reduce other consumable costs, and increasing income by increasing our patient throughput and by ensuring that all the referrals are clinically appropriate.

38. Do you have any questions or comments?

-

Interview no. 2

Duration: 1h40min

Date/Time: 17/06/2015 at 17:15

Part 1- Department Characterization

1. **What divisional group does your department belong to?** Radiology (Medical Division).
2. **Which scans are the most common?** Bone Scan and MPS.
3. **How many:**

a) Gamma-Cameras- 1 **b) PET/CT-** 0 **c) DEXA-** 1 **d) Injection Rooms-** 1

e) Consultants- 4 **f) Technologists/Radiographers (Band5-** 1**)** (**Band6**- 1**) (Band7**- 0**) (Band8a**- 1) **g) Nurses**- 1 (Part time)

4. **What is the mean number of patients per day?** 13 NM patients, 14 DEXA (3 days per week).
5. **Opening time:** 8.30am-5.00pm (8.30am-8.00pm Monday and Wednesday).

Part 2- Interviewee Characterization

6. **Job title:** Superintendent Radiographer (with reporting duties).
7. **Qualifications:** Bsc Radiography; Post-Graduation Nuclear Medicine; Reporting Course.
8. **How long have you been working as (job title) in this organization?** 9 years.
9. **How long have you been working as (job title)?** 11 years.
10. **What do you consider to be the most important tasks of a (job title)?**

Patient care and safety. As deputy, for me day to day it's the staff. Because I am actually managing additionally, which why I got the band 8, is I am not just managing the staff within the nuclear medicine department but I am also managing all the radiography assistants in the whole radiology as well which is 15 of them. So I am managing quite a lot of staff. But that is just added, that is on the top of the job.

11. **What do you consider to be the most demanding tasks that you carry out and why?**

Managing the staff.

Part 3- Financial related questions

12. **In your opinion, what has PbR introduced compared with the previous financial model in terms of patient and financial outcomes?**

This model has been in place now for about 10 years. Since then it has developed into a way that asks us to look for more efficiencies within our department because if we are getting paid by the result and we are able to be more efficient then we are more productive and we are more profitable as well as a department. That seems a bit of a strange concept as a part of the NHS to be profitable but if we are able to do more work with the same resource then we are therefore profitable. I don't know if I can give an example but when I first started my job here one of the primary things I was tasked with was to repatriate our cardiac service which we didn't do at (institution) before, we didn't have a cardiac service when I arrived so any patient that required a MPS at (institution) was referred to the (another NHS institution) and the (another NHS institution) would cross charge our hospital in order to undertake the way. By repatriating that work we no longer send that work to the (another NHS institution). It gives the Trust a huge saving year on year because we are doing the work here and we are doing it efficiently here as well so we are able to do the same capacity of patients required but obviously for significant less cost.

13. **In the context of Radiology, is the PbR system improving or worsening the patients' outcome?**

I think it's making it potentially worse it could be because of the fact that we are looking for efficiencies, a workflow, how many patients we do per session. It's finding that balance between the patients' safety so that we are able to give each patient the right amount of attention and that we are working effectively by doing as many patients as we can. It's trying to find that balance.

In your opinion, did the scan number increase with the implementation of PbR?

I think so, because obviously my line manager is going to want me to do as many scans within a time frame as possible and as a superintendent I am trying to please or conform with those targets if I can but at the same time I also have to weight that up with being able to work in a safe manner as well. So it's trying to create that balance and

sometimes you can make a bad judgement and realize that maybe it's too many patients for a list and the only thing that it is going to affect in that situation is the patients. It's not going to affect anyone else, and the staff morale won't be as good as well obviously.

Do you feel more pressure to do more scans and produce more income?

I used to, not anymore. I used to because you make these judgements and they are just judgements and you can get them wrong and then you realize actually: maybe we shouldn't do 10 cardiacs on a list because it's not safe and initially I was pressured because I wanted to please my line manager but then I realized: There has to be a balance between what is achievable and what is what you are actually going to deliver as well.

Do you think that the patients are having more scans than necessary?

Yes. 100 %, I agree with that. Absolutely. I think since my experience of being a radiographer for when I first started, quite a long time ago, to now I think imaging is being utilized much more rather than the clinical argument of the doctors. I think that is a real problem. I think there is not enough stringent boundaries on being able to refer for scans. I think that what is happening within the laws that are employed by IRMER and things like that, that they have set boundaries. The problem that we are having is that the consultants now have that knowledge and they know how to utilize those boundaries to get the scans that they require. I don't think the reality is necessarily that they are properly being as truthful. I think that there is a severe over-requesting of imaging on patients that possibly don't need scans. After we do an assessment on them here we often wonder: "We could guess that they are normal, we do the scan and guess what: It's normal." That's the category of patients that we worry about and I think there is imaging for the sake of imaging and that is a real concern.

Why do you think that happens?

I think it's difficult to know because I don't have direct contact with the clinicians whether it's a laziness to not want to examine the patient. Maybe they have pressures to see a set of number of patients in the clinic at one time and therefore they don't have the time to assess the patient clinically as well. I really don't know what the answer is but there are a large number of requests that come through our door that we see and quite often we feel that, yes, legally under IRMER it's a justified examination. They have ticked

all the boxes, legally there is nothing stopping them from requesting that scan. But in real terms, does that patient really need that scan? I would say on a large number of cases the answer would be “no” to that.

14. According to the amount of requests that your department receives...

a) Is there any area that you may think that your department may need to increase the capacity?

Not really, no. We are managing our demand at the moment, yes. For the type of workload that we have we have a little bit more capacity, we have space so if all of the sudden we had 20-30 extra bone scans, we could potentially fit it in. If we had 10-15 cardiac scans we could fit it in but if we are talking about a different type of test it requires restructuring our actual work, how we work.

I think at the moment our current system is that the scans that we are doing, so the bone scans, parathyroid, DMSA, paediatrics, myocardial perfusion, all of those studies we can cope with. If there is an increase in anyone of those areas we could potentially cope with. If you introduced a completely different speciality, like SeHCAT or bowel imaging or gastric emptying or any of those studies I think we would struggle. And I only talk historically because when we first were asked to repatriate cardiac service we were told that we would get about 5-7 referrals per week. I did my business plan, worked out and found out that actually there is a capacity, we could do 5 a week. Within one year we are now doing 14 a week so now I have fallen for that track once. I know that if they tell me that it’s X amount of work per week, I know I have to make an allowance for at least 3 times then and if I can’t fit that in then there is no chance we could run the service because the service would not met the waiting time targets.

b) Or decrease the offer?

I would say no, in that aspect I wouldn’t say that there is anything that sorts falls into that category. However, what we could introduce that might be of use is probably SeHCAT imaging for irritable bowel syndrome.

c) If yes, which factors are against those changes?

Because I already have done a business plan and I checked to see what level of worker that is required and we just would not be able to fulfil that level away. We wouldn't have that capacity on the scanner. No chance. I think that the referrals would be quite high for that procedure and it's quite camera intensive that test.

For what we are doing currently and the areas that we are covering the camera seems to be sufficient in terms of what it can deliver. So that's why we are not looking at SeHCAT. Currently it would go down the line if these patients required SeHCAT they would be referred to another centre and cross charged (similar to the cardiac that used to be done).

15. Is the department budget covering all the expenses?

I would say yes, because I don't see the figures. If there was a problem with the figures it would have been pointed out to me so yes.

16. Do you feel the need to save/reduce expenses?

I think we are on budget, our department is on budget so I wouldn't say we need to reduce our budget, no. I would say that we are fairly even on year-to-year basis. My line manager would tell me if there was an overspend on our budget but year-on-year our department tends to save radiology. Nuclear medicine budget is linked with the whole of radiology's budget so that my line manager will look at the budget as a whole and there will be some areas within radiology that are overspend and there are some that are underspend. Nuclear medicine tends to be one of those that are underspend and it will subsidise one of the other areas within radiology, and again the main course of that is the saving year-on-year that we are making by doing the cardiacs here. So we are saving year-on-year probably about around £70-80.000 a year on doing the cardiacs here at (institution) rather than repatriating them all and sending them to the (another NHS institution).

He (divisional manager) is looking at the budget as a whole so maybe for example the interventional area tends to be a more expensive area because of the expenditure of the equipment they use, the catheters and things like that, and so he almost will use our savings to make up for the deficit in other areas.

17. Since you have been working at this Trust, have you put in practice any measure to decrease costs...

a) In staff?

Not in staff, no.

b) In equipment?

No.

c) In consumables?

Yes, we have. I didn't but one of the nurse team, she is a senior nurse and her main role is in intervention and she also deals with a lot of the stock ordering for the rest of the radiology so she makes suggestions to us about certain things whether it's gloves, latex gloves, different kinds of syringes, different kinds of cannulas, kinds of covers, all of these kinds of things she makes recommendations and says: "These ones are cheaper, can you try them? If you can try them we will order the cheaper ones."

We changed the kits supplier to decrease costs. We did the option of changing from (another NHS institution) to (another NHS institution).

We also order the vial and not individual doses. That's why we save our money.

18. Do you consider that the tariff for NM procedures corresponds to the reference costs and why?

I checked these tariffs about 5/6 years ago and then made my own ones for the department to tell my line manager what it actually costs to do the test. I did a comparison study between tariffs and the costs of the tests. I don't know if they changed now. When I looked at them 5 years ago I was a little bit surprised because I think there was a big fluctuation between certain tests and other tests for example parathyroid imaging I remember the tariff was particularly low and MIBI and pertechnetate together with a long scan deserved a much higher tariff. There was another investigation (I really can't remember what one) that I felt was overpriced, the tariff was higher compared to what the scan would cost to do. But I don´t know what the tariffs are in the last 4 years. I can ballpark tell you what it costs us to do every investigation here.

Have you ever considered decreasing the type of scans whose procedure cost overweighs the earnings?

We have never based what we do on comparing the tariff costs to what it costs to do. What we have done in our department is taken the type of workload that we are unable to carry out efficiently. So there are certain studies that are again very labour intensive in terms of scanning, for example octreotide scanning is quite a long scan which takes a long time to do and that would affect pretty much all of our workflow. Our department produces about 2.600 scans a year which is a lot for a one camera department. But the reason why we are able to perform that number of scans is that we effectively utilize each day to do a specific type of scan which means that we can work effectively because the camera is always busy and we are always putting a particular test on every half an hour. If we try to add more exotic type of scans like octreotide scanning and things like that we wouldn't be able to work as efficiently so we are working on the basis of trying to get as many scans done as efficiently as possible so it's never based on the tariff. It's based on what we can produce.

What we found actually if I give you an example: on a Monday we do a full cardiac list so effectively we are doing 16 cardiac patients in one day and we do that with only three vials of *Myoview.* So we are definitively saving money because we are only using three vials. Yes, we are working an extended day but the staff are paid for that extended day but even then to be able to do 16 MPS scans in one day has a fantastic value.

To give you another example: If we wanted to do one cardiac test on one patient on one day the tariff would be quite high because you obviously have to buy a vial of *Myoview*, and then you have to use all the resources to do that one patient. So I will need a nurse, an electrocardiography technician, a radiographer, the camera and the vial of *Myoview*. So you pay all those things for one scan, then I bet you will come very close to the tariff price. If not we might even be higher than the tariff price. However, if you do 16 patients in one day you only use three vials of *Myoview*, your cost overall has dropped dramatically because you are still paying for the nurse anyway, you are still paying for the radiographer anyway, you are now doing 16 patients divided by all of that costs. So

therefore the tariff is no longer an issue because you are able to easy target the tariff, the number of patients compensates the cost because the tariff is based per patient. So therefore, if I can do 9 patients on the same cost as I can do 5 patients then guess what: the overall saving to the department is better. So that's how we run our list, so on a Monday we would do cardiacs, on a Tuesday we would do some dynamic tests in the morning like *MAG3s*, thyroids but interspersed within that we do bone scan injections as well. So by 12am our 9am injection of the bone scan is ready to go on the table and we would be doing bone scanning all the way through in the afternoon. It's the most efficient use of the camera, the camera never stays quiet, neither do the radiographers and our entire isotope is efficiently used and none is really wasted.

19. **Have you ever done any analysis on the real cost of a specific exam against the cost paid for the exam?**

    (Answered previously).

20. **What strategies do you put in action to attract income?**

The only external work that we have is for the DVLA. We do private cardiac scans for the DVLA. Do you know the driving license agencies? So people that drive heavy goods vehicles as public vehicles, if they have a previous heart condition they will need a MPS. In order to get their license they would need a normal MPS as a part of their assessment. So we get referrals from the DVLA. We just sent the DVLA a letter so our lead clinician would have written the DVLA saying that we now offer this service. If there is any patient within our category area the DVLA can then refer them to us to do their scan. But that's probably the only one that we have actually gone out and written to a specific organization. There isn't any strategy to attract more income. We have a contract with the (private institution) that doesn't have a nuclear medicine department. That's a local private hospital to us, it has links with our consultant radiologists here and we get referrals from the (private institution) as well. We have a service level agreement with them at the moment as well. It is not being anything that has been advertised to them.

There are not many nuclear medicine departments around so personally I feel that it's a good opportunity to generate income but at the moment there isn´t a call for it. It's not something that I look at but it could be good way of us generating income.

I personally don't think that it's difficult to get income. In fact we are very lucky. It's one of the easier areas to get income because there are a lot of small private hospitals now. But I am not getting the ok and the go ahead and the ok to do it from my line manager and I am so busy. I have so many other things at the moment.

But we are not producing income. 95 % of our patients are from NHS. And as you know that a lot of the private hospitals that are around now they have a CT scanner, they will have even an MRI scanner, lots of the private hospitals but not many of them have a nuclear medicine department and I think that is a very good type of resource.

I don't have the means to contact them. But I think it's a massive untapped resource. I think it's a really good opportunity to get work, particularly there is no competition, we have no competition so the (name of 4 private hospitals), 3 of them have wards with inpatients. These are not little private institutions.

21. In which activities does the department receive higher income?

Cardiacs and also we do bone scans for the (2 private hospitals), we do them, particular as the orthopaedic consultants are also (institution) clinicians, so there are orthopaedic consultants here that have a session at the (2 private hospitals) and therefore because they don't have that imaging modality we get those referrals as well. So it's also to link in with the people that work there. We make money, we do make a profit out to it. It's not a full private tariff because I believe the private tariff for a MPS is about £600 and we charge £550 to do it but in actual the cost is significantly less than that for us to actually do it. But I would say the major resource of income for us is probably the DVLA work that we get.

22. In your opinion, what is the effect of non NHS income in NHS patients?

I don't think there is any effect. That money is sort of absorbed, probably by the budget because over the last five years the radiology department has had a CIP plan, all radiology department has a CIP, we have had to reduce some budget by 5 % every year so

we're finding any income or anything that is generated within the department tends to be swallowed up by the CIP, by the savings that the Trust is putting in the radiology department. So I don't think it really benefits the NHS patients in any way. I think it's just absorbed by what our budget is every year, which is reduced every year. The government is reducing the budget. We have to think of ways to generate income to try and supplement that saving. The private income does supplement it in a way that compensates the departmental budget.

23. **In your opinion, what implications does the bank/locum staff have on the budget?**

We have none. If we had it would send us over our budget. In our department we have set up a training programme for any band-5 radiographer within the radiology department to come through and have nuclear medicine training so we have our own internal training programme. That mitigates the need for bank or locum and that's one thing I am proud of: We have never had bank or locum as member of staff for the 9 years that I have been working here.

24. **What implications on the budget/management would your department have if it belonged/not belonged to an NHS FT?**

For nuclear medicine there hasn't been any change (the institution became a FT in the last 6 months).

25. **In your opinion, what advantages and disadvantages would your department have if it worked 7 days per week?**

No. Obviously that would allow for more capacity. But that's a really difficult question because the minute you start to look at 7 days working you are talking about Sundays, the staff pay changes on social hours (I think its double time that you are paying per staff member). Also you would have to pay additional fee to the radiopharmacy to supply on a Sunday. We did do Saturdays at one time and they charged us an additional and social hours fee for the supplier of radiopharmaceuticals so that's a really difficult thing, really difficult to answer because the cost for everything all around, all together to

provide that service on the Saturday and Sunday might be too great. It might not be beneficial cost wise.

I think it would be a nice option to have particularly for some patients that are working because they have an opportunity then to be seen on a Saturday so I think in terms of patients, yes potentially they could. We get around that right now by offering the cardiac appointments late. Obviously they would have to miss a bit of work on one of their sessions because we do the stressing in the morning but we offer a late session so they could finish work and come back and have their scan done.

I think the department would need to be bigger to offer that because to offer a weekend service I think you have to be able to offer it regularly. To be able to offer it regularly I think you would need a bigger team of staff to be able to rotate. We have three members of staff. We would be working nearly every Sunday. So I think there are a lot of things to consider if you are thinking about weekend working. Part of it is what is your workforce size, what capacity do you need, how much is it going to cost for all of your consumables, radioisotope, staff costs…There is so many things to consider if it's viable to do weekends. I think anyway, especially when we tested it by doing these Saturdays occasionally to catch up it's quite a high cost. If they increase the tariffs, then yes, of course there would be a call for it. Our department I couldn't see it happening because we are too small department, we have got too few call members of staff that would be able to connect to that level of work because it would need that I would be working at least every two Sundays in a month with this small team.

Part 4: Operational management related questions

Departmental level:

26. What are the advantages or disadvantages of having an own porter/central portering system?

We use the radiology porter and it is advantageous. Our portering system is that we have a porter call so there is three porters based in the centre of radiology and they will cover all transportations for all the patients in all of radiology. And yes, it works very well. I mean occasionally you are going to get one 10-15 minutes late. But we had central

portering system, we had the (company name) and we would call the porters and the biggest problem we found is that the pool of porters were so big that if a porter did not do their job for us it did take a very long time and we found there was nobody taking responsibility for it because the centralised area was so big and it was covering the whole hospital so that actually didn't work for us. It did take longer time because obviously that centre is controlling maybe 20-30 porters for the hospital. So this system [at the moment] is more efficient.

27. **Is your department involved in research studies with external institutions? (If not, what is the importance that you give to research?) (If yes, what are the implications in the budget and importance to the department?)**

No….we are doing one actually at (institution) for the BNMS, we are doing a DATscan study at the moment. But that's the only one we are doing. It's just a thing that we are doing additional to the scans. We are not involved in doing a separated study as such. What we are doing is: we are collecting our data that we have already got and sending our data out so we are not actually doing a study for anybody. It would be great to have research as a source to increase income. My previous job (I came from a research centre), so I worked in a cardiac research centre and that was one of our main sources of income which is really strange for me. To come from that to here and (this being a district general hospital) what I am finding is that the type of consultants that are working here are the ones that are not necessarily pushing the boundaries of the profession. They are more interested or concerned with the patient care as it is; you know they are not pushing their profession. The district general hospital is probably not the best environment for them. I mean maybe if we hired a different kind of lead consultant that was much more gear towards research and things like that then we might have gone down that way. But what we have is somebody that wants to be able to provide a safe and efficient service as we possibly can so that's where we are following.

Research would increase our budget but the type of department, the environment that we are….I don't know what it's like but if a department has never done research before I don't know how easy it is for them to jump onto that ladder because you do tend to find that departments that already do research tend to be approached for

more research as well because they have the reputation and it's almost a self-fulfilling thing, isn't it? The minute that you have done this research study you go off, you join in, you present, then your department's name is out there and therefore you are approached by other research companies, saying: "Would you like to do this, would you like to do that?" and obviously we are not in that, we have never had a reputation for that so it's a difficult position to go, to jump into.

28. **According to National Framework for Service Improvement in Radiology (NFSIR) there are two important methodologies for service improvement: ''lean'' thinking and process mapping. Is the patient pathway according to these practices?**

Yes we do processed mapped. So I think this was 2-3 years into the nuclear medicine cardiacs being repatriated here. We had a locum consultant who suggested at that time doing and thinking on processed mapping. So we process mapped our workflow, our entire workflow for cardiacs. He did process mapping before so he explained to us how process mapping works, he went with me through all of our steps. At that time before the process mapping, we checked what is involved in our steps from the moment the referral form lands in our department to the moment the report is released to the consultant. So we did a full process map of how long each stage takes and what we could do to try to minimise the time taken in those stages. Actually in the end once we did that (because it worked so well) we decided to process map everything so basely our entire nuclear medicine workflow.

29. **Do you have specific weekdays for determined exams and why do you have that structure?**

Mondays and Wednesdays it's cardiacs, Tuesdays it's a combination of paediatrics, endocrine and bones, Thursdays it's renal, endocrine and bone so it can be a combination of orthopaedic and cancer bones. It's advantageous, mainly due to the number of patients we are able to do by organizing the list. In that way we are able to maximize the use of our radioisotopes and also we are able to maximize the use of our camera and the staff operating the camera.

Patient level:

30. What measures are taken when patients do not attend?

The department policy is: One DNA, we will offer another appointment. Two DNA, we would call the patient and if they say "I'm sorry, I didn't get it" we agree an appointment over the phone. If there is no response or the patient fails a third time we send the referral back to the consultant.

31. What measures are done to decrease the rate of DNA?

That's not good. That's our biggest hole in our bucket, our DNA rate. What we should be doing and what we have been trying to do is to call the patients a few days prior to the scan, mainly the expensive ones, so MPS, endocrines, parathyroid imaging. The bone scans we don't think to call because we do such a large amount. Our aim is always to call all the patients but we just do not have the administrative staff to do that volume of calling so we then think "Ok, if we can't call everybody, let's call the ones that cost the most". We would like it to be done across the board for all of our patients. The calls are done by the clerical team, or it should be done by the clerical team because they are the ones that make the appointments, they are the ones that should ring. I have one clerical member of staff. The DNA does bother us. It slightly improved lately. I have actually been getting some of my team during the patients in the evening. I don't think it's fair to expect our clinical members of staff to be doing administrative duties. Personally that's my opinion. I think it should be a clerical role really.

Letters are send to all patients. We have been calling in particular the cardiac patients and the parathyroid patients prior to their appointments. I don't know if there is a national average of DNA or anything like that because we don't measure it against anyone else, we just measure ourselves with each of the other department. Six months ago our DNA was in the region of 12 %. I actually today just sat on the radiology meeting to give them our report for this month. This month it's 6.3 %. So it's getting better but it's sporadic. If I have one of my colleagues here who is very vigilant and never sits and is always doing something, if he is quiet he will ring the patients so guess what that month my DNA rate is down. If he is on holiday and I have another member of clinical staff who

does his clinical work and there is nothing wrong with that because he is doing his job, he is not going out of his way to do anything else, our DNA rate goes up.

Calling to the patients definitely works because we can identify the patients that we can't get hold of. At that point we don't order their dose, we don't do their test. We can leave a message to say: "We have booked a test for you, it's on this day. If you can ring us by 12am tomorrow then we can confirm your appointment, otherwise your appointment will be cancelled."

32. What measures are you taking to decrease the cancellation rate in inpatients due to human resources mistakes (e.g: wrong preparation, late transport)?

We don't have that situation, no. The connection works well. Typically it would require a clinician from the ward to come down and speak with us. They have to contact us. If they wouldn´t contact us then we would contact them because when we get the request form one of the key elements that they have to put in is their bleep number. They cannot make a request without given us their contact information. So once we have that we will contact them. I mean, really the system is very smooth and they contact us, they know they are not going to get the scan if it's not being discussed anyway.

I normally speak with the doctor and the patient preparation is pretty good. I think the main thing is because we no longer have paper request forms. In the old days when we had paper request forms you could have a doctor putting the patient's name, date of birth and what ward they were on and what they want to do and shave that on under your door. Then you have a request form for a ward where the patient is but you don't know which clinician they were under. So you are lost because we think: Is this a valid request? You haven't got anybody to discuss it with because when you ring the ward they say "I am sorry, I don't know who has written that request form". Now you are thinking "What do we do?" So you are in a bit of limbo there, where now there is somebody accountable, the person that has requested the form is contactable and we can discuss directly. In most cases now the requests are much more appropriate as well because they are accountable for it, they know they are not going to get away with a silly request. So I think that has had a positive impact and I think because of that the system does work better. Inpatient requesting for nuclear medicine does work better.

We don't do inpatient myocardial perfusion here for that reason because of the ward. They don't take on the recommendations that we send to them. So basely we would agree the scan with the consultant or the doctor there, we would send an information leaflet up to the ward to tell the patient: "No tea or coffee 24 hours before, no beta-blockers 48 hours..." things like that and yet they would coming down to us….. We had that problem, yes. But as a result of that our lead clinician had the discussion with the lead clinician for the wards and they decided that it wasn't something that was possible to do and it is only MPSs´ inpatients, we do not them. So we only do inpatients that don´t require preparation.

That is the reality of the situation. Our consultant had a very friendly discussion with the consultants concerned and we said that we have this problem, we are trying to get your patients' scan but they are never prepared and therefore we are now sending the patients back. This is a lost of slots now that we can no longer fit anybody in because the patients aren't prepared. How are we going to work around this? And the consultants from the ward said: "The reality is that the MPS isn't the most necessary investigation while this patient is on the ward." If we can recover the patient, discharge and then we can request the scan upon them being discharged so we can do this as an outpatient and we get referrals for these ward patients. They will have the ward that they were on the request but they always put: "This patient is going to be discharged on …. please book an urgent MPS." The system just wasn't working.

We tried a number of things but we just find out on the wards there is such a high turnover of staff that the information isn't relayed to any new member of staff, so you will find that maybe for 2-3 weeks there are patients starting to come down prepared and they are ok but then you give it a month, those nurses will have left, there is new nurses that have coming and guess what we are back to square one again. So it just wasn't working. It was very frustrating as well, because that patient would come down, they might be quite a difficult patient as well and we have prepared, we have done everything that we can, we get them into the stress room and guess what, they are not prepared. So they have hold up the entire list of everybody else, the outpatient list that is also booked for that day. One, we haven't done that patient and two, the other six patients that are

waiting behind him are all delayed as well so it just wasn't an efficient way of working for us. The patient numbers are so small that it was just not worth doing, it was better that we just said: "If you need to do an urgent inpatient MPS, which what we maybe do one every two months, if that send it to the (another NHS institution)." So the (another NHS institution) takes some of our work but a very, very small, awkward difficult proportion of work and we get the full value for money out of it.

33. **What time targets do you have for the time between the patient arrival and then being seen?**

We don't give them a time target, no. Partly because we have processed mapped our area and we know what is achievable and we know that if we book 8 cardiac stresses in the morning that is an achievable amount, the teamwork to when the patients are finished, we know you must get the patient in 35 minutes.

Cardiacs can be delayed, for example: you are going to do a treadmill exercise on the patient and then you find that they are not able to achieve their heart rate then you have to convert it to an adenosine and that will delay the list and that's a bit of natural delay.

But there are no time targets. Everybody knows their roles in the department and it works, it works really well. The way that the workflow is being done here, it works really well in terms of how we deal with each of the patients. We have one dedicated radiography assistant so they are not a radiographer. They deal with bringing the patients in, getting them changed, measuring their height and weight.

The only delay would be if we require repeat scanning, that might delay the patient but we are always keeping them informed, the team here has worked for many years and they all know their roles and we all keep the patients informed. We are doing external feedback as well from the patients (once a year we do 20-30 patients) and we always have really good feedback from the patients so I think it's becoming a bit more like everybody knows their roles, you know, so we don't have any delays as such apart from technically the scanning.

IT level:

34. What are the advantages/disadvantages of your IT system?

We still do have some paper and I don´t find advantageous a system fully computerised. I think up to a point the computer system is great, up to the point of the requisition, the request form is not lost, that being computerised advanced us and made us a lot more efficient but in terms of things like reporting it's still useful to be able to get clinical information. What we tend to find is that for MPS, you don't always get all the clinical information from just a simple request because there are things to consider like risk factors, previous cardiac history, whether they had any previous intervention, bypass surgery, whether they are asthmatic so those sort of things we have designed our own questionnaire. So when the patient first comes in the radiography assistant will measure their height and weight, get them changed, they are going to the injection room and she will go through this questionnaire with them on paper. So when the consultant comes to report, yes it's all on the computer screen but he will have the request form and this questionnaire so when he comes to reporting it's all there sequentially so when they are reading or when they are writing the report they can say "this patient was referred for…because of clinical indications….."

In terms of reporting, for MPS the processing can only be done using a specific processing package available only in scanning room´s computer. But all the other imaging you can access anywhere.

We use PACS. VR saves time and I wouldn´t prefer to transcribe.

35. Does the NMD website have updated information for referrers/patients?

Not the department, no. I don´t know why. The information to the patients is reviewed annually but the only information that is available is what we send out in the appointment letter. So there isn't any freely available information. If there was somebody just interested in nuclear medicine at (institution), let's say, or what do we do, there isn't any information available regards to that.

36. Does the NMD website contain the prices for private services?

No. I think on the website there might be a telephone number for our reception if there is a request for private scans. But we don't publish that. The reason why is that

the hospital's private work is delivered via the private health company. A long time ago (institution) had its own private wing. Now a private company has taken over that private wing. If you look at (private health company's) website then yes, it will probably have a price for what it would cost to have the scans here privately. But we are not privy to that. We work for (private health company), so (private health company) will send us the patient, we will do the scan and the (private health company) would pay radiology whatever it is. But there is a private contract that is being agreed which we are not previewed to that. It's a contract that is being agreed throughout the whole hospital with the (private health company) so we don't know what the income is for that or whatever….We don't know the prices, nothing.

I don't even know how that agreement was made but it was made without our permission if you like. It was a decision that was made way above mine or even my line manager's, the radiology manager's head. We are now doing scans for (private health company). When the request comes you do it and they will put the money into the hospital Trust's funds so I think (personal name) might allocate a fee for it or they get some fee for it but it's not like a private patient's fee. You get significantly less for it than what you would do if it was a proper private patient. They push the prices down. They charge for an MPS, I think it's £1300 . I think the hospital receives 550 and I don't even know what that was agreed or how it was agreed or anything. Well, if we get our private work from an external source it's fine because we can charge them. Private patients go through (private health company) so anybody that comes to (institution) as a private patient they will be caught by (private health company) and they will be looked after in the (private health company) wing and any patients that are requested for tests via (private health company), the (private health company) will pay radiology and (private health company) will charge the patient their fee. But I know, it's just ludicrous.

Final Questions:

37. **What are your future steps to improve the budget/operational management for the department?**

Our biggest cost saving we are thinking for the next 2-3 years it's going to be skills mix. For satisfaction of the staff working here, it gives them more professional opportunity but that's the first reason. The second reason is the cost of a senior consultant would be far higher than the cost for me to do the reporting because I could do the reporting for a far cheaper amount than a consultant radiologist could do so that would be a significant saving within nuclear medicine when I take on more reporting duties. We have two senior consultants that are probably going to be retiring within the next 2-3 years and I think the tariff is £16.000 p.a. approximately. I am not going to cost that. I might cost a little bit more but not £16.000. That is the next biggest thing that we are going to save money on.

We have looked at lots of different things in the department, on how we can become efficient and to be honest we now are at the stage we are really not looking at making significant debts in our budget with the ideas that we have had. We could look again at our expenditure, on our consumables but how much money are we really going to save per year? Probably not a significant amount. The real area if you look at any hospital's budget or any department's budget, 80 % is on salary, 20 % is on what you use, so really why are we hammering the 20 % over and over again when actually the real pays we need to be looking at (where the saving is), it is the 80 % of the costs…that's really where we are going to start saving money now and the only way, realistically. So basically again if we break that 80 % out and you look at radiology, I think it's something like 70 % of the wage is spent on only 15 % of the staff, the consultants. So consultant radiologists take approximately 60-70 % of the entire radiology budget and they only account for 10 % of the staff. It doesn't take a rocket scientist to work out where we are going to save the money.

There is a particular area that we are very interested in. We have been getting a business case for a new gamma camera which has the ability to do SPECT-CT on and I think sports injuries would be a good way of tapping into that resource. I think there is a lot of called for that particular area and the BNMS even said is that fusion imaging is a growing area.

38. Do you have any questions or comments? No.

Interview no. 3

Duration: 0h47min

Date/Time: 19/06/2015 at 10:30

Part 1- Department Characterization

1. **What divisional group does your department belong to?** Critical Care Theatres Diagnostics.
2. **Which scans are the most common?** The most common scan is DEXA scans. Half of our patients are doing DEXA patients. In nuclear medicine it would probably be bone scan.
3. **How many:**

a) **Gamma-Cameras-** 2 (1 SPECT-CT) **b) PET/CT-** 1 **c) DEXA-** 1

d) **Injection Rooms-** 2 **e) Consultants-** 3

f) **Technologists/Radiographers (Band5-** 2**) (Band6-** 3**) (Band7-** 3**) (Band8b-** 1**)**

g) **Nurses-** 2

4. **What is the mean number of patients per day?** 6 PET/CT; 18 NM and 13 DEXA.
5. **Opening time:** 9am-5pm.

Part 2- Interviewee Characterization

6. **Job title:** Service manager.
7. **Qualifications:** BSc Physics; Post-graduation in Medical Physics and MSc Nuclear Medicine.
8. **How long have you been working as (job title) in this organization?** Since February 2014.
9. **How long have you been working as (job title)?** Since February 2014.
10. **What do you consider to be the most important tasks of a (job title)?**

Leadership, compliance with waiting targets, and representation of the department within the larger Trust.

11. **What do you consider to be the most demanding tasks that you carry out and why?**

Managing people because people are unpredictable.

Part 3- Financial related questions

12. **In your opinion, what has PbR introduced compared with the previous financial model in terms of patient and financial outcomes?**

I have very little knowledge of PbR so I don't know if there has been much of a difference.

13. **In the context of Radiology, is the PbR system improving or worsening the patients' outcome?**

I don't think it would have changed the patients' experience. I don't think the financial model has impact on the patients' experience. It may have an impact on the finances of a large teaching hospital but that doesn't necessarily mean that it affects the patients' experience. There is no reason why it should affect the patients' experience, all other things being equal. The quality is not affected by the financial model.

In your opinion, did the scan number increase with the implementation of PbR?

I don't think it has affected many nuclear medicine departments because nuclear medicine departments tend to be very small units within larger radiology departments. We are different to that model, we are separated from radiology. I don't think Paying by Results has changed the work we do or the numbers of different types of scans we do.

The number of scans didn´t increase because ultimately whether we do a scan or not, is determined by the ARSAC holder and the ARSAC holder has to abide by the clinical indications approved by college of radiologists' guidelines. We cannot just lower the threshold because for instance doing a PET scan without it being…without consultants getting into trouble because they know that they shouldn't just be doing a PET scan on a young patient who complains of lower back pain. There are strict guidelines, what indications are required to do certain examinations.

14. **According to the amount of requests that your department receives...**

a) **Is there any area that you may think that your department may need to increase the capacity?**

Yes, we need to increase our SPECT-CT capacity.

b) Or decrease the offer?

No, not really. There is nothing that we are losing money on. Well, we don't get paid for our PET scans so we do lose money on that aspect. Most of our scans are commissioned by the local commissioning team so the NHS London would commission us certain number of scans. They have decided, just last week, that they are not going to commission us for PET-CT which means that all the PET-CTs (we were hoping that we were going to be commissioned but they said no this year, they may change their decision next year) we carry out on patients from the local area we don't get paid for that work. The financial analysis shows that if those patients who needed a PET-CT were instead referred to (another NHS institution) which is the nearest other PET centre it would still being more expensive than if we do the PET patients ourselves and don't get reimbursed for it. So doing PET here without being paid for it is the least worst option basically.

c) If yes, which factors are against those changes?

Because we can't get a new scanner. We can't afford it. There's no money to buy a new equipment.

15. Is the department budget covering all the expenses?

Yes, pay and non pay, most of the non pay is radiopharmaceuticals.

16. Do you feel the need to save/reduce expenses?

Yes. The Trust has set a CIP target. A CIP is a cost improvement programme. CIP target at 8 % over the next financial year which means the Trust has to save something like 50 million or something. Each department has been asked to come up with ideas for CIP within its own department. So for instance one of our CIPs was changing our radiopharmaceutical provider to a cheaper one. Another one was getting the PET-CT commissioned which obviously hasn't happened so that CIP has not happened. Another one is repatriating Gallium PET-CT patients who currently get referred for their scan to go to (another NHS institution). We want to do Gallium here, we need to get Gallium doses from (another NHS institution) but we can do it cheaper here than sending patients to go to (another NHS institution). Reducing the price of the maintenance contracts for the PET scanner and extending the PET-CT scanner lease from 7 to 10 years at a reduced annual

cost. So these all CIP measurements, which have saved us a few thousand pounds here and there, they all add up.

17. Since you have been working at this Trust, have you put in practice any measure to decrease costs...

a) In staff?

I have replaced locum staff with permanent staff.

b) In equipment?

So the maintenance service contract we've negotiated a lower price for that and also we have extended the actual scanner lease, because we don't own the scanner, we leased it from General Electric. The original lease period was I think 7 years and we extended that to 10 years but instead of the annual lease price being, I don't know…whatever…£50.000, we reduce it to £40.000 but extended it from 7 to 10 years. So we are paying more over the long term but less every year.

c) In consumables?

We changed from (another NHS institution) to (another NHS institution) and they are cheaper. We scheduled to save about £40.000 over the course of a year by switching the provider.

18. Do you consider that the tariff for NM procedures corresponds to the reference costs and why?

No, because tariffs don't take into account differences in radiopharmaceutical price. So things like brain perfusion SPECT which isn't a SPECT-CT so it's not a SPECT-CT tariff but the HMPAO is very expensive.

But only specific ones have tariffs that do not correspond to the cost spend. So the ones that are profitable are things like bone scans because a bone scan dose costs £15 or something, it's very little. So you have got your kind of very basic non-imaging test, then you've got things like whole body planar, dynamic imaging, then you've got SPECT, then you've got SPECT-CT, then you've got PET-CT. So if you are doing an expensive like a *HIDA* for instance which doesn't necessarily has SPECT-CT, the *HIDA* costs about £500 a

dose, and DATscans, they cost about £500 but they are not SPECT-CT so they are not a SPECT-CT tariff, they are being a SPECT tariff.

Have you ever considered decreasing the type of scans whose procedure cost overweighs the earnings?

Not at the moment, no. We've been told to carry on our PET scanning. If the finances get even worse than they are at the moment then someone may tell us: "Stop scanning because it's too costly for the Trust." But that has an impact on patient care and the Trust board has quality of patient care as their top priority and finances comes second after the patient care.

19. **Have you ever done any analysis on the real cost of a specific exam against the cost paid for the exam?**

Not me personally but there are cost accountants in the Trust who analyse how much it costs the department to do a specific exam. They have set the recharge model for nuclear medicine cost charging to other departments so if endocrine department refers a patient for an MIBG to us we don't know how much we should charge endocrine for doing that. The cost accountants will do that because they will say: "Ok, this is how much camera time it takes, this is how much staff time it takes, this is how much the staff are paid so therefore half an hour of a radiologists time is £X, consumables is £X, overheads for the department like electricity, lightening, heating for half an hour is £X, divided by the number of tests per year..." so they come out with a figure at the end which is called our SLR which stands up for service line reporting but that's how much the nuclear medicine department charges another department within the hospital for carrying out something. We don't set those, the cost accountants set those.

20. **What strategies do you put in action to attract income?**

So we tried to charge private patients, increase our private patient income by encouraging more private patient referrals, that's our main resource of income.

We have a communication with clinical trials office to encourage more clinical trials to come through our door, especially DEXA, we're doing a lot of DEXA clinical trials.

We also have links with the private patients office, we have sent out brochures to potential PET referrers within London and Southeast England, we have put photographs in magazines within the hospital to advertise the PET service but I am not an advertiser. It's not had much of an effect, I don't think. Any additional referrals that we've received as a result of advertising is difficult to quantify. Our private patient income is definitely gone up significantly, not exclusively in PET though, across the whole board. However, we have no kind of control over how many private referrals we get, they send to us from (private inpatient) wing. It might be that referrers are more aware of the scans that we provide as a result of more visible representation in the Trust, from me and from the consultants. So by consultants attending MDT meetings and discussing patient cases, referrers are more aware of the potential of the nuclear medicine examinations so they are more likely to refer to us. But the Trust also has a strategy to increase it, the private patient work anyway as a mean to get out of its financial difficulties.

21. In which activities does the department receive higher income?

PET private patients and PET patients from other Trusts and therapies as well. So we have two sources of income: private patients and provider-to-provider income. So provider-to-provider income is when another Trust refers a patient to us and then we invoice that other Trust for the work that we've done so that's not from the local commissioners. That's from another Trust. Therapies, we can charge a lot of money for, for a provider-to-provider it's something like 15.000, for private patients we can charge about 25.000 for a therapy. So private therapies are very lucrative for us. But essentially anything that isn't the local commissioners or local patients is lucrative for us as a department.

22. In your opinion, what is the effect of non NHS income in NHS patients?

The effect is that we've got more money to spend on the department. Private patient income has allowed us to add additional staff. We couldn't survive without our private patient income. If we didn't have private patient income we wouldn't be able to have the number of staff that we have.

23. **In your opinion, what implications does the bank/locum staff have on the budget?**

It doesn't have any implication on the budget but we are under pressure to not use bank staff or locum staff or minimise their use because they are expensive. For us, for a small nuclear medicine department, we can't justify using lots of locum staff. We used to have 3 locum staff at the same time; we don't have any at the moment. We have a budget set whether we pay for locum staff or not doesn't affect the money that we are given, it's not like we have a pot of money and we take a little bit of money out to give to. Because locum staff are more expensive than permanent staff it does affect our pay, yes, but we have a fixed budget and if we go over that budget with the amount of salaries that we pay it doesn't affect what our budget is supposed to be. It just means that we failed to keep within our budget and therefore we would be told off. But the budget is just what we are paying to spend. Whether you go for that or not is sign of whether you are performing or not. That wouldn't change how much your budget is, the budget is basically your target to spend.

Did you overspend when you were using locum staff?

No, it didn't because we also had other posts which were vacant and weren't filled, so it´s a balance.

24. **What implications on the budget/management would your department have if it belonged/not belonged to an NHS FT?**

I think if we weren't a FT we wouldn't have so much control over our own budget and how we spend money as a Trust but the flip side of that is that most Foundation Trusts now are in financial difficulties whereas if you are not a Foundation Trust you are less likely to be in financial difficulties. That's what I think anyway.

25. **In your opinion, what advantages and disadvantages would your department have if it worked 7 days per week?**

No. Nuclear medicine procedures are not acute examinations apart from V/Q perhaps. There's no need to have nuclear medicine 7 days per week. It wouldn´t increase the income. There is not enough demand for us to be a 7 day department. The reason

why we have been doing DEXAs on a Saturday is to bring the waiting times down. You could say it's because of capacity but principally because we need to bring some of the waiting times down. We pay overtime as time plus a half but it's only like 3 hours for a tech and admin staff. We get fined if patients breach over six weeks so I think probably we are saving money by avoiding patients breaching six weeks wait by just opening up on a Saturday morning. But I haven't got figures to prove that, I just think that we are saving…

Part 4: Operational management related questions

Departmental level:

26. **What are the advantages or disadvantages of having an own porter/central portering system?**

Well, (person) isn't really a porter, he is a radiography helper but he spends most of his time porting so yes it is advantageous to have our own because we know that he understands nuclear medicine procedures and the importance of getting patients down at specific times and if we would share him with the rest of radiology he would probably spend more time fetching patients for play X-ray.

27. **Is your department involved in research studies with external institutions? (If not, what is the importance that you give to research?) (If yes, what are the implications in the budget and importance to the department?)**

Yes. It's important as a source of income and for the general standing of the department as a nuclear medicine department in a teaching hospital to be involved in research, in clinical trials.

28. **According to National Framework for Service Improvement in Radiology (NFSIR) there are two important methodologies for service improvement: ''lean'' thinking and process mapping. Is the patient pathway according to these practices?**

I don't know. Probably. Lean thinking is developed by Toyota in Japan. When they build cars they just introduced a lean so every single part of the process was reduced

minuscule amounts which at the end created the big result. We are not consciously applying.

29. Do you have specific weekdays for determined exams and why do you have that structure?

Some of them, yes. So for instance we tried to do cardiacs on Fridays, stressing cardiacs, we tried to do DATScans on Thursdays. It has got good implications, it has beneficial implications for staff because it means that they can do sequential types of scans, so you know…changing collimators….

Why not organizing all scans in each day?

Because it's a very inefficient way of using your scan slots, you end up with separated waiting lists next to each other, so if you say we only do HIDA scans on Wednesdays then you've got no flexibility if your HIDA referral rate goes up, basically your HIDA waiting list will go up and up and up while your bone scan waiting list would stay down here.

Patient level:

30. What measures are taken when patients do not attend?

Referrers are informed. Patients aren't given an additional appointment so if a patient does not attend they're not automatically given another appointment. The referrer is informed that the patient has not attended and it's up to them to re-request it unless the patient contacts us.

31. What measures are done to decrease the rate of DNA?

So letters are sent out when the appointment is made. Certain patients are called as well, so PET patients are called by the reception, DEXA patients receive text reminders.

Why not sending text reminders to everyone?

Nuclear medicine exams have two separated appointment times, like for instance: if you've got bone scans, you've got a 9 o'clock injection time, a 12 o'clock scan time on CRIS because we use the injection codes. The text reminder system which is a

hospital wide system sometimes misses one or the other so the patient might have been receiving a text saying "please come to nuclear medicine department at 12 o'clock"…it's an IT problem.

32. What measures are you taking to decrease the cancellation rate in inpatients due to human resources mistakes (e.g: wrong preparation, late transport)?

Liaising with ward staff, you know things like PET-CT patients not being fasted, so we liaise with the ward staff to ensure the patient preparation.

They are becoming more aware of patient preparation on the wards but ward staff changes periodically, so some new nurses may not be aware that PET scan patients have to be fasted or indeed that PET scan patients would be in the department for 2 hours rather than a CT scan which takes a few minutes. It's a teaching kind of issue.

33. What time targets do you have for the time between the patient arrival and then being seen?

15 min.

IT level:

34. What are the advantages/disadvantages of your IT system?

The disadvantage is that if the RIS or PACS system fails for some reason then you can't do anything. The solution is manually registering patients or not registering patients but continuing the work and then registering them afterwards, retrospectively. But if PACS goes down you can't do anything. You can't report. It's just a fact of life. If our PACS system doesn't work then no scans can be reported.

So the patients will attend with their appointment letter…if CRIS is not working and you can't even see your appointment list then we have no idea who is due to arrive because we don't write down. We don't have like written records of appointments. We don't have a notebook saying: "You are due to have a bone scan at 9 o'clock." It's all on CRIS.

The advantages are that you are not using paper, you are not having so many mistakes and you are not relying on human error or writing down things, deleting things,

putting a cross. Everyone uses RIS systems now in the UK, no one uses paper diary. I don't think.

35. Does the NMD website have updated information for referrers/patients?

Yes, a little bit, not much actually but we are in the process of revising our website.

36. Does the NMD website contain the prices for private services?

No. Prices are provided when the patients contact (private wing). For commercial sensitivity we don't advertise our prices.

Final Questions:

37. What are your future steps to improve the budget/operational management for the department?

We need to save more money or we need to generate more income. So our CIP is to increase our private patient income but also reduce unnecessary expenditure and improve efficiency. We are in the process of trying to get more PET-CT private patient referrals from (institution) consultants who currently send them to (private institution), so diverting private PETs away from (private institution) to come to (institution).

38. Do you have any questions or comments?

Some of the questions are very much open to interpretation, so one person might understand the meaning of a question differently to another person. I don´t know what your other responders answered.

Interview no. 4

Duration: 1h05min

Date: 23/06/2015 at 16:10

Part 1- Department Characterization

1. **What divisional group does your department belong to?** Clinical Imaging and Medical Physics.
2. **Which scans are the most common?** Bone SPECT.
3. **How many:**

a) Gamma-Cameras- 4 (2 are SPECT/CT) **b) PET/CT-** 0 **c) DEXA-** 1

d) Injection Rooms- 3 **e) Consultants-** 6 (3 are Part-time)

f) Technologists/Radiographers (Band5- 3**) (Band6-** 11**) (Band7-** 4**) (Band 8a-** 2**)**

g) Nurses- 4

4. **What is the mean number of patients per day?** (Unknown information)
5. **Opening time:** 8.30am-6pm

Part 2- Interviewee Characterization

6. **Job title:** Acting Joint chief technologist
7. **Qualifications:** Post-graduation in Nuclear Medicine, some courses in management and leadership.
8. **How long have you been working as (job title) in this organization?** Since 2011.
9. **How long have you been working as (job title)?** Since 2011.
10. **What do you consider to be the most important tasks of a (job title)?**

Ensuring that the patients are well cared for and the main focus of the attention of all of the staff and working that we keep organised about financially and practically so that that happens.

11. **What do you consider to be the most demanding tasks that you carry out and why?**

The most demanding task would be any time you've got to go to discipline rule with people (Human Resources tasks) because of the amount of time that takes up. That's not consent but then when you do have to do that it does take up a large part of your time, preparing management cases. It's not as rare as I'd like it to be.
But at the moment if you asked me what's the most demanding thing it would be preparing and keeping all the documentation up to an appropriate level for outside inspection and inside use.

Part 3- Financial related questions

12. **In your opinion, what has PbR introduced compared with the previous financial model in terms of patient and financial outcomes?**

We haven't changed the way we approach patients because as I said we've always got to be patient focused irrespective of whatever the background is. They've got to be sorted out first and foremost and obviously then the money retrieved from there, from the original referrers but it's not changed the way we work. It depends on the focus. The focus that we had before was never to have large amounts of open time with nothing in. So we would always try to fill those spaces with patients and that's what we do, we try and fill them up. Some things have changed for us for example with our cancer patients. The expectation is that we will have a full turnaround within 7 days which is 5 working days before in the departmental level when somebody is on a nominated cancer pathway. We would expect to do those to have them booked, preferably scanned, within 2 days and then the report within one day afterwards. That's one of our fastest turnaround, our expectation of somebody who is on a cancer pathway has the scan booked and turned around within essentially 3-4 days. It's our motivator for that as supposed to the payment site. That's more what I was getting on.

13. **In the context of Radiology, is the PbR system improving or worsening the patients' outcome?**

The outcome….I can't answer it. I'd like to be able to answer but I can't. I would be guessing if I said: Yes, it's improving…I think it is for time rise and being seen we do a

bit quicker. That's where we are, however, beyond us I can't answer that. I think it's a question of getting across all grades. I wouldn't say shift and focus but just the overall focus people have got, so inpatients we will always try and get on within 24 hours, cancer pathway patients as I've said a few times we will try and book preferably scan within 2 days. It's that speed of turn around that we are trying to reach.

Do you think that the quality is the same by speeding up the process?

Yes. It should be but then you've also got the break, actually, that when somebody is on the camera it means somebody else is waiting. You can't book two people at once, that's an inevitable thing. We look as booking as a 6,5 effect of our hours out of 8 and that is factoring lunches, changes, break downs, whatever happens. Obviously we go over that but that would be what we are go for. I think the expectation is that we have 80 % utilization of our machine. Any issue with the patient, any problems with the machine will certainly have an effect backwards and if you've got more patients then that's exacerbated. So 80 % is a reasonable figure to try and guess when it comes to overall utilization of a machine per day and that's what we are going for.

Do you think that the quality provided to the patient has changed?

That's something I would be guessing. I don't think so. I would still insist on absolute quality for everything that we do and not taking shortcuts. A patient takes as long to scan as they take to scan. We have not introduced shortcuts (with like all your things when you practice), you are always going to review your practice, you've got to order your practice and the question is: "Do we need this? Do we still need this? Are we doing the right thing? That is something that we've been doing for years but should we still be doing that?" The conditions that let various practices and protocols may well have changed. "Do we still need all of those things?" One example would be that protocols would have hang on from using different isotopes. We get indium rarely. We only use technetium HMPAO when we do white cell scans. "So are all of the criteria for booking those scans and looking at those scans the same as when we used Indium? Do we use them in the right way?" It's just something to think about all the time. You just constantly review your practice.

In your opinion, did the scan number increase with the implementation of PbR?

Our numbers have actually gone up a little bit of the last few years. Traditionally this is one of the problems when nuclear medicine as a modality nationally was that your numbers were not as necessarily dropping down but just staying quite flat, not getting more not getting less. Certainly over the past year to two we have noticed that our number of patients have gone up. In certain things there is a different focus in the department, it depends how it's been led, for example we are doing a lot of more radium therapies and therapy work than we would have done three years ago but then that's also driven by the main interest of the consultant in charge, which itself has changed. It's not the financial model. It's obviously a benefit that you can recoup somewhere like from the therapies more easy than you can generate with bone scan, but that's not the driving factor, it's actually serve those patients. If you are asking me of my experience it's not the financial side that drives that, it's the practice side that has driven us. The things that have changed up, I would say, it's consistently trying to get higher numbers through because of the various targets that the Trust has said to do, particular types of patients. For example, I said those on the cancer pathway or which also takes in the speed that we have got to treat most cancer patients out. It would have been normally up to 2 weeks a couple of years ago but we are trying to turn it around in 2 days for a standard bone scan.

And in a financial way?

If you are talking on the ground, no. That's certainly not something that has been asked up me.

14. According to the amount of requests that your department receives...

a) Is there any area that you may think that your department may need to increase the capacity?

The issues would be the longer scans, you can always fit in a thyroid, a GFR isn't a huge issue to fit in a scan because it's running parallel to the actual scanning time as long as you have someone to inject and take the bloods, that's not an issue. An example would be that we have increased the amount of sentinel nodes studies that we are doing, both breast and melanoma patients. That in average takes about one hour and half and if the referrers have forgotten for whatever reason and they would like to do within a week,

because we are dragging on other patients, we are trying to do them quicker. That fills up the available space we have got faster which means that it's harder to find a niche for patients whose scans take that long.

b) Or decrease the offer?

I think that like everything else we should be reviewing actually what we charge as supposed to decreasing other areas. There're some things to drop off but then if they are technetium based is not really an issue - they are just freeze dried kits, that will keep, if you don't have many around.

c) If yes, which factors are against those changes?

You have also got to think in the effect of the capacity so that would be the element of staff, needless to say it's a niche business that we are in and with this issues about recruiting (at the moment we have got a third of the staff as locums). But that also means that actually we've got financial mandate that locum staff cannot overtime. That actually inhibits our capacity in that aspect...

I would like to have more permanent staff. More permanent staff to be slightly more flexible within the hours that we currently have. But then if for example times of technetium shortages when you want to maximise the usage of the technetium, it's ok, we'll start earlier and finish later but actually: "Do we have the flexibility to do those things?" Especially since you've got a cohort of staff that you can't keep on for any longer pay or on the time that they were overtime. At the moment because of looking at recruitment there's been a whole raft of issues in change. There was a technologist review in 2011 which supported certain number of staff but it's funny that we do get a reasonable turnover. We have a lot of people who've only planned to be in England for a short amount of time that means 2 years, maybe 3. So you've always got that turnover. In the past I think nuclear medicine departments and radiology in particular were spoiled by people staying for a long time, I mean I am an example but I've got one technologist that has been here since 1984. I've been here since 1996 but we're also very much like the exception rather than the rule. There was a time when we were the rule rather than the exception. Another issue I would say would be the way local training has changed.

Courses have shut down that used to exist, other courses that exist are further away. There is people that come with different backgrounds that want to become technologists. But then that's seen as a middle range sort of course in the sense that it's not projected for a really long term unless they change their minds. That was only percept to be a staff gap course for a couple of years in between and having something for longer but there were issues about the course closing down which used to allow us to….people could train that way, also you got radiographers who would go through for an extra year there. So there's been changes in the way training has happened in the country over the last 5-10 years.

15. Is the department budget covering all the expenses?

It probably is but it's like everybody else. It's whether the flow cash can be rightly recouped. Then we go back to HRG coding and its adequacy.

16. Do you feel the need to save/reduce expenses?

Always. Do I think we should feel the need? Preferably not but we are always looking because that's a financial demand that the Trust can actually give us. One of the things would be to make sure that we ideally have no locums. That's obviously one of the biggest aim and then if we do have locums we need to make sure that they are working appropriately, so if somebody is a band 7 locum they are not just an extended band 6 or worse, an extended band 5, they need to work at the appropriate level. But likewise the people are paid appropriately for the level that they work and I'm talking about the locum staff. You can always look at what you've got and see how you can organise it better. There're financial targets, the Trust has got something called "fit for the future" where it looks at ways of which the actual running cost can be reduced. You have always got your CIPs.

17. Since you have been working at this Trust, have you put in practice any measure to decrease costs...

a) In staff?

In staff I haven't.

b) In equipment?

No (the number of cameras was reduced because they needed to be replaced)

c) In consumables?

For consumables we do our best to shop around within the system that we have got which is a smart order system which looks like the NHS staff guidance and we try to pick from those but a lot of the charges are decided, some things are handed down. An obvious example: we used to use an old-fashioned non sealed cannula that used to cost 99p. Then we went on to a safety cannula which was also ported and initially was £2.99. That's a 3-fold increase in the price of the cannula but because of bulk ordering that cannula price is now down to £2.50 which is still more but then it's up against the fact that you don't have to buy as many peripherals like three-way taps and also there is the safety aspect of it. That's an example of how something has paid off in other ways but maybe not financially. An example would be that there would be deals from outside. An example would be the Trust: we don't have pumped water into the department in the sense that for drinking we have to have bottled water. That's a cost that didn't exist before. But then there would be other things, there's a long drive to try and get the department more paperless. Personally I don't think any NHS department will go paperless but paper-light would be perhaps something where it will always get printed, people would always say that more paper is generated since e-mail came in because people print off the e-mail, that hasn't resolved the problem. An example would be our printer which you would think: "Ok, keep your printer, don't get a new printer." But the newer printers they cost less, they use up less consumables so you'd obviously go for those and hope that actually the initial lump of cost, once its finished it will start paying for themselves. So we will look into what we use, we will look at all the equipment all the time. At the moment everything upstairs has got a price on it just to try to jog people memories of what they do before attempting to throw things away. It's a secondary benefit from the fact that we've got somebody from stores, actually we've moved from getting a store's person to come down so we work on a just-in-time rather than just-in-case basis because obviously in just-in-case you have different people ordering, you'll build up stock, you might not use it as efficiently but that I mean that might use stuff that it's going to pass the sell by. You're more risk of throwing stuff out that just never got

used because it got put in the back of the cabinet. To have this just-in-time scenario everything is barcoded so that the store's person will come along. They are barcoded and they've got a price on it so everybody knows what the prices are. Another way to look at that would be to look at the omnicell´s so that you've got something that people have got to…. The vending machine type scenario but then there are a lot of those issues and the pathways that was completely dependent on the people who are putting stuff in and the fact that they'd swipe stuff out appropriately. If they didn't do then the system fell down and then you had shortages. At the end of it it's something that we brought up in the technologists' meeting as well: "Actually that's where you find them, please look at those and consider when you are doing it."

If you went upstairs they've certainly been told off about it but as people say: "Culture is what happens when you're not there." It's certainly something that we've got to reinforce. I mean it happens with the waiting times, the fact that inpatients must be seen within 24 h, I keep repeating and the fact that I look at the figures from the speed that we see the patients and I normally give a feedback about it. Likewise when it comes to cost I do the same but that is more recent so I don't know the long term effects of that, yet.

18. Do you consider that the tariff for NM procedures corresponds to the reference costs and why?

The short answer is no. It's certainly better than it was because they've increased the tariffs recently, we're undergoing a change. There are two different ways. Some places build the cost from the bottom up which is: "How much does the syringe cost? How much does a needle cost? How much is the tape you have?" So you build up your cost that way. Other ones, depending on where you go...that's the way I think we're going. The way it was, was that you have a financial amount of money for buying things in the department. Proportionally, decide how much that you want to get from consumables and for each scan how much money you are going to get. But that's driven from the top down. May sound strange but they actually correspond reasonably well. Whether they corresponded exactly as well as we wanted them to correspond, that's another question entirely. So that's always been the issue about recouping all of the cost

to make sure it's adequately done. The work is consistently being done with that. I would say in the past we haven't, I think we're better out it now. Could we be better? Yes, we could.

The cost corresponds to the money that we receive at the moment but I think that we perhaps need to review more regularly to make sure that we keep up with the costs. It corresponds the money we should receive for each of those scans. One of the issues with nuclear medicine which is something that I do have to take to the bottom of more readily is simply the way we've represented on CRIS, that's one of my bugbears that the work that we do to make sure that it's adequately represented. The complexity of what we do I think is difficult for people who are in a radiological world to comprehend because as I mentioned earlier is the fact that we're looking at different scans in different rooms. An example would be bone scans. Somebody who goes into the injection room, they take up time in the injection room and the technologist's time, they may be injected there or they may be injected on a camera for a two phase scan, they would come back later in the day, they might necessarily be on that machine and then subsequently then they would go to the SPECT/CT machine. So you've got that complexity thing. Is all the technologist's time being adequately taken? Is it all being represented on the diary? Are we working as efficiently as we can? That's hard to capture when people think in terms of CT, half an hour, half an hour or 20 min, 20 min. Nothing is that much longer, nothing is that much different, you don't move it around. So we have a complexity which I think can be sometimes hard to capture. I don't think CRIS captures the work that is done as well as it ought to. That's not necessarily where there is a short fall but I think we could do better to ensure that we capture all of our costs better.

I would hope that if we worked more efficiently then the money that we receive would correspond to our cost but as long as there's enough cost you've only got to look at…..I think there are 60 new HRG codes at site but you've got at least that amount of codes within the bone scan coding in the national coding. I know there are slightly different things but it's just an example of: The complexity of what we do isn't fully captured by them and I think we are better than we were a few years ago because we had an awful load of let goes. I understand that we've got a more BNMS codes that were

rolled out and I think more of them need to be rolled out in the future because of the complexity of what we do.

I should emphasise that that's my perception. The pressure hasn't been put on me to justify what we do in comparison to those codes. That's usually the head of the department. I mean you consider its complex because I can think of all of the things that feed into it as the way they are all being captured. I can only see what is in the front to me. It's once you step outside of the department. I don't have that vision, I don't have sight of those things, certainly above, on a directorate level.

19. **Have you ever done any analysis on the real cost of a specific exam against the cost paid for the exam?**

    No.

20. **What strategies do you put in action to attract income?**

Certainly it's to …..like our level of specialisation, our level of expertise as well in a way over a wide range of field. There's an expectation, I think, that the consultants would constantly try and increase the profile at MDTs and to make sure that nothing slips off. Anybody who has worked in nuclear medicine will sometimes see that some scans are almost fashionable but in a lot of cases it depends on the consultant who was in charge of the referrals is aware of it. Certainly if that person retires or goes and then somebody else comes in, but they've done something else, then you might get a particular study that will drop off the rate down. It's keeping all of those things going and it's also to try and increase the profile of the department. Another obvious thing is: We have a radiopharmacy….to make use of that and to keep those markets where we can supply radiopharmaceuticals at a good and competitive rate.

We have private patients but that depends on the referral patterns. I couldn't give you a degree of how actively we seek those out.

A lot is over the fame of the institution. I certainly found out like here as abroad, people are happy to come here, a perception. And you've also got to realise that as well as that I mean a lot of people when it comes to nuclear medicine certainly when it came to attracting staff that to the 80's, 90's and even now a lot of the consultants here have

literally written the book of nuclear medicine so you have got (Professors names), all the people that wrote the standards in the radiological textbooks in nuclear medicine.

21. In which activities does the department receive higher income?

Radiopharmacy. It's the biggest cost and the biggest income.

22. In your opinion, what is the effect of non NHS income in NHS patients?

Certainly in the hospital it makes a difference and it is worth to the Trust. It's something that they actively seek…. we have got a 14-storey cancer centre outside, the top 4 floors are private, it could be 2 but it's at least 2. We've got a private radiotherapy unit just around the corner as well so it's something that it's definitely worth the Trust. It will bring money in. Obviously everybody would say that every patient gets exactly the same study, it's just a different pathway to get there.

23. In your opinion, what implications does the bank/locum staff have on the budget?

It's a drain. You are paying on average more for a bank/locum staff than you would for an equivalent substantive person combined with the fact that there is probably more jobs than there is locums which means that they command a higher wage which goes back with what I was saying earlier. The question is if you have got a band 5 post, the locum that comes will be paid as a band 7 to cover that. But the other thing about locums is: you have them because you really need them but you don't really want them because they cost so much.

24. What implications on the budget/management would your department have if it belonged/not belonged to an NHS FT?

I don't honestly know. I can't answer that. This institution is an NHS FT probably for 4-5 years but I can't attribute anything. There have obviously been changes; I would say that's due to the wider finances being cut or else remaining the same. I can't honestly say from my point of view, from a working technologist's point of view that we've noticed a massive change. It's a change on the latter head. The changes certainly that I've noticed are probably attributable to something else. I can see the differences with the government ring fencing and cutting the money which internally means that the Trust is

faced with a different savings plan every year which obviously filters down towards to us. That's an effect. There may be other changes but I am not aware that the Foundation Trust status has been the actual cause. That might be attributed to something else.

25. **In your opinion, what advantages and disadvantages would your department have if it worked 7 days per week?**

Obviously lots of people would want to come. That would be an extra 2 days, there is huge amounts of issues. We have issue staffing the department for 5 days a week. Before we start talking 7 days a week I would like to get 5 days a week working as best as I can. Then you've got other things around radiopharmacy. You also need the amount of staff to share the radiation dose because to do that obviously we need larger generators to be able to guarantee the amount of work that you do over a week long. You would then have to have extra staff to be able to do that, the same amount of staff but fully substantive and you've always to go longer. I'd definitely want more staff. I mean I can appreciate from the patients' point of view that not everybody is available but then you could say the same that most people would like to come on a Saturday but that's not good obviously. You can't do everyone on a Saturday and still have to re-spread all through the week. The thing with a lot of nuclear medicine work is trying to think waiting list-wise there might be a couple of scans that build up from time to time but essentially we will then try and attack that and make sure they don't fall outside the reach dates. But there is enough of nuclear medicine scans, it's not like you have to get a CT, it's not by large, it's not a casualty modality, you know. No one would come and say: "Quick, I need a DMSA."

Part 4: Operational management related questions

Departmental level:

26. **What are the advantages or disadvantages of having an own porter/central portering system?**

It would benefit us if we would have our own porter. More particularly on the (institution) site which is the acute site. We would have that controlled. It's the fact that you've got patients going up and down and then there's the level of priority that were

given within that. Someone like theatres will always be higher priority. If you have a rush of theatres then we suffer. After the patients being injected, the last thing you want is somebody who's injected then to wait for an hour, an hour and half to go back up to the ward, to have to come back down to us within an hour for a bone scan for example. We don´t need necessarily a porter designated entire to us but somebody who was there for part of the time if you are talking about a morning or something to get through those morning patients to get dated. Or it could be somebody with a dual role for example, a health care assistant or porter if you are going to do mix and match roles. We make use of the radiology porters. We used to be central but then it's the radiology. It happens the same thing, that's still not our porter. The radiology is doing a lot of more, it's a bigger department, there is 250 radiographer staff in the radiography department so they will take priority, the interventional radiography will take priority over us.

27. **Is your department involved in research studies with external institutions? (If not, what is the importance that you give to research?) (If yes, what are the implications in the budget and importance to the department?)**

It's important for reasons I mentioned we should be involved in research for department profile, for the knowledge and educational learning of the techs and radiographers upstairs. The fact that we have got the ability to do that it means that more companies will come, will expect and certainly if it's an external they will provide the money. So it is a source of income.

28. **According to National Framework for Service Improvement in Radiology (NFSIR) there are two important methodologies for service improvement: ''lean'' thinking and process mapping. Is the patient pathway according to these practices?**

I couldn't give you an honest answer like whether those were the main things that drove. It's certainly something that we've engaged in the past and interesting was: the patient pathway shows up the complexity of the way patients come in and the amount of different referrers and how they come in. It certainly got better than it was. We had EPR or electronic requesting for years which has made a difference rather than

people walking in from time to time. Lean thinking is something that…..I am trying to think if one improved, the problem. Is that we do it as we go along and I don't think there was an overriding process but it comes back to like governance and audit which is always looking what you do and thinking that you can improve what you do.

There was no conscientious decision of doing any of those methods, not in the time that I've been doing this. The stuff that we have been doing would be looking at the workload how it's changed, looking at it over a couple of years and looking at what we need anymore and within that setting up to book appropriately. So it's good scheduling. The booking staff used to work more separately, they were in different offices and they were cross-sided, now we have a booking hub which they go through. In the past certainly we've looked at when we were reaching over 100 cardiacs studies a month we had somebody whose prime duty was to schedule and prepare all of our cardiac patients, that it moved more smoothly so that when they came in they didn't have tea or coffee because they had had a reminder phone call. We have obviously introduced text messaging or whatever to try and decrease our DNA rates. I mean those were examples of smoothing at the patient pathway but as regard the ordering one: by and large our patients come via EPR or they tend to come internally. There are obviously external referrers as well.

I am not able to answer as clearly as I'd probably like to.

29. Do you have specific weekdays for determined exams and why do you have that structure?

Yes. For example we run a thyroid clinic. Those patients tend to be seen on Mondays, that's when the clinic works. So, they do the thyroid scans first and then move on to the thyroid clinic and if necessary they'd go on to have their therapy doses afterwards. Somethings (because we have our own suite for other therapy patients like Iodine-131, Lutetium patients), we will see those on particular days because it depends on the delivery to the amount of time that they are in the room to when we can scan them. It also depends on the availability of the consultants because we have consultants that work in different areas and their availability when it comes to stressing our cardiacs etc.

The pluses are that if you've got specific scans you are hopefully not making the same radiopharmaceuticals several times during the week when in fact you can get it all from one vial at the start of a week, for example in case of thyroids. That's not to say that you couldn't have included all these other patients. Our therapies the same thing, that you can't just have like one day (actually that's not quite true) but the limiting factor would be our therapy rooms. We don't image breast sentinel nodes anymore which only would be injections so we would have that none call ready by large on the day that they're going for theatre. So there's outside constraints, likewise we've got to do our sentinel node studies ideally on the morning of or failing that in the afternoon before their surgery. So there are surgeries that are the limiting factor when we've got to do those patients.

Another thing is: we use krypton, we use a mixture of krypton and DTPA, but we don't get krypton everyday so we would try to book our patients' lung scans on the days that we have krypton which is Monday, Wednesday and Friday but to do those obviously that would mean that we'll get the most out of each krypton tin if we're actively putting inpatients (obviously we would try get them doing within 24 hours anyway). If they happen on a Monday, Wednesday or Friday morning that's great, we'll scan them in that day. If they happen late in the day before and we can't get them done we'll also put them in that day.

Patient level:

30. What measures are taken when patients do not attend?

It depends on how they don't attend. If we've had no contact with the patient we will give them a second opportunity. We try and do patient agreed booking which is one of the reasons we've got a booking option and hopefully we can ring and get the patient to agree. If they have agreed and they don't turn up and they've given us no excuse we will definitely send that back to the referrer and ask them: "Do they still want that?" And ask them to re-refer that patient.

31. What measures are done to decrease the rate of DNA?

As I mentioned earlier we have introduced a text SMS service which will remind the patients when the booking is made and also (I think) the day before or two days before. We also have the booking option which we will try and get patient agreed bookings so that people are less likely not to turn up if they have been speaking to somebody the day before.

The agreed bookings we will try to do to all patients but we can't guarantee. Definitely for any non technetium study we will always try and get an agreement before, quite simply because of the cost. Definitely any lutetiums, DATScans, any therapy, we will get an agreement with that patient beforehand.

32. What measures are you taking to decrease the cancellation rate in inpatients due to human resources mistakes (e.g: wrong preparation, late transport)?

If there is any late transport we constantly try and keep an eye on that. We log it by DATIX or R01 forms which is an efficient log so that it's recorded on a Trust level. If there are any issues after that then I will go and speak to the portering managers if we need to re-calibrate the service at all. Wrong preparations that depends on when they are done. Likewise we will also know that because if it's a consistent problem obviously we need to address at the time but also have a good record of it to be able to show that it's a consistent problem. Certainly on a radiopharmaceutical level we are fortunate here. What we try and do is: if we know the night before that inpatients will come down we'll ring them and we will try and get a nurse to go up and assess the patient to see if they are able to move, whether they can even stand and do our scan for that amount of time and we try to encourage like a positive handover. In a lot of cases that is difficult because of the ward staff who want to dash off, they only accompany the patient down. Our nursing staff over here, they are not here just to primarily look after a single patient all the time so we will encourage the nursing staff to stay and let them know that if that patient needs constant care they need to be here to give that constant care.

33. What time targets do you have for the time between the patient arrival and then being seen?

We don't have time targets. If they have been booked appropriately that shouldn't be an issue. But reality intervenes. The secret of that obviously is good communication, ideally obviously they should be seen on time. Then someone says that any manager would have to keep emphasising the staff: "Don't forget people are waiting!" The administrative and clerical staff in the front desk will let us know and we will go around. If there are delays, the patient needs to know as soon as possible and to be given a realistic figure. We get a good feedback in our patient surveys. We have got a patient experience survey that is constantly ongoing and we get reasonable feedback by waiting times and that they are being kept informed all the time.

IT level:

34. What are the advantages/disadvantages of your IT system?

The reporting is done via Dragon so there is no paper report. It's voice recognition. The referral is still by paper, in the sense that it's printed out when it comes out via CRIS (after being transmitted by the EPR). That's something I am going to attack over the next couple of months. Hopefully by the end of this year I'll be able to tell you something different, I want to do it soon. At the moment what we need to do is get full electronic vetting. The issues that we would have are that you've got a backing sheet that needs to contain the patient identification and needs to be signed by the technologist. So you've still got a piece of paper even if you scan the actual request sheet. The pregnancy test has got to be signed plus the form currently signed. We intend to move over to electronic vetting that would mean. That they can be vetted from anywhere and it's not dependent on someone coming and sitting down for a session to do that. Once that happens it's a see-change with mentality as well. Some people are very used to paper. You've got to get rid of them. Currently in radiology a paper is actually easy to work with during the day but also whether we need to keep it stored that's another thing. I want something robust enough to be able to record any notes that any of the technologists

have made, so that it's scanned in and then we can get rid of that but there will probably be an internally period when we are doing both.

I think it's a great idea to be all computerised, and everything is already there so that would be having the vetting done electronically. I don't mind the forms initially being put out just as a worksheet. I don't think we should be keeping them; the images aren't reviewed on film anymore. They are reviewed either a mixture of PACS and Hermes workstation which is practical platform for all of our machines to feed into.

I do want to eliminate the paper but as I said I don't think you'll be able to eliminate it all, you become paper-light. People will still print. That's what I want and I think we have done a lot of background work making it easier to vet on CRIS. Some of the consultants find it hard to think about the change and living without paper. I think we need to do it. It's a space, it's an expense that you don't need both in printing consumables and paper, also in staff time consumption (which would be the administration and clerical staff spending time managing and moving it around). If that doesn't need to be there they can support other things in the department in a better way.

35. Does the NMD website have updated information for referrers/patients?

No. Our nuclear medicine website isn't great. It's something that I should feed into. The way we worked over the last few years has been complex. That will be changing over the next couple of months but it's not my sole responsibility, everybody feeds in, everybody is responsible as far as they work under the senior but this is where you get the discharge between the service manager and then the service level, what we do and so the chief technologist. The chief technologist is being always looked at the work you do, not necessarily the service level of staff which is why I didn't give you a straight answer to some of those questions but I know about them because I have been involved in the meetings. It's not necessarily my responsibility although it's something that I am going to drive in a few cases.

36. Does the NMD website contain the prices for private services?

No. The same thing. The website isn't as good as it should be. It's not been a site of focus for us. I have seen other hospitals' websites and I can see where they have got

personal profiles of the doctors plus what they do and where you contact if you want to go privately or if you want to go in the NHS way. It's not been a source of focus for us.

Final Questions:

37. What are your future steps to improve the budget/operational management for the department?

One thing would be to computerise all of the ordering system but also the actual referral system which is what we've just talked about. That would be one. Two: Consistently review the spend on consumables and, it's a case of changing the minds, certainly it's something that we've been doing over the last couple of years but also spreading that down to the people at lower levels in the tree so that everybody knows where they stand and that there is a budgetary constraint with just about everything that they do. I would say to make sure that we employ rapidly when somebody leaves to make sure that we're filling our posts with substantive staff rather than locums. That if we do have to have locums, continue making sure that they work at the level that they are paid for and that we are not paying something for work that they are not doing just because there is a shortage. Also to work in staff retention, to keep the good workers and not get to many bad people in, to make sure that your employment and recruitment is robust so that you pick the best person available not just because they are the only option, which I think is obvious a problem. You have to have the courage to say: No, this people don´t fit the role.

38. Do you have any questions or comments?

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Interview no. 5

Duration: 0h58min

Date/Time: 22/06/2015 at 17:00

Part 1- Department Characterization

1. **What divisional group does your department belong to?** Urgent Care.
2. **Which scans are the most common?** Haematological and neuroendocrine scans.
3. **How many:**

a) Gamma-Cameras- 4 (1 is SPECT/CT) **b) PET/CT-** 1 **c) DEXA-** 1 **d) Injection Rooms-** 2 **e) Consultants-** 4.3 **f) Technologists/Radiographers (Band5-** 2**) (Band6-** 8**) (Band7-** 5**) (Band8a-** 1; **8d-** 1**) g) Nurses-** 0

4. **What is the mean number of patients per day?** (Unknown information)
5. **Opening time:** 9.00am-5.30pm.

Part 2- Interviewee Characterization

6. **Job title:** Professional lead in nuclear medicine
7. **Qualifications:** (Unknown information)
8. **How long have you been working as (job title) in this organization?** Since 2002.
9. **How long have you been working as (job title)?** Since 2002.
10. **What do you consider to be the most important tasks of a (job title)?**

I would think it's to give a certain direction to the department and to represent the department.

11. **What do you consider to be the most demanding tasks that you carry out and why?**

The most worrying and demanding thing in some ways is worrying about the regulations and radiation dose for instance for staff and patients. That worries me and stresses me. The most demanding thing is all the silly little chores that I have to do which I really should have asked somebody to help me doing which is sending like bills

and checking invoices and stuff like this which gets annoy. So I don't have very much support for the business side of things, business chores basically.

Part 3- Financial related questions

12. **In your opinion, what has PbR introduced compared with the previous financial model in terms of patient and financial outcomes?**

I don't really focus on that, to be honest. We are really focus on Service Line Reporting what happens here and just our mean outcomes at the end of the year. I mean let the Trust worry about that. We don't feel it here, so we haven't seen it and we don't know whether bundling or unbundling is going to have an effect on the Service Line Reporting. I am not sure if it has and I think we have more issues around, things like catch a drug fund and what's approved, that sort of thing rather than PbR.

13. **In the context of Radiology, is the PbR system improving or worsening the patients' outcome?**

Because we have a Service Line Reporting we don't really get involved in that. So the PbR is more going to the clinical teams who ask for our scans. We as a department don't see that in the same way. Now the question is: Nuclear medicine, as far as I know, has been included and excluded and included and excluded from the bundling of tests. Currently I don't think of any of that at all because I don't know where we are and that's now hopefully going to be dealt by the senior operational manager who does it for radiology... but up to now what we have been focused on is the service line reporting about what we charge to our clinical teams, our referral base.

14. **According to the amount of requests that your department receives...**

a) **Is there any area that you may think that your department may need to increase the capacity?**

No, I think we are pretty stable now. Our PET is becoming quite busy so not enough yet to say we need to increase the capacity. Our SPECT-CT is busy so we will probably think what we can do without having a second SPECT-CT because the SPECT-CT is the thing that's a pressure. The thing that I would say is that the cardiology is a pain in

the neck because I would have thought and slightly hoped that cardiology would have disappeared but it never does…MPS. Because it's a very high dose, the cardiologists don't seem to like it and they keep criticising it. But then they keep sending us the patients and what we're seeing to be sometimes used as if they have a waiting time crisis in their department for stress echos they will then send us more patients. So it's very hard to plan what the future would be. Cardiac CT is promising very, very low dose scans and there has been a great increase in cardiac CT in this hospital. But we still have cardiac MPSs coming through.

b) Or decrease the offer?

Cardiac. But only because it's maybe a function of our particular cardiologic group, it's not a clear collegiate joint up process. I do think that nuclear medicine is very high dose compared to the CT has been promised, it's less than 5 mSv for a cardiac CT and we are giving 15.

c) If yes, which factors are against those changes?

-

15. Is the department budget covering all the expenses?

Yes, last year we were in surplus, we made more than we spent.

16. Do you feel the need to save/reduce expenses?

I am always under pressure to find Quality Improvement Plans (QIPPs) as they call it, cost improvement programmes, qualitative and patients' initiative things, so we are always under pressure for those. We have done them by increasing the PET recently. We maybe will continue to do that by increasing the PET but we find it hard to find QIPPs elsewhere, cost savings elsewhere so we always feel a bit guilty and self-conscious about that. We do feel the pressure but at the minute PET has saved us a lot because our PET grow has been very dramatic.

17. Since you have been working at this Trust, have you put in practice any measure to decrease costs...

a) In staff?

Yes and no, in the sense that we have changed some staff in grades but it is usually cost neutral. By taking a one and a half band 8b and turning them into two band 7s we were taking the total cost and increasing the number of staff so we were more efficient in terms of the amount of staff we had for the same amount of money. We had some extra money that we got from a project that was going on and an increasing work that was going on but it wasn't sufficient to buy more than half a technologist so we went to a band 3, associate technologist.

So the answer is we have tried to do skill mixing from that perspective but it used to be into try and keep…trying to increase our work group because the work was growing up in the most efficient way and the most cost effective way….

b) In equipment?

We have tried certain things. We bought the PET-CT on the basis of being low dose and try to inject half the radiation dose that most of the people do. We do a 3 MBq per kg dose so our typical injection to a PET is 200 MBq. But in practice of course the amount of saving was small because our patient numbers were small when we agreed the terms. When our patient numbers increase we will see if we can get more savings because of that.

c) In consumables?

One of our biggest cost savings was switching from Chromium to DTPA for GFR. That was just a great deal savings a few tens of thousands, probably. Summarily we went to a *technegas* as supposed to use 5 days of krypton on a half and half basis so we do two days of krypton and three days of *technegas*. Before we were doing 5 days of krypton so we did a big saving. That's tens of thousands…..

Which patients use krypton?

That's a medical decision and it's a changing process. They probably tried to push as many people as possible into the krypton because they prefer the krypton but as they developed their experience on *technegas* I think it's probably even that. I suspect they probably think that maybe patients with Chronic Obstructive Pulmonary Disease or

something like that it might be better to use krypton. But I think it was a moving definition because of what they wanted and what was absolutely clinically needed.

18. **Do you consider that the tariff for NM procedures corresponds to the reference costs and why?**

No, they don't take into account the pharmaceutical cost very well, it's not fast enough moving so when companies shift their tariff for their costs of our pharmaceuticals, it doesn't respond well enough. I mean, classically, there was a situation where the total cost for a DATscan was less than the cost of the pharmaceutical. So therefore as soon as you bought the radiopharmaceutical you were already in a deficit.

Have you ever considered decreasing the type of scans whose procedure cost overweighs the earnings?

No, because the patients stuff has to be done. We just compensate on the fact that the Trust pays us for the cost internally…SLR is a funny sort of thing. It's a cost not a price, that's the first thing. So our local departments get a cost of what we do, so we work out how long it takes to do a bone scan and who typically does a bone scan. Each test is assigned to a band and we then tell the finances that a band A takes this amount of a physicist, this amount of a technologist, this amount of a pharmacist and this amount of a doctor and they'll scale that, read that out and tell that means that it costs £200 and then we say a band 1, band 2, band 3, 4 and band 5 costs. We tell them all this cost and we then set aside a couple for high cost drugs and tell them how much the drug costs. For therapies particularly of course we would say that. The strange and difficult thing for me to understand was that they take all that money and say: "Alright, so you have got this amount of patients last year, this is the amount of money that it should have cost but actually that would have cost a lot more than we have given you. What we'll do is we'll scale down your bandings". So if I say a bone scan costs £200 then they say: "Actually we can only afford to give you 180 for that so you get 180 next year." So they decide our budget based on what our current budget is sort of and then we tell them the bandings and they say: "Nice, we accept that. By your calculation it costs you this amount to do but we can only afford to give you this amount. Therefore we'll scale everything down so that

you'll only get £180 for the things." So our budget is always slightly different but I said that we tend to overperform so they maybe give us too little but we get too much money anyway.

19. Have you ever done any analysis on the real cost of a specific exam against the cost paid for the exam?

We just pointed out the obvious fact that they would pay us £500 for a DATScan and it costs £900 to buy the drug so it was obvious that we would be behind the game.

20. What strategies do you put in action to attract income?

Our main sort of attraction is giving a high quality service and trying to find areas which other people don't do or don't do as well. It's just contacts and hopefully word of mouth and people learn that we do things in a good way or we do things in a bad way. We do get number of SPECT-CTs from other centres because that woman who just came in the door two minutes ago is an excellent radiologist as well as a nuclear medicine person. Her musculoskeletal is very well valued by the people in the northwest London area and now we are getting from all the places as well. It's worth more for the referrers, certainly they send some private referrers to her, not by the offices of our private clinic but actually from the (ward name) because they work in various different hospitals. I would say part of the pressure is because of her very excellent standards but part of it is also because SPECT-CT doesn´t exist in every place and we don't think we'll hold on to that. I think as centre like ours we are always trying to find things which a large centre should be doing in advance of other people. Obviously other people can then catch you up and you then have to try and find something else new or something else different or do things in a different way.

21. In which activities does the department receive higher income?

Therapies would be our biggest.

22. In your opinion, what is the effect of non NHS income in NHS patients?

The money coming from private patients comes to us but we don't have a huge private patient practice. It's a minimal effect I think in this hospital. We don't have a strong, strong…..I don't know what a percentage that would be. PET was quite strong I

guess at times. We have a big number of PETs at one point and may lose those because private haematology patients are leaving but generally speaking the private work is a small component, the big generators are the therapies and PET. Much money comes from those.

The people who benefit from that is the private patient unit. We only pass on the costs to them but we don't get a profit from the private patients, the hospital gets a profit. The way we work is that there is a donation to the soft money (chargeable fund) from private patients that the doctors do but not the department. Obviously extra work is good work for us because anything is part of our SLR but we just pass the costs onto the private patients. So private patients don't gain me…I charge the private patient the same amount as I charge a NHS patient, it's no benefit to me. The hospital charges more and the private patient unit gets that money. The prices are significantly higher but the costs are the same so I only can pass on costs, I can't pass on price. They decide the price and they get the money for that, we get the cost. So as a department we don't benefit except in the money that comes from the donations to the chargeable fund from the doctors.

The hospital does do something with that money and I think if we find a significant increase in private patients we could go to the private patient unit and say to them: "We need you to fund this or that and I am sure they would do that". But the numbers aren't that significant that we need to do that but there were obviously possible venues that we could go to do that.

If we need that money it would be done, but again it's just covering costs because they would see that is an investment that they could then do more patients and then we would charge them, again the same costs, but they would still gain the surplus.

23. In your opinion, what implications does the bank/locum staff have on the budget?

It is a cost. We are very lucky because we've only got currently one bank technologist and one Admin and Clerical bank person. In my first years we used to be 50:50 and that was very hard. The main problem when you have a large number or a significant number of bank staff, the danger is that you have a "them" and "us" between the two. So I think that's the biggest problem. But obviously the cost will have an impact

on you as well. It's not the forefront of my mind, it's the forefront of the Trust's mind but as our department we don't do so badly. Radiology has got a massive spent on agency staff, we have only 1 out of 16.

But it is a pressure. If we had a large number, the management's focus would be heavily on it but at the moment it's not very heavily on it because we don't use a great deal. In the last couple of years we've had 2-3 agency staff….we overspent and we underspent and that was it and then we get some….but to be honest the biggest overspend that we had was an unexpected large increase in the therapeutic drug cost. That draws off everything else.

24. What implications on the budget/management would your department have if it belonged/not belonged to an NHS FT?

I have no idea. We've only been a FT for 2-3 years now so personally, no, not particularly. I am sure the people that deal with the commissioning and the services and staff must have known the difference. They are very much conscious now that the (institution) is a (institution) place rather an… we are part of this bigger picture and it's not less more emphasis in the (institution) nature of the place rather than the NHS nature of the place as part of a bigger organisation. But again that still creeps in at times. I still emphasise we are part of the NHS, it's the most important thing rather than other thing. But I think obviously they raise issues that the whole office issue, the Trust finances are tricky. It will always going to be tricky regardless if you are in NHS or not or if you have Foundation Status or not.

25. In your opinion, what advantages and disadvantages would your department have if it worked 7 days per week?

I am not sure if this had much advantage. The most nuclear medicine tests aren't that important to be done with the possible exception of V/Q. I sometimes wonder about the evidence that they need to do a diagnostic test or anything in a 7 day working. I think it's a bit of a fad to be honest and the evidence that you have that people die more at weekends is probably skewed by the fact that you only come into hospital on the weekend if you are really seriously ill. So if you take away the fact that these patients are

generally sicker than other people, there is probably not that much of a difference between death rates of weekends and non-weekends. I think this is a distracting thing. I would think that if you have good quality people for 5 days a week who are not overly tired, who are completely 100 % committed and you have a good cohesive group of people that's much better than having a 7 day week thing. We may have to have more people, therefore we may not get the quality of staff because it's difficult to get quality staff sometimes. So if you turn to say that the whole NHS has to employ an increased number of staff or increase the hours that staff do I think you're maybe diluting the quality over the 7 days rather than producing high quality over 5 days. This is why I was saying to you. I think sometimes some management consultants come in and say: "Oh look, we find a metric that measures something, that proves this and this and this". That's actually very superficial and doesn't take a step back and say: "What could be the cost of this?" And "what would be the dying side of having this?" Because they think of things as units and not think of things as quality and care. It's not as shifting tins of beans like a supermarket. It's execution in quality care and I don't think 7 days is needed for that.

Part 4: Operational management related questions

Departmental level:

26. What are the advantages or disadvantages of having an own porter/central portering system?

I don´t think that having a own porter is advantageous because we couldn't justify more than one and then what happens is if you don't have enough porters (when that person is off sick or that person is on holiday) the main porters will say: "Well, we don't need to do...you could do your own porter", and they won't come as well.

We have a portering system and it's all online and you book the porter online and the main porters go and pick them up and bring them down. You need to ask the technologists because they love it and they are the people that have to do. I don't deal with it and I don't even know how to book a porter. But the technologists they seem to use it quite happily.

I think there are always problems of portering but I don't think the online system causes the problem and I don't think that the centralised nature of it causes the problem.

I think if we had our own porters, it might seem superficially attractive, but I do know that when other centres have done this, the problem is that the main porters will not help out when your portering isn't up to scratch if you have sickness or absence or whatever. You assume that you've porters when you don't. That doesn't help.

27. **Is your department involved in research studies with external institutions? (If not, what is the importance that you give to research?) (If yes, what are the implications in the budget and importance to the department?)**

We obviously have some research going on which is sometimes people who are university appointments at this hospital, sometimes from external groups as well. I receive income in some degree, yes. We would charge them more because we would define the definitions of what they would do because that money would come to us, to the department, because that is outside of SLR and that's outside of private patients so we decide this. Our ability to decide or to negotiate that is somewhat limited, of course, because sometimes when a big multinational comes in and says: "No, no, we only prepared to pay X for a bone scan, you have to decide whether it's worth it or not". Then you decide and sometimes there is more than monitored calculations involved. A teaching hospital of our size, we should be doing more research. I think one of our failings is we don't do enough research and I don't think we publish as much as we should.

28. **According to National Framework for Service Improvement in Radiology (NFSIR) there are two important methodologies for service improvement: ''lean'' thinking and process mapping. Is the patient pathway according to these practices?**

We haven't done any project, not in that formula. I mean I'd like to think we did have a good process of how we've mapped, of how we do our things and I do think we probably are quite a lean department but we haven't used their methodologies, no. We think we work in a reasonable way and when things come up that don't work that way we have a good methodology of reviewing that. We have a good structure within the department to reflect on what our practice is and we have a number of meetings

organised that focus on those sorts of things like audit and a quality manager system that picks up a lot of these things.

29. Do you have specific weekdays for determined exams and why do you have that structure?

There is a structure. We couldn't do things without some sort of structure. I mean obviously that structure is more than indicative but it's not an iron law. We certainly do our therapies on a certain day so we know when we do our post-therapy imaging that takes us a lot of our gamma camera time and that means the times available for doing other scans is constrained. Therefore we do certain things on certain days, all the things like stressing of patients for cardiac as we try and control that, partly driven by the availability of doctors, partly availability of the radioactivity. Obviously it's better to do cardiacs at the start of the week than in the end of the week because it's when our generator arrives. So there's things like that, there's a structure that is imposed by the system, by the delivery of companies. They can only provide you radioactivity for certain things on certain days so there is certainly a structure but if we needed to do an urgent bone scan or an urgent something and there was a good clinical reason to say: "This could not be waiting to the next day", we would still try and fit them in. That's why I mean it's not an iron law.

For example, thyroids are always on Monday because we try and do our therapies on a Thursday so a thyroid is seen for their scan on a Monday. Therefore we put the Pinhole collimator on a Monday and try and do all the thyroids whether they are thyrotoxicosis treatment or not. There is a structure that gets imposed partly by the practicalities of certain things which is out of our control but obviously we have a certain control. We impose some control on it ourselves. There is a certain fluffiness to.

Patient level:

30. What measures are taken when patients do not attend?

The official line is probably that we will send a letter to the referring consultant and say: "Your patient did not attend. Please re-assess and re-book this patient if he needs". That's the official line and it depends on what it is. If we know the patient, if we

sort of understand the patient we might phone them up and if they have a reasonable excuse we might say: "Ok, we will re-book you for this."

What does normally happen?

Probably it depends on the patient, it depends on the situation, if we are quite forgiving of our PET patients for instance, we might try and chase them up why they did not come, things like that. It depends on how busy our reception staff are, to be honest. So the official line is that but I think we have some people doing certain things differently….because in some ways that's a hard line and it's sometimes more cost effective for us to proactively seek out the reason why it happened and try and address it.

31. What measures are done to decrease the rate of DNA?

We've tried hundreds of different things. Cardiacs is always a particular problem, bone density is a particular problem, bone density was a terrible problem but that was because patients were being booked along and the waiting list was long but now that the waiting list is coming down it's becoming better. I think one of the things is the capacity issue and that was during cardiacs as well, increasing the capacity. That was easy on cardiacs because the number has dropped down as well. Cardiacs for instance we phone up the day before to remind them of coming. Partly because we are phoning them up not just to remind of coming but also to remind them not to take caffeine, we want them to come prepared. PETs get phoned a lot because of the preparation as well because those slots are so precious that we don't want to lose them.

32. What measures are you taking to decrease the cancellation rate in inpatients due to human resources mistakes (e.g: wrong preparation, late transport)?

We have the DATIX system. When we first had PET we had a large number of those and every time a patient didn't turn up we would put it on to the DATIX system and so the feedback has worked. It worked partly because the DATIX system has been the avenue to produce those answers to the clinical teams and obviously the clinical teams became more knowledgeable as the PET became more familiar to them. So I think it's just education and that horrible phrase: communication which is a cure for every problem in our organisation. Somebody is somewhere doing any managing meeting will get up and

say: “Obviously, it’s an issue of communication” and that’s meant to be great and insightful although it’s just warm apple pie.

We do have those problems and we’ll always have that. I think and again that it’s a human resources issue, a particular crisis on a particular ward, you’ll have things, we’ve had problems which were not so much. We’ve had electronic requesting errors because the junior doctor picked a wrong patient…you get a lot. We can try and minimise those things and that’s what the DATIX system can try and sort that out but interestingly we had a BNMS audit recently and I was told that I referred to many patients to the Care Quality Commission because I referred….an incidence of the patients who were sent for the wrong test and they thought I did too many of those. I think they were wrong and I am not going to change what I do but yes, we have got mechanisms in place.

33. What time targets do you have for the time between the patient arrival and then being seen?

We don’t really have. I mean we have a patient satisfaction survey that runs at least once a year and one of the questions is: “Were you seen on the time of your appointment?” So we try to do that and we also have a patient journey monitoring thing which we do once a year (at least) as well maybe more if we thought that was an issue where the form goes in with every patient and then follows the process of the patient around the department, the patient’s journey, so when it comes to any area of the department it will be written comments including: “Was the information transmitted on time? Was the injection done on time? Were there any delays?” That sort of things. We find that information and we can see what problems are in the process. I think that is the sort of mechanisms that works quite well in our department. I am not sure how many people do that.

IT level:

34. What are the advantages/disadvantages of your IT system?

Our IT system is almost completely computerised. If you come back in two month time hopefully it will be 100 %. So what we have currently is we have request forms coming in on paper form but they also come in electronically. So in the hospital

they electronically come into the RIS system but they also print out on paper in the doctor's office and the doctor vets them using the paper record. That's what is send around with the patients and the tech and reception deal with that. We are getting this new RIS system coming in the next couple of weeks which is the horrible CRIS which you suffer under in there and we are going to suffer under as well. We are taking that opportunity to say to the doctors: "We are not printing out any more paper for you. You are going to have to do that all electronically". So hopefully we'll go all electronic, we won't be able to go completely electronic because of the GP. For the DEXAs they'll still come in on paper but we are going to scan those and see how that works. We don't have to worry about the storage of paper, we have a storage problem in the place and I think the searchability should be better. We shouldn't be using paper in the 21st century.

35. Does the NMD website have updated information for referrers/patients?

We updated it very recently but it doesn't say much so it needs to be improved. The one thing that we put an effort in is we have got two videos on our website for the thyroid therapy patients so we can teach people the head of the game, what we are going to talk to them about that, restrictions on the thyroid therapy. That was my first attempt to do it because we were saying the same things to everybody all the time so we thought this might cut down our time we spend with patients explaining. In practice we spend quite a long time explaining.

Is it written in the letter, the existence of that website?

I think we intended to, I think we have, I can´t say that I have checked it but it is on the main website for the nuclear medicine department so I think it's in the letter. The letters are all changing now so I have to check.

36. Does the NMD website contain the prices for private services?

No. Prices are a discussion between the private patient unit and the referring doctors and/or the patients themselves.

Final Questions:

37. What are your future steps to improve the budget/operational management for the department?

I think we just expand some of our therapy areas which some people have already done, alpha therapy, stuff like that. I think our area is trying to monetise some of our expertise in terms of research and making sure that we don't just do it for being nice to people which we have done already too much of or trying to bootstrap ourselves into more research. But I think we have got enough of the standing and the reputation that referred for good quality work, even that we don't publish enough. I think people who know us, know we do a good innovative stuff and therefore I think we need now to say to people: "We don't just want you to be nice to us, and say what wonderful innovative stuff you do" but actually say: "If you want to do work with us you are going to have to properly pay us for that". Because we do have lots of people coming to see us, to do projects with them and do a little bit here and there and most of the time it's: "Ok, we'll do that for you" and we get a very minimal cost. But I think particularly our pharmacy is a very high quality pharmacy and I don't think we charge enough for that. We have good quality physics, we've got a good number of doctors and we have got an excellent technical staff so they contribute to that innovation and doing the things better and differently so we need to say to people: "If you want to come to the (institution) and take the values, benefits and the flexibility of the (institution) that comes to a certain cost." I think we've not been good at doing that. That's where my five year plan was, it's to improve our standing, maybe running more courses. If you look at certain hospitals in the London area places like the (another NHS institution) have been very good at running courses and creating courses, (another NHS institution) are pretty good at it. We haven't run courses, maybe we should do more of those. We'll probably try one this year, very simple straight forward one at one level but it's our first foot in the door. But there is all the things we miss. We have a lot of visitors coming to see us because we have been quite far ahead on certain things but you wouldn't know it because nobody thinks that the (institution) has been the highfaluting academic place and we probably aren't the highfaluting academic place. But we are quite a cutting edge place in sense of we do

things ahead of other people and we do things better than other people, we seem very arrogant but we do, quite honestly. We have a very good Gallium service, the Trust has invested in the Gallium and the radiopharmacy, we probably have the biggest radiopharmacy in the country which does not sell on. I mean there is probably bigger radiopharmacies in the country but we don't sell on currently. So that's one area where we could develop, we could sell some radiopharmaceuticals but I am not in the least interested in selling bone scans to the district general hospital in X. I don't think that's where we should be, I think we should be selling Gallium Dotate or Galium Prostate-specific Membrane Antigen, something fancy because that's I think where we are going to be. You pay top dollar for that. Who is going to make money by selling a MDP pot? It's little radiopharmacy... So that's my master plan, it's to say that we've got that but to be honest I would even rather not do that if I had my way. I would rather say: "If you want a Gallium scan for your trial send the patients to the (institution) because we can scan them, we can do that, we've got a good way of doing it, we have been innovative in the way we've done that, we've been thoughtful in the way we have done that". That would be my ideal. Most ideal would be generating enough stuff to get a second PET scanner but that's a long way, that's quite a bitter way. I'd love to be able to generate.

38. Do you have any questions or comments?

Interview no. 6

Duration: 0h30min

Date/Time: 24/06/2015 at 07:35

Part 1- Department Characterization

1. **What divisional group does your department belong to?** Imaging.
2. **Which scans are the most common?** MPSs.
3. **How many:**

a) **Gamma-Cameras-** 2 (1 is SPECT/CT) **b) PET/CT-** 0

c) **Injection Rooms-** 1 **d) DEXA-** 0 **e) Consultants-** 1

f) **Technologists/Radiographers (Band5-** 1**) (Band6-** 1**) (Band7-** 1**) (Band 8a-** 1**)**

g) **Nurses-** 2 (Part-Time).

4. **What is the mean number of patients per day?** 10 patients in NM.
5. **Opening time:** 9am-5pm.

Part 2- Interviewee Characterization

6. **Job title:** Superintendent Radiographer.
7. **Qualifications:** DCR, PGDip (Nuclear Medicine).
8. **How long have you been working as (job title) in this organization?** 20 years.
9. **How long have you been working as (job title)?** 20 years.
10. **What do you consider to be the most important tasks of a (job title)?**

As superintendent it's making sure that the department runs efficiently and everything is gear to be looking after patients. But in parallel with that obviously the most important aspects with nuclear medicine are safe handling of radioactive materials.

11. **What do you consider to be the most demanding tasks that you carry out and why?**

So because I've got the most experience I tend to do virtually all the paediatric injections and some of them are more demanding than others.

Part 3- Financial related questions

12. **In your opinion, what has PbR introduced compared with the previous financial model in terms of patient and financial outcomes?**

Can't say.

13. **In the context of Radiology, is the PbR system improving or worsening the patients' outcome?**

Can't say.

14. **According to the amount of requests that your department receives...**

a) **Is there any area that you may think that your department may need to increase the capacity?**

SPECT-CT.

b) **Or decrease the offer?**

No.

c) **If yes, which factors are against those changes?**

(A camera will be replaced).

15. **Is the department budget covering all the expenses?**

Can't say.

16. **Do you feel the need to save/reduce expenses?**

Yes.

17. **Since you have been working at this Trust, have you put in practice any measure to decrease costs...**

a) **In staff?**

Not using Agency Staff to cover staff shortages.

b) **In equipment?**

No.

c) In consumables?

Radiopharmacy cost cutting wherever possible.

18. Do you consider that the tariff for NM procedures corresponds to the reference costs and why?

Can't say.

19. Have you ever done any analysis on the real cost of a specific exam against the cost paid for the exam?

No.

20. What strategies do you put in action to attract income?

We do see some private patients, very, very few of them are inpatients, but it's only 1-2 per month. So the private patient income is almost insignificant, we really don't see very many.

We don´t have any particular strategy, not that I am aware of. I run the department. I've got nothing to do with financial planning or budgeting.

21. In which activities does the department receive higher income?

Can´t say.

22. In your opinion, what is the effect of non NHS income in NHS patients?

I don´t know.

23. In your opinion, what implications does the bank/locum staff have on the budget?

Locum staff are expensive. We don´t have them.

24. What implications on the budget/management would your department have if it belonged/not belonged to an NHS FT?

I don´t know.

25. **In your opinion, what advantages and disadvantages would your department have if it worked 7 days per week?**

The advantage would be if there is sufficient demand that we would needed to meet waiting list targets, disadvantages would be increased cost.

Part 4: Operational management related questions

Department related questions:

26. **What are the advantages or disadvantages of having an own porter/central portering system?**

It would be quicker to have an own porter, but there is absolutely no way we could justify having a porter sitting around purely for nuclear medicine patients. We only see 2-3 inpatients a month. If there were more inpatients it would have to be an enormous amount more to justify having a porter dedicated to nuclear medicine.

The central system works very well for us compared with many other hospitals like for example (another NHS institution) where I used to work. You were lucky if you would receive a patient after about 2 hours from asking for it. The 2 hours were the minimum that you would expect. Here, if a patient hasn't arrived within 30 minutes from requesting it, that's unusual so that's pretty good here. But there are only about 6 porters covering the entire hospital, doing everything so sometimes they are very, very busy. Those 6 people work very, very hard. They are never sitting around doing nothing and of course if you get staff sickness or leave or anything of that the number of porters goes down then you get bottlenecks. But it doesn't affect us hardly at all because we hardly ever see any inpatient but I'm aware that places like CT an MRI where they may have 10 inpatients waiting to come down they do get bottlenecks and things do get delay because of delays with the porters. But it doesn't affect us. We know in advance if we need to get an inpatient down. We know we need to ring maybe half an hour to an hour in advance so we would say: "We want the patient in an hour time. Can you please collect the patient within 45 minutes?" That always gives the porters enough time to get round that. The only times we have problems is when there is an emergency like a Ventilation Quotient (V/Q). We would then ring the porters and say: "We need to get this patient

down as quickly as possible" and they always manage to it within…well, not even as much as an hour...so it's never really being a big issue for us.

27. **Is your department involved in research studies with external institutions? (If not, what is the importance that you give to research?) (If yes, what are the implications in the budget and importance to the department?)**

I am not really aware of anything that we are doing which has any significant research element so I think I'd say no.

It would benefit the department but so far we haven't really been involved in anything. We were doing some research on *SeHCATs* but I think that's now finished probably a year ago.

I don't know why we don´t have research studies. I would assume it's because nobody has come along and made a request for us to do anything. Because I am sure that if a request was made then it would have been considered and we would almost certainly been doing something.

28. **According to National Framework for Service Improvement in Radiology (NFSIR) there are two important methodologies for service improvement: ''lean'' thinking and process mapping. Is the patient pathway according to these practices?**

I am not aware of them but actually lean thinking is doing everything as efficiently as possible which is what we do. Process mapping you could probably bring in an external assessable consultant to look at what we do and I would be very surprised if they don't say that we're already doing what we are supposed to be doing because the department does run very efficiently. We have minimum waiting times, we're meeting demands no matter what the demand is. So one way or another I would be surprised if we are not meeting whatever requirements would they impose.

There ought to be lots of examples but the fact is that we've actually been doing everything so efficiently for the last 20 years or so. I can't think of any way that we have radically changed anything.

Have you put in practice any measure to improve the flow of the department?

The main problem with the SeHCATs is that you take the collimator off the camera (so is converted into a whole body counter) which then makes it so ridiculous sensitive to the radiation that we can't have any other radioactive patients anywhere around including in the other camera or waiting close to the camera. So what we were doing was either doing SeHCATs after 5 o'clock going to an evening (when the other cameras finished) or we would do SeHCAT studies on Saturday when there was nobody else around. But because the SeHCAT demand has now dropped we are now able to do SeHCATs during the working day but we do need to juggle it so that no patients interfere. What we are now doing is having our radioactive patients, for other examinations, waiting in the main X-ray area away from the nuclear medicine so that they don't interfere with the SeHCATs when SeHCATs come around. So we were adjusting the way that we performed the tests, baring in mind limitations that we have with other examinations going on at the same time. That is evolving so I guess that could be an example of where the things changed.

29. Do you have specific weekdays for determined exams and why do you have that structure?

Yes, the cardiac studies are done on Mondays, Tuesdays and Thursdays because that's when we have cardiac stress nurses. The SeHCATs we try to do on the other two days of the week so that they don't clash with the cardiacs and to minimize disruptions. But apart from that we do the other range of examinations on all 5 days in the week.

We have tried to group things together for efficiency, particularly in times in the past when there were technetium shortages. We did try to run clinics where we were doing 6 DMSA scans in one day or 6 bones in one day but the nature of our demands is such that it's actually quite difficult to group patients like that because we actually don't have sufficient numbers to justify having a day of DMSAs only, or a day of bones only, particularly because a lot of the bone scans need to go for SPECT/CT. So each one of those takes a minimum of an hour so there's actually only about 3-4 bone SPECT/CTs that you could fit in a day anyway. Where necessary yes, we have tried to group examinations.

Patient level:

30. What measures are taken when patients do not attend?

It varies. The basic line is that if they don't attend then it is logged in the hospital computer as DNA and the patient then has to go back to the referring consultant for them to generate a new request. It is only generated when the patient informs their referring consultant that they have DNA and then the referring consultant has to re-generate a request. It is not automatically re-generated just by the fact that the patient has DNA.

31. What measures are done to decrease the rate of DNA?

We instruct all our patients to telephone us as soon as they have received the appointment to confirm that they are intending to keep the appointment. For the expensive examinations where we are using expensive radiotracers if the patient doesn't ring us we make every attempt to contact the patient and ask if they are intending to keep the appointment.

We expect everyone to call us but we would call them for expensive tests if they have not already confirmed. We still keep the other patients in the list if they don´t call us and we do attempt to ring them but I have the prerogative to make a decision whether or not we will order the tracer for the patient if they have not confirmed. Generally if it's an inexpensive tracer and we are going to be using that tracer for other patients on the same day then we will give them the benefit of the doubt and we will order sufficient tracer for the patient who has not confirmed. If it is an expensive tracer and they have not confirmed and we have not been able to contact them then we will not order the tracer. So if the patients then arrive we will have to re-schedule their appointments and inform them that they did not follow our instructions so we don't have the tracer.

32. What measures are you taking to decrease the cancellation rate in inpatients due to human resources mistakes (e.g: wrong preparation, late transport)?

Wrong preparation, we try to avoid that by making sure that the nurse looking after the patient is aware of the preparation prior to the appointment and we ring them. We also send information letters up to the ward or if it's for a cardiac scan, one of the cardiac nurses will physically go up to ward and talk to either the patient or staff looking after the patient. So we do everything that we can to make sure that this information is

passed on. With most inpatient examination we will contact the ward the day before the examination to check that the examination is still required and that the patient is going to be available and that whatever preparation list required is being adhered to.

We see so few inpatients it's difficult to say but there are very few who we have to re-schedule because they have not followed the instructions one way or another. It's a very small percentage.

33. What time targets do you have for the time between the patient arrival and then being seen?

We don't have an official target but I would say unofficially no more than 15 minutes.

IT level:

34. What are the advantages/disadvantages of your IT system?

There is no computer log in the way that the request is received, but pretty much every other stage is being computerised. The advantages are: auditing and efficiency.

35. Does the NMD website have updated information for referrers/patients?

Not that I am aware of, no. The IT is the responsible ones.

36. Does the NMD website contain the prices for private services?

No. The prices are obviously known to the private patients care's office but….I am sure the consultants here are aware of them but the technicians are not.

Final Questions:

37. What are your future steps to improve the budget/operational management for the department?

We are almost certainly going to be replacing the existing SPECT camera with a SPECT/CT, probably next financial year. So baring in mind what's happened with the existing SPECT/CT when that was installed (we generated new demand for SPECT/CT examinations) with the second camera I would imagine that the demand will increase.

38. Do you have any questions or comments?

Interview no. 7

Duration: 0h34min

Date/Time: 24/06/2015 at 09:40

Part 1- Department Characterization

1. **What divisional group does your department belong to?** Imaging is in the Clinical academic group of clinical support services.
2. **Which scans are the most common?** Bone and MPSs.
3. **How many:**

a) Gamma-Cameras- 7 (3 are SPECT-CT) **b) PET/CT-** 1 **c) DEXA-** 0

d) Injection Rooms- 7 **e) Consultants-** 3 (1 Part-time)

f) Technologists/Radiographers (Band5- 1**) (Band6-** 10**) (Band7-** 5**)**

(Band8a- 1; **8d-** 1**) g) Nurses-** 3

4. **What is the mean number of patients per day?** 40 patients in NM; 12 PET.
5. **Opening time:** 8.30am-5pm. Then we do several Saturdays cardiac work and every second Saturday we run a full day of PET-CT as well.

Part 2- Interviewee Characterization

6. **Job title:** Head of Radiopharmacy and Nuclear Medicine.
7. **Qualifications:** Bachelor of Pharmacy, followed by an MSc (nuclear medicine), and then a PhD.
8. **How long have you been working as (job title) in this organization?** Since 2010.
9. **How long have you been working as (job title)?** Since 2007.
10. **What do you consider to be the most important tasks of a (job title)?**

Three things: One and by far above the others is that my department gives good and efficient patient care. Number 2 is ensuring that staff and equipment are adequate and number 3 is fiscal prudence, ensuring we have enough money or make enough money or whatever we need to do.

11. What do you consider to be the most demanding tasks that you have to carry out and why?

The most difficult task and the one I dislike most is being the person who has to be political to stop difficult relationships between staff within the department or between other people. I think I am fairly good in doing it but I hate it.

Part 3- Financial related questions

12. In your opinion, what has PbR introduced compared with the previous financial model in terms of patient and financial outcomes?

Frankly, I don't think it has changed anything for me.

13. In the context of Radiology, is the PbR system improving or worsening the patients' outcome?

I think it's neutral, I don't think it does anything better or worse. I mean we should take care of patients independently of the financial model.

In your opinion, did the scan number increase with the implementation of PbR?

No. And I'll tell you why. I think although I am like an eagle looking at my monthly budget statements, I delve deeply into it, the whole aspect of income for patient work is not transparent and neither do I feel it is honest. And by honest I mean there is no financial mistakes, by honest I mean there is one study where the total study costs my department 1.200 per study and the reimbursement is £193. I just don't think that's an honest compensation for the work that I have to do and that is for a DATScan. The drug alone is £800 and through PbR I receive £193, so I just disagree with that sort of compensation.

14. According to the amount of requests that your department receives...

a) Is there any area that you may think that your department may need to increase the capacity?

I would like more capacity for PET-CT but our hands are tight because the commissioners only pay a certain amount per annum and not more so although the

demand is fairly high I am concerned that if I open the flood gates I don't get paid. PET-CT is not a part of PbR so it's locally agreed and as a high cost treatment.

b) Or decrease the offer?

No.

c) If yes, which factors are against those changes?

(Explained above)

15. Is the department budget covering all the expenses?

That's a very open ended question. I have just told you that I don't think the income aspect is transparent. Also we have to give up a lot of money to central finance of things we over perform which we don't necessarily like doing but for the most part it covers all our demands.

16. Do you feel the need to save/reduce expenses?

Constantly. At this organisation we call them CIPs, cost improvement plans. Every year I have to give up approximately 6 % of my budget. I don't know until when, in terms of strategy, financial strategy. I have other academic things to worry about but for the moment it's being every year about 6 %

17. Since you have been working at this Trust, have you put in practice any measure to decrease costs...

a) In staff?

Oh yes, many. Stopping all agency staff, having people belonging to staff bank and then using those for overtime etc. and I guess the most important aspect is by honestly creating new jobs when I need more people so writing business cases and getting more staff so that there is no agency expense.

b) In equipment?

That is out my hands. We have a managed equipment service, so all the service charges are paid centrally. It's not part of my budget anymore.

c) In consumables?

Yes, so we are as much as time allows quite driven to get the cheapest consumables whether it's sharing with another department to buy gloves or needles or syringes or such. We have very little schemes so cost saving or reducing expenses is continuously on our minds.

18. **Do you consider that the tariff for NM procedures corresponds to the reference costs and why?**

No. I don't know why the tariff is so low, I don't know who to talk to. I am so busy with the day job that you really need someone else to pick up these inaccuracies in the tariffs.

I mean I am not saying it's not correct. It corresponds well for many things but for other things it's clearly outdated.

Have you ever considered decreasing the type of scans whose procedure cost overweighs the earnings?

No, I would never do that. I think that's morally bad so I will never stop something but for new expensive therapies or diagnostics I will not start them until the referring department ensures me that they have money to transfer to.

19. **Have you ever done any analysis on the real cost of a specific exam against the cost paid for the exam?**

No.

20. **What strategies do you put in action to attract income?**

I am rather good at generating income, by selling radiopharmaceuticals, over-performing in PET and some private clinical services. I typically have a little drinks party without alcohol mostly. After work we are inviting consultants, for example oncologists, and we have a little display of a new technique or whatever and then we hope they will refer their private patients to us.

21. **In which activities does the department receive higher income?**

Radiopharmacy, PET and private patients.

22. In your opinion, what is the effect of non NHS income in NHS patients?

Private patients are such a small percentage, that it's insignificant. We also will never do a private patient if it has a negative effect on an NHS patient. So I won't schedule a private patient if there is an NHS patient waiting for that slot. I work quite moral about this.

23. In your opinion, what implications does the bank/locum staff have on the budget?

Number one: we don't have locum staff anymore. Number two: We only hire bank staff when that particular need is not budgeted for and that's a way to get staff to get the work done. Locum staff has a negative effect on the budget.

24. What implications on the budget/management would your department have if it belonged/not belonged to an NHS FT?

I don't think it has. Because I was head of a nuclear medicine at a FT department and I don't see any benefits. Not for me…..I think for the organisation it benefits: Have you handled your estate? Can you sell this land? Can you charge for parking? But in terms of day-to-day operation I don't think anything. There is no effect on the budget for small departments.

25. In your opinion, what advantages and disadvantages would your department have if it worked 7 days per week?

So I think for the patients absolutely. I think that's what we should do. For the department, it depends whether you consider the department people or a service. I think the service would benefit, we would use our technetium generators better etc. but I am worried about the funding for staff in 7 days a week. I think about this a lot. We already do Saturdays. I think there are two models: the people who are really against 7 days a week working will tell you that we have to pay people a lot to work on a Saturday or a Sunday. I think what one should do is just schedule some people that they work Wednesday to Sunday and have two days off. But you still need more normal staff to fill that gap. 7 days working, one needs an uplift of, I don't know, 35 % on your staffing budget

Part 4: Operational management related questions

Departmental level:

26. **What are the advantages or disadvantages of having an own porter/central portering system?**

We don't have our own porters. We used to have our own porters years ago when I arrived here but we felt that when there is great need for porters the one or two porters we had couldn't do everything and then there were times they just sat and do nothing. So I am a proponent of central portering. Central portering's biggest weakness is time delays to get to the patient.

27. **Is your department involved in research studies with external institutions? (If not, what is the importance that you give to research?) (If yes, what are the implications in the budget and importance to the department?)**

Yes, we are. Research is a little portion of our academic activities. Clearly there are benefits for us and therefore for the patient we hope and there are financial benefits. The money goes to our own lead department and then hopefully at some point it comes back into our budget.

28. **According to National Framework for Service Improvement in Radiology (NFSIR) there are two important methodologies for service improvement: ''lean'' thinking and process mapping. Is the patient pathway according to these practices?**

Yes, we've done lean. Example: Looking at our booking system and taking that through lean. There was some advantage but not huge. It was forced upon us and it probably changed our staff hierarchy a bit.

29. **Do you have specific weekdays for determined exams and why do you have that structure?**

Yes, we do. I mean the most obvious advantage is availability of special staff on certain days and if you have to make up a vial of radiopharmaceutical you make up a big vial on 3 days rather than a little bit on 5 days or 7 days.

It sort of has benefits for the consultants staffing group because they can't be everywhere so if you do cardiac stresses only 2 days a week etc. then…we have 5 sites so the consultants, me and many people can't be everywhere at the same time. There are benefits to that.

Patient level:

30. What measures are taken when patients do not attend?

After the second DNA we send the referral back to the referrer.

31. What measures are done to decrease the rate of DNA?

I think we have a low DNA rate. For expensive and cardiac studies we sort of remind people of their appointments by telephone.

32. What measures are you taking to decrease the cancellation rate in inpatients due to human resources mistakes (e.g: wrong preparation, late transport)?

Especially in PET we now charge the ward or the department who referred the patient if they missed to prepare the patient. So every month we have a list of 2 or 3 DNAs of inpatients who had a cup of coffee before a study or got glucose before a PET scan and then we charge the referring department but only inpatients from this hospital. We don´t receive so many patients from other hospitals.

33. What time targets do you have for the time between the patient arrival and then being seen?

Normally as soon as they come.

IT level:

34. What are the advantages/disadvantages of your IT system?

It's a huge advantage to be computerised because we are on so many sites and from anywhere in the nuclear medicine at (institution) you could find the referral, you can look at the scan and you can find all patient notes. Every site has one reporting room, so we have 5. But we also have a Hermes system so any consultant can be at any site and report all the other studies. It is much more efficient.

35. Does the NMD website have updated information for referrers/patients?

I don't know to be honest. Communications department are the ones that are responsible. I get questions from them now and then always within one hour I send them the information back. But I don't look….

36. Does the NMD website contain the prices for private services?

No. It's not our policy to put prices on our website.

Final Questions:

37. What are your future steps to improve the budget/operational management for the department?

Many big projects. So there are always new costumers for the radiopharmacy, more private patients and more PET. It's the same refrain you can take from what I've said previously but we actively work on those things and I guess then there is a fourth aspect and that is new therapies in nuclear medicine. I share meetings and we are starting new therapies. It is a good thing for the patient and it probably will bring some income.

38. Do you have any questions or comments?

No.

Interview no. 8

Duration: 1h05min

Date: 1/07/2015 at 17:05

Part 1- Department Characterization

1. **What divisional group does your department belong to?** Surgery and Imaging.
2. **Which scans are the most common?** Bone and Cardiac Scans.
3. **How many:**

a) **Gamma-Cameras-** 1 **b) PET/CT-** 0 **c) DEXA-** 1

d) **Injection Rooms-** 1 **e) Consultants-** 1 **(**2 Part-time**)**

f) **Technologists/Radiographers (Band5-** 0**) (Band6-** 5**) (Band7-** 1**) (Band8a-** 1**)**

g) **Nurses-** 0

4. **What is the mean number of patients per day?** 8-10 patients in NM.
5. **Opening time:** 8am-7.30pm.

Part 2- Interviewee Characterization

6. **Job title:** Unit Manager.
7. **Qualifications:** Post-Grad in Nuclear Medicine, Short courses of Management through NHS.
8. **How long have you been working as (job title) in this organization?** Since 2012.
9. **How long have you been working as (job title)?** Since 2005.
10. **What do you consider to be the most important tasks of a (job title)?**

Obviously it's looking after your patient clinically, that's the most important thing. I think if you ask me admin work is important because most managers would probably be working mainly in admin but here I have a lot of clinical responsibility. The daily running of the department depends on me being available to help so I'd say clinically will be the most important aspect of it, looking after your patients, making sure that there is all scheduled, everyone is doing the right thing.

11. What do you consider to be the most demanding tasks that you carry out and why?

Most demanding is possibly doing the two tasks and having enough time to do it because just imagine we're working a long shift and from 9-5 the outpatient's clinics are open. There are troubleshooting to do, there are questions to answer, your phone keeps ringing while you are doing patients and you're meant to be doing an admin work and you just don't have time for that. It's finding that time when it's quiet but sometimes it is never quiet to do your admin work. That is the most demanding thing, getting yourself organising to finish all the tasks that you need to do.

Part 3- Financial related questions

12. In your opinion, what has PbR introduced compared with the previous financial model in terms of patient and financial outcomes?

I don´t know what PbR is. I must say, because I came from the private sector, all these budget things are just starting to come to me right now and I don't really get to attend the budget meetings. It's all more senior managers of the radiology department that goes to that. So what we tend to know is what happened in the meeting but to compare one to the other I have no way of knowing what the other was, the first one, to be able to comment on the new one.

13. In the context of Radiology, is the PbR system improving or worsening the patients' outcome?

(The PbR system was explained briefly.) The PbR system sounds much more reasonable because you get paid for the work that you do instead of you just working with whatever money that's been drawn to you because you have targets to keep. Let's say you have one million pounds to work on and you're meant to be doing two million worth of patients, how are you going to manage that with that one million pounds you been giving? So you're going to cut corners and that's just not good. But if you got paid for every scan that you do that means that you are being compensated for the capacity and the amount of patients you should do. So obviously if we do more we get more

money but that means that you don't have to cut corners because you get money from the actual jump that you do. Like, I just think that if you're meant to be doing 200 patients within a certain budget and you know that budget is not enough then obviously either the quality of care to the patient will suffer or it's just not going to work. The staff will suffer, they might move because they're not happy, they're overworked, something will give in. But if you are being paid in proportion to the work that you do then that sounds more reasonable I think. I don't know how much money you get paid for it whether that amount is reasonable but if it grows then your money grows with it, it's proportional, it's not like you're stuck with whatever budget gets throw up to you.

In your opinion, did the scan number increase with the implementation of PbR?

With nuclear medicine it's not…the doctors can refer and refer and refer but they get vetted anyway. It's not like you can just give patients radiations whenever they want, it's not like ultrasound you can repeat and repeat. So it gets vetted, it gets filtered, it gets controlled. I don't think that happens in nuclear medicine. For the other part of the hospital it probably does but in imaging, involving radiation it's probably unlikely.

14. According to the amount of requests that your department receives...

a) Is there any area that you may think that your department may need to increase the capacity?

DEXA at the moment. I manage nuclear medicine and DEXA so I can only speak for those. I am sure the other managers have their own dots and I know that they are short as well but at the moment in nuclear medicine it's pretty much steady about 3.000 scans a year. But in DEXA the demand has increased a lot and we've been opening ad hoc sessions to cope with it.

b) Or decrease the offer?

Not really.

c) If yes, which factors are against those changes?

Due to the fact that DEXA sessions are only run twice a week and the people that runs a DEXA scanner is pretty much the same people that does nuclear medicine (and in nuclear medicine we are working extended hours at the moment) what we tend to do is:

if it is quiet in nuclear medicine we open the ad hoc sessions on the day, so we don't take staff from the other part of the department. That means we just use the resource that is already there but it's not being used because nuclear medicine is busy. What I also tend to do is what I did on Monday. Monday is our cardiac sessions so we stress our patients but our doctor is already on holiday, so the morning there will be no cardiac list apart from resting scans. The stress in the morning was pretty quiet so I've opened the DEXA list in the morning. That means one of us can go there and do the sessions but that's how it's done at the moment. It's like patching things up really. It's not a proper solution to the problem. I think the proper solution is to deliver a business case to the people concern and say that it has increased. We need an extra radiographer but then, there is a problem: "Is there money available to do that?" The problem is that there is a deficit and obviously with a deficit even if there is more demand you have to solve that deficit first before you can demand for more radiographers. If the Trust is already in deficit, they own money already, they won't have that money to provide a radiographer for me. If you have to pay a debt, you have to pay a debt first before you can move forward making the service better. So at the moment what you can only do is patch things or what I do is to patch things with the resources that I have and are available. It's not the ideal way of doing it because "What if we were always busy here, that means that we would never get sorted?"

15. Is the department budget covering all the expenses?

I don't know. Probably not. But I don't go to the budget meetings.

16. Do you feel the need to save/reduce expenses?

Actually the reason why we changed our working hours was to save money. We were asked as managers to do cost cutting measures. I said to them that we usually run 3 cardiac lists a week and each cardiac vial is about £250, so if we cut one day and extend the hours (you know with the radiopharmaceutical they're much "hotter" in the morning), the more you inject the more you can get from your vial. So if we extend our sessions you get one day off the cardiac list that saves us £250 a week which is 13.000 a year. This is part of our sort of monthly managers meeting. We go through a list of

problems that we encounter in the department and we get asked: “What sort of measures do you think?” or “Is there something like work from outside that we can put in, is there capacity to do it?”, “How can we do it just to get more money in the department or maybe cut down the force?” But we have that in our department locally but divisionally, the division manager asked us to do a presentation and he took in consideration what told him.

17. **Since you have been working at this Trust, have you put in practice any measure to decrease costs...**

a) **In staff?**

In staff, no. When I got here there was no band 7 so I kind of made sure that there should be a band 7 because it is necessary. So it’s not actually to cut cost, it’s actually increasing. But there was a band 7, that wasn’t something that was created from nowhere, there was something that was neglected and wasn’t replaced. There was a band 7 here before and a band 8a. Between the two of them they were running both the DEXA and the nuclear medicine so it was just neglected that the band 7 wasn’t replaced. I just made sure that we get that person. But what it tends to happen is obviously nuclear medicine it’s a little bit specialised area so we have students who rotate and eventually get absorbed as band 5. What I did, because obviously we can’t hire band 6, I had a couple of band 6 guys here who were doing their rotation in nuclear medicine but they got interested in other stuff and they then left so I got stuck with band 5 rotating through the department. So instead of hiring a band 6 from outside I trained the band 5 and I put them through a post-graduate course so that they have their necessary skills and knowledge and I think they just finished their exams so they are about to be nuclear medicine technicians.

b) **In equipment?**

In equipment no, because we only have one gamma camera scanner. Actually if you changed that it would be increasing. But I am trying to think where we have saved money. Not really …

c) **In consumables?**

I see this as a consumable savings because for our cardiac patients we used to send the cardiac asthmatic patients to other hospitals to do their dobutamine scans and what we've done is we've developed the pharmacologic stress with regadenoson so that way we don't have to send them to another hospital, although the regadenoson is slightly more expensive than adenosine but then sending them to another hospital would cost at least £500 and the regadenoson is much cheaper than that.

Oh, and there is also one thing I did: we only do one DATscan session a month. Basically I made the DNA lower for the DATscan patients by getting one of the admin people to be a dedicated nuclear medicine appointment booker and that way she can, with the DATscans and the more expensive radioisotopes, call and confirm the patients before their appointment. I made this booking confirmation worksheet where she goes through a list of questions so like for DATscan patients things that you can easily overlook by the sending out the letter: "Are you allergic to iodine?" When you're allergic to iodine obviously you can't do the DATscan. It's not a cheap isotope. If they can't lie down flat….things like that. Can they follow instructions? Are they mentally able to understand instructions? That did a lot of difference. So I have saved the hospital at least £1.000 a month by doing that and to the cost of a band 3 staff that need a couple of hours every time to ring every month to make sure those patients will come.

18. Do you consider that the tariff for NM procedures corresponds to the reference costs and why?

As I said I came from the private sector and I didn't know anything about tariff so we don't have that kind of thing. What I found here is that I think it happens a lot in nuclear medicine, it's a misunderstood area. Not a lot of people can recognize the cost of radioisotopes and I think with the tariffs sometimes for certain scans the complexity of it is not considered. Let's say an indium white cell scan or a gallium scan that takes 3 days to do will be like a category 2 where it should be a category 3, something like that, or maybe a DATscan that sounds like simple to do but because the isotope is very expensive something doesn't get into consideration. I don't know the actual tariffs that correspond to each scan because as I said I don't deal with those kind of stuff but there was one time when I had a meeting with one of the finance people and he went through tariffs with me

and I noticed certain things that just don´t fit. To be honest I don't understand how tariff works. One said to me that sometimes if you are an oncology patient, you get diagnosed with cancer, you are given a certain amount of budget where you can do so many kinds of scans and so many different scans for that amount of money, these people get paid. And the tariff is created based on that but I don't really understand how…

19. **Have you ever done any analysis on the real cost of a specific exam against the cost paid for the exam?**

    No.

20. **What strategies do you put in action to attract income?**

With the DEXA what we are trying to do because it's a cheaper referral and obviously you get a lot of money for that, it's we're trying to make sure that the schedules are much lower, we don't want our patients to wait a long time to get the scans done, to encourage them to come to send more patients. The GPs sometimes would like you to do the patient as soon as possible so we try to accommodate that and obviously if our waiting list is low then it's much easier for us to do that. We have more EBS (like choose and book) slots, to allow them to choose and book whenever they want. It makes it more flexible to them.

For the "choose and book" they have like 3 slots in each session for that which is more than enough I think. What we tend to do is: we look at it and if I am booking today and the next 2 sessions for the next 2 weeks, if there are EBS slots that are free we put outpatients and it doesn't get wasted. That's what I did as well. I asked for a dedicated admin person to do that for me. And that way when something is not correct she tells and we solve it out straight away. That way the waiting list doesn't go really, really big and we get all the GP scans sorted before it.

They still send the referrals as normal but they can also choose and book. The patient can ring and say: "I want to go for a DEXA scan. What are the slots available?" and they say: "There is one at 11 o'clock on Monday." Then they can choose. What I did to make it better for them is to have more EBS slots available and I have my admin person monitor those EBS slots so that they don't get wasted, that if they haven't been chosen by

our patients to book themselves in that she puts another patient in there and calls and says: “Can you come on this day?”

21. In which activities does the department receive higher income?

Because the bones there’s lots of them they’re not a higher category tariff so cardiacs possibly because that should be at least a category 4.

22. In your opinion, what is the effect of non NHS income in NHS patients?

To be honest with the state of the NHS at the moment generally speaking, I am not speaking about here, any money that you can get from anywhere as a source of income will be beneficial to everyone who benefits, may that be private or may that be a NHS patient. Just private patient that comes to the NHS and pays money doesn’t get special nurses. They get the same nurses who may be non-motivated to work if they are overworked but may be motivated to work if there was enough staff which can be provided by the money funded by the private sector coming into the department. So basically what I am saying is the quality of care doesn’t change whether you are private or from the NHS. I don’t think so. I don’t think the nurses come to work and say: “I am working with a private patient today I am going to treat him especially nicer than the other one.“

I think the quality is improved because it helps with the money. It helps that NHS earns more money with the facilities they have and the resources they have already and to be quite honest I think the way for the NHS to go more forward is by making it semi-private. That the people need to pay some amount of money, not everyone, certain individuals who are able to pay a small amount even to have the government because if not I don’t think the NHS….it’s either you keep it or you lose it, that’s the only way. I don’t think it’s going to hang on like this for a long time.

I suppose we have paid a little of taxes and that’s why some people are reluctant to do it. NHS is a very big company or institution and it’s failing so much at the moment. If you are going to keep that mindset that you’ve done your share and you’re paid the government can’t put it out. You have to be open minded. It needs money to be injected. Obviously the plan for it was done properly in the beginning. They didn´t ambition elderly

people needing all of this care at this point. You have to keep an open mind and say that even if you paid your taxes somehow if you want to keep it as it is, nice and cheap, not free anymore but still nice and cheap compared to other European countries then you have got to keep an open mind and be prepared to give some money back. That's the way I think about it.

23. **In your opinion, what implications does the bank/locum staff have on the budget?**

I don't understand it. What I mean is: I feel that in nuclear medicine you can't have a locum staff that comes in and goes in the week. If you are ever going to get locum staff here that is because you need it. It's not like you can top up if you are just short for the day. In the ward they can call bank or locum saying: "We are short of nurses, can you send one?" But in nuclear medicine it won't happen that you have one locum staff for a day and you don't have for the rest of the week. So I think in here you have one when it's necessary, which is when someone had an operation or a maternity cover, things like that. In that sense it's reasonable because it's long periods of time. What I don't like about locum staff sometimes is that they go in and out, they don't really know what is going on in the department and you end up teaching them instead of them helping you. They're actually making your work double. So it's like training someone else and if they don't stay long enough that means that you're just training them and sending them away so you don't really benefit. It's just certainly having a second person but you actually don't. But if it's like for a long term to cover sickness or maternity even if you train them for the first week if they are going to stay for the 6 months to help you then you've benefit from it even if you pay them extra money. In the wards it doesn't work like that, they could change on a daily basis and it might be that you have someone coming in here that has never been in your department. How do you know where the drugs are and stuff like that? So I think in that sense then it's a bit more difficult for them.

It has negative impact on the budget. I think it's a chicken and egg situation. You have a department that requires a certain number of staff but you don't have the budget to provide that number of staff. Now when you fall short then you get the locum to work in your department where you pay them almost the double of the price of what you

should have been paying for in the first place, which would eat your budget anyway. So I think if it can be avoided, to me if you have a department that has enough number of people staff are motivated to work harder, staff are motivated to not be sick because that happens, they are stressed, and you won't need any from locum. But then again you need the NHS to provide enough number of people for you. So I can't say that I don't need the locum people because they are necessary but until the NHS corrects or have enough money to provide the necessary number of staff that they need, then the locum work will be needed. It has a negative impact in the budget because you pay more money, you pay the agency and you pay money for the locum person as well, compared to your regular staff.

24. **What implications on the budget/management would your department have if it belonged/not belonged to an NHS FT?**

With the Foundation status you get more money for it, you get more support financially. Am I correct? I think that's what it is like. (Another NHS institution) is a Foundation Trust; it's a really big hospital whereas this is a district general.

25. **In your opinion, what advantages and disadvantages would your department have if it worked 7 days per week?**

It's not needed for nuclear medicine because I don't think there is a need for the extra two days and we haven't got that demand to be working for an extra two days. We would lose money, definitively, because you need more staff to cover the shifts. We are working with the radiation as I said earlier. You want to make the most use of the radiotracer as much as you can in the day so if you have 20.000 GBq of *Sestamibi* you'd like to inject that 20.000 GBq to as much patients as you can because you only pay for one vial. That doesn't cost you anymore. If you injected 10 or you injected 20 patients it costs you the same. So I think the way to work in nuclear medicine is to extend the hours rather than to add more days and which is what we've done here.

Part 4: Operational management related questions

Departmental level:

26. **What are the advantages or disadvantages of having an own porter/central portering system?**

Radiology has its own porter and we are part of it. It's always an advantage to have your own because they'll be at your disposal, especially in nuclear medicine when you have a specific scanning time and you need the patient. If you have your porter sitting right waiting for being called then you have your patient on the table right on time. We have one shared with the rest of the department and even that is difficult. Like, if there are two bed patients coming down for MRI you might need to wait for another half an hour before you can get your own patient for nuclear medicine. And to centralise, take the radiology porters out and just put one central, I think that is even more complicated. So it does make a difference to have your own porter but then you have to have enough work for that porter so that he is just not sitting there all the time.

Another advantage is that the communication with our porter is much better because they are just outside and it's a smaller group to handle basically.

27. **Is your department involved in research studies with external institutions? (If not, what is the importance that you give to research?) (If yes, what are the implications in the budget and importance to the department?)**

It's not that it's not necessary. It's just none at the moment. No one wants to do research, we haven't had a research proposal for a while. It's been a constant question on our meetings: Have we had any research proposal? And it's just not there but we don't mind having one. It depends on how complicated it is. There can be quite complicated things so as long as it can be handled it would be good to do research because obviously your knowledge gets wider, you tend to be exposed to things that you don't normally do and makes you think. As long as we can cope with the amount of work I don't see any reason why we shouldn't.

28. **According to National Framework for Service Improvement in Radiology (NFSIR) there are two important methodologies for service improvement: ''lean''**

thinking and process mapping. Is the patient pathway according to these practices?

I don't know these two.

Have put in practice any measure to improve the flow of the department?

Like our vetting process for the referrals (this is something that has been existing here when I got here). In other hospitals where I have worked, the vetting process is done by either physicists or the doctors of the department. Here we have been dedicated as technologists to vet certain scans based on a protocol, obviously when you get handed in an oncology form bone scan that is quite straight forward. We could give an appointment straight away right there. So those things have been addressed and we are doing it unconsciously I should say. Also, what we've done is the V/Q referral pathway, our doctor created this pathway which we follow: If no asthma, under 50 up to 40, normal X-ray, you can vet yourself.

The advantage is obviously the waiting time. Especially with oncology patients, target patients, private patients, you can give them the appointment that they need straight away without having to wait for someone to vet it. So if we have a free slot the following day, we can cover in the following day. At the moment with the way we are working sometimes we do them on the same day, so no need to wait. The patients here came from the outpatients' clinic, they come here asking: "Can we do a bone scan?" "When are you free?" "Are you free today?" Vetted it….done. It's really quick so it could be a one stop shop if it allows.

29. Do you have specific weekdays for determined exams and why do you have that structure?

There are different exams spread across the week to make them available so if we receive like a MAG3 request today I know that I need to have MAG3 stuff tomorrow. Only cardiacs and DATScan are specifically booked on particular days. It's because of the availability of the consultant to stress and for the DATScans it has to do with our license to hold Iodine-123 and also to save some money with the delivery, we try to put them all in one day. The other scans are fairly regular and they need to be regularly available so like bone scans you need them available every day. You spread them across the week.

Patient level:

30. What measures are taken when patients do not attend?

We confirm the scan two days before so that we know whether they followed the instructions, stop medications and stuff like that and if they didn't then we can move them to a free slot and we can give it to someone else. And actually I was been told last week that the DNA rate in nuclear medicine is just 3 % and mostly those are the patients that have the wrong telephone numbers on the system, and we can't hold them to confirm. But for the DNA if they just didn't show up, or didn´t call whatsoever, as far as I know the referrals are put on hold until we get another referral or until the doctor calls in to say: "This patient was referred for this but she was given an appointment. She didn't show up" or sometimes what they claim to say is: "I never really had that appointment." So if that is the matter then we'll ask for a new referral and do the scan.

Obviously it depends on the situation. If it's a cardiac or paediatric patient then we tend to accommodate them. Elderly, obviously, if they are late because of the transport and the radiopharmaceutical is expired we can't do anything, we just have to re-book and it's not their fault or sometimes if they are late because they are not feeling well, we try to renew, things like that. We need to be a bit more flexible.

31. What measures are done to decrease the rate of DNA?

We call for everyone two days before. The DATScan gets called in separately because what we tend to do is: we send the appointment and they are asked to give us a ring to give us the medications they take (because there is a list of medicines that they need to stop) and when they call in they get asked all these specific questions about lying down flat, understanding, any allergy. Then they are told that you need to confirm your appointment 2 weeks before your appointment, when we order the radiopharmaceuticals. If you don't confirm, we don't order for you and then two days before the appointments we still call them.

We just started doing that when we changed the shift. When we were working 9-5 we had no capacity to do that but because of these quiet times in the afternoon we are able to do that, we are more flexible.

32. What measures are you taking to decrease the cancellation rate in inpatients due to human resources mistakes (e.g: wrong preparation, late transport)?

I haven't solved that problem. What I tend to do is we just emphasise to the doctors and to the nurses, whoever we are talking to, that we will make an expense already just by booking this patient because we need to order the isotope. So we emphasise to them that just by you nodding to me and telling me that the patient will be available tomorrow in the morning at 9 o´clock already prepared, you've spent money already on that patient; and if she doesn't come then that's money wasted and a slot wasted that could be given to another patient. I think that's the way we tend to work on it. That we emphasise with this kind of stuff. You spend money first not after or not during so that they understand it, that they have to prepare. What we also tend to do is to talk to the doctor, get his details and make sure that we know each other by name so if there is anything that is wrong then at least I know who to come to. It's actually happened when one of the urology nurses (booking prostate cancer patients) came to us and said: "Can I book two patients in the next couple of days because their follow up is on Friday?" My colleague happily booked it and the nurse said: Well, I'll call the patients and let them know. None of those patients showed up. So I emailed the oncology, (there is a special person that sort of lays all the oncology work) and I said to him: "I have lost costs of isotopes and slots for other oncology patients because of what happened. From now on if you need a patient to be booked in, we'll give you an appointment but we won't order the dose unless you confirm that you have rung the patient and that they have said that they come and agreed to that." So those kinds of things, I think it helps but you just have to be a bit more vigilant about telling them because some people don't understand that it's important. Sentinel node patients, it happens that they changed her mind, that they won't have the surgery and then they don't tell you. Sentinel node is about £50 per patient so you lost £50 that day already and we told that if you have to cancel you have to let us know the day before, otherwise we are losing money.

For the nurses, inpatients, for the more complicated ones like cardiacs, because it's a lot of preparation, then we would give a paper with instructions but for more straight forwards, let's say, you just need to drink water, we just speak and then we just

put a note under. But for more complicated we do give them a small piece of paper that tells them exactly what to do.

33. What time targets do you have for the time between the patient arrival and then being seen?

Obviously you'd like to see them within the next 10-15 minutes and at the moment we are coping with that. The problem is when they are coming back for the scans (like bone scan patients) because if you had a patient that took a little bit longer in the toilet or took a little bit getting up or getting on, 10 minutes, and by the end of the day you'll be one hour late after 6 patients.

IT level:

34. What are the advantages/disadvantages of your IT system?

We have a new system and obviously people tend to not like any new, any changes. It is all computerised but there are certain doctors who still write the request form on the forms that they have. It gets handed in but we have an I-system where referrers are supposed to go through. We didn't use to scan patients referral but because of several referrals getting lost and you're not having it in nuclear medicine it matters a lot especially for things that we cannot vet. For paediatrics, cardiacs, you need a doctor to vet it and if the doctor is on holiday and there is no one else to vet the form that means (even if the paediatric patient has been cannulated) we don't have a form, we can't do anything. So it has happened something similar that I have a patient….no form and so the form wasn't from the I-System, it wasn't an electronically generated form, so it's not something that I can reprint. Actually even if I could have reprinted it wouldn't have the authorisation, the signature of the doctor. From then on we started scanning these documents.

The electronic system is better because you have a way of checking. It's not the best solution for the problem. I think, for me, everything should be electronic. We shouldn't accept non-electronic referrals and vetting should be electronic. That way once it's on the system, it is on the system. You can't change it unless the doctor changes it and

it's available for everyone to see. The only problem is if the system breaks down then….but it happens.

It's a bit silly when you have an electronic system and you are not using it when it's just so much advantageous. You keep a copy on the system that can be reprinted when necessary so if you lose it you just reprint it. That solves a lot of problems already. Sometimes it happens that if we lose a form and it's not electronic, one member of staff would be looking for it for two hours anywhere within the admin office and that's two hours of your staff resource is gone just for looking for one form and when you could be calling patients: "Can you show up tomorrow?" That risk could be lower.

35. Does the NMD website have updated information for referrers/patients?

We don't have a particular website for ourselves.

36. Does the NMD website contain the prices for private services?

-

Final Questions:

37. What are your future steps to improve the budget/operational management for the department?

In nuclear medicine what I think I need to do is to train more people because my radiographers are a cross train in different modalities and they get pulled to do other stuff. So I think my goal is to have a core of technologists and radiographers that rotate through nuclear medicine and DEXA as their main modalities and we do other modalities on the side when they're not here. I intend to get these slots in the diary a little bit more optimised basically. It's optimised at the moment but it can be improved. DEXA….. I would like to get a business proposal.

The business case was not proposed because of the DNA rate of the DEXA. With the DEXA we don't tend to call them two days before, it's just the nuclear medicine scans and the reason for that is the isotope cost. Some of the major manager thinks if we can get the DNA rate down then we could actually cope better so we don't need an ad hoc session. That's what they think… I don't think that.

To be quite honest, the reason why I don't do business case is because I know that there is no money out there available for me anyway. I am just being realistic. If it comes to a point when we have to open a DEXA session every week to cope then I will. At the moment it's like twice a month that we have to add a DEXA session. I must say that the DNA rates are quite big because it's an elderly population so if it snows they don't want to go out. Besides it's not something that you need to do straight away, it's not an urgent procedure so people just don't think it's necessary. If they don't feel like it they won't come.

38. Do you have any questions or comments?

Interview no. 9

Duration: 00h50min

Date: 08/07/2015 at 16:30

Part 1- Department Characterization

1. **What divisional group does your department belong to?** Imaging (Investigative Sciences).
2. **Which scans are the most common?** Bone scans, V/Q and PET/CT.
3. **How many:**

a) Gamma-Cameras- 5 (1 is SPECT/CT) **b) PET/CT-** 1 **c) DEXA-** 1

d) Injection Rooms- 3 **e) Consultants-** 5 **f) Technologists/Radiographers (Band5-** 0**) (Band6-** 4**) (Band7-** 7**) (Band 8a-** 2**) g) Nurses-** 0

4. **What is the mean number of patients per day?** 13 PET/CT; 20 DEXA.
5. **Opening time:** 9am-5pm.

Part 2- Interviewee Characterization

6. **Job title:** Superintendent Radiographer.
7. **Qualifications:** Diploma in NM; Reporting in NM.
8. **How long have you been working as (job title) in this organization?** Since 2003.
9. **How long have you been working as (job title)?** Since 2003.
10. **What do you consider to be the most important tasks of a (job title)?**

I think he needs to be able to manage all team and to manage the workload and the matter of knowing your team so that you create an environment that is confident to work. There is different people working in the team, different skills, different personalities and I think it's important for me to match the skills to the tasks. It's also important as a superintendent to stick to the targets because we have targets and so we need to stick to all the targets that are given to us. We need to make sure that patients appointments are up to the time and manner and patients are kept informed. And good imaging. We need to make sure that the staff and the imaging are fine. That would involve making sure that the staff are up-to-date with their technical

training and also things like manual handling and safety that they need to know and they need to be aware of the basic legislation. I think as a superintendent I need to make sure that they do that and that they have the necessary skills to do their jobs.

11. What do you consider to be the most demanding tasks that you carry out and why?

At the moment the most demanding thing is trying to schedule patients in a reasonable time scale because at the moment we have 2 cameras, which are very old and they keep breaking down. So the hardest thing at the moment for us really is trying to book patients at a decent time and to try to do that we constantly have to cancel patients. Also trying to keep within the breach date because you find that we get more and more patients, more and more referrals but there isn't any more resources so you have limited staff but the workload is increasing. So trying to maintain the workload with the resources that we have as it is, is very difficult. That's the hardest thing at the moment. If you had asked me a few years ago I would have said probably the hardest spot of managing is managing people because everyone is different and stuff. But now I would say that what is probably easier it's managing people. Now it's more managing patients with the resources that you have. There are no resources, you don't get extra staff, you don't get extra money, you've got old equipment, increase of patients, increase of workload and it continues to increase but there is not an increase of any resources to match that. That's the hardest thing.

Part 3- Financial related questions

12. In your opinion, what has PbR introduced compared with the previous financial model in terms of patient and financial outcomes?

Does the PbR affect everyone? I don´t know. I haven't really noticed any difference.

13. **In the context of Radiology, is the PbR system improving or worsening the patients' outcome?**

I haven't really noticed any difference. As far as I know we get money for the number of patients that we did so then at the end of the year you say: Ok, we did this amount of patients, it costs that much and we will get money for that amount of patients that we do. In the past, not too long ago before that what would happened was the different departments would have to pay for their imaging so there was a cross charging. I am not sure if that was everywhere but it was definitely at this Trust where we had cross charging so if the cardiologist sent a patient for a myocardial perfusion they would then get charged for that. That was the case up to a couple of years ago. Since the system has changed it's a better system. When we cross charged the different departments then the consultants were reluctant to send their patients because they all had budgets and they would try to stay within their budget. They were reluctant to send patients especially for more expensive tests. So Payment by Result is a better system as far as I'm concerned because you're not then restricted by what you do, what patients are referred for what tests. Consultants are not reluctant to send patients for certain tests.

In your opinion, did the scan number increase with the implementation of PbR?

Yes, but I don't know if it's because of PbR or if it's because of the type of work that we are now doing in NM has changed. In the last couple of years we are now doing more SPECT-CT, we do PET-CT so what we can offer is much better than what we could have done in the past. So I think that impact is the scans referred to us and not necessarily the financial system.

Do you think that the quality provided to the patient has changed?

I don't think it has much. Even when they come to the department they don´t notice much difference at all.

14. **According to the amount of requests that your department receives...**

a) **Is there any area that you may think that your department may need to increase the capacity?**

Cardiacs.

b) Or decrease the offer?

No.

c) If yes, which factors are against those changes?

No money, no staff**.**

15. Is the department budget covering all the expenses?

No. We always overspend. Radiopharmaceuticals, increased number of patients because the money that is given for the patients for a year is based on the last year and by going forward you quite often increase the number of patients so there is going to be an increase of patients number but the budget is based on the patients from the previous year. I think there is always a shortfall and as I said with the increasing of scans and new techniques in NM that we are able to offer the referrals are going up for PET/CT and orthopaedic SPECT/CT, but the money you get in the end of the year is based on the patients from the previous year. It doesn´t take into account the increases.

16. Do you feel the need to save/reduce expenses?

No. I think we are using it our best we can. We are always told not necessarily to reduce but we are advised to be as economical as you can, so try to not waste, try to get the cheapest supplier, try to get the studies together so you can use only a kit, to do everything you can reduce the costs of studies. The department as it is at the moment is very stretched, very understaffed, we have got a workload increasing so it is justifiable to say that we don't need to reduce the costs in terms of staff and patients. I don't see where we can reduce it. If anything we need to increase our team.

17. Since you have been working at this Trust, have you put in practice any measure to decrease costs...

a) In staff?

No, I personally haven't but since I have been here we had a consultation where our staffing was reduced, so across the three sites our staff was reduced by three. We lost 3 technologists which is why we find it so difficult at the moment to work it.

Why was the staff number reduced?

It was felt that we didn't need that amount of staff because of the workload. But at that time, SPECT/CT was just coming to the picture and we were doing PET/CT but they all increased in and they didn´t take that into account when the changes were made.

b) In equipment?

I need to say that we are not replacing them. No money.

c) In consumables?

We might just buy the cheaper versions but we did more little things like instead of nuclear medicine have their own deliveries, we now order through the rest of imaging so we've reduced our delivering costs in that way in the sense that everything is delivered to a main store instead of coming separately to us. We generally just review the stuff, we order over the time and if we can find a cheaper version then we do that. At the moment, actually we are looking to our V/Q scans. We use krypton and we are actually looking to see if in one of the other sites we can move to DTPA and that will reduce the costs. That's not really consumables, those are radiopharmaceuticals.

We are also looking into *technegas* as well. The difference is like: *technegas* has got quite a big outlay in the beginning, because of the units. So *technegas* can initially be quite expensive whereas DTPA we don't pay for the units, we only need to pay for the kits and they're quite cheap and then you just pay for the radiopharmaceuticals. There is no equipment involved but also krypton is usually on the standing order and you pay for the radiopharmaceutical whether if you use it or not. For a bottle of *technegas* we need to have an initial outlay. Also it only becomes cost effective depending on how many patients you do but that must be taking in account the quality of the images because some people say that DTPA images are not as good and are not as easy of acquiring.

18. Do you consider that the tariff for NM procedures corresponds to the reference costs and why?

Some of them, not all of the tariffs. Some of the tariffs what we charge are less than the costs. I think particularly some of the PET-CT tariffs don't actually match our costs when we take into account the radiopharmaceutical, tec time, doctors time, they are kind of grouped into groups, aren´t they? So the studies, I don't think they are

represented accurately. Some of the studies are put into tariffs and it's undercharged so we don't get what we actually should be getting.

Have you ever consider decreasing the type of scans whose procedure cost overweighs the earnings?

No

19. **Have you ever done any analysis on the real cost of a specific exam against the cost paid for the exam?**

No. I am not in charge of the finances or the budgets or anything like that. I do know that because we get a lot of outside referrals to us and when we check about the prices or what they can be charged because of the tariffs, the national tariff, we can't charge them what we think they could be charged. It's all within some rackets for certain tests. They go to our finance team and they will then tell them how much it will cost. But how much they can charge is quite often dependent by what the tariff is so you might find that you are doing a test but you are undercharging and it costs even more than actually what you are earning from it.

20. **What strategies do you put in action to attract income?**

I don´t know.

21. **In which activities does the department receive higher income?**

I would say from PET-CT.

22. **In your opinion, what is the effect of non NHS income in NHS patients?**

I would say it's significant but to be honest I don't really get involved in finance. Are our private patients important for the NHS? I think no. Personally I believe that the NHS should be able to stand on its own feet without the income from the private patients. But I think as it stands at the moment the private patients do provide significantly more income. It does make a difference to the NHS but I don't think it should be like that.

23. **In your opinion, what implications does the bank/locum staff have on the budget?**

It's kind of a mix, really, I am not sure about bank, but if you get agency staff, although the cost is initially very expensive, you then don´t have to cover sick leave, holiday leave, pension and stuff like that. So in terms of the budget I think long term it's cheaper but short term it's probably more expensive.

24. **What implications on the budget/management would your department have if it belonged/not belonged to an NHS FT?**

I don't know.

25. **In your opinion, what advantages and disadvantages would your department have if it worked 7 days per week?**

I think it would have advantages for patients, not for staff. It could possibly increase the income because you could increase the number of patients that you are doing but the most importantly is the patients that would be seen in a time of their manners. We would give the patients a choice, it´s a better service to patients because they can then prepare appointments around their social life and other commitments. So it's more a service to patients but I think it's more stressful for staff.

Do you think that the money coming from the patients would compensate the costs?

I am not sure because I would have thought you must have a significant increase of the number of patients and therefore money from those patients to cover the costs of the increased staff. You need to have a significant increase of patients I think.

Part 4: Operational management related questions

Department related questions:

26. **What are the advantages or disadvantages of having an own porter/central portering system?**

We share with X-ray. Our system works as part of X-ray so the X-ray porters at the moment are separated to the general clinic porters and that works well for us. When you have to use porters from the general pool then that doesn't work because you get

delays and because the porters have to go everywhere else. I think that when they are not working in x-ray or nuclear medicine they don't have appreciation of getting patients here on time. I think it's their job to get the patients here the way they can so I prefer to have porters local to the department. I think if they are part of a general pool you have got to call for them to come to X-ray and they are not going to prioritise X-ray, they probably just go in order of which the requests come. Whereas if you have got a porter up here in X-ray or in nuclear medicine you can say: "Ok, I want this patient at this time." Even as we do, I can go to a porter and I say: "Ok, this needs to be done now." And you can tell them: "You need to prioritise this patient prior to that patient." It works a lot better that way and you reduce the time you have to wait. So it's a better service and more efficient service, I think, for nuclear medicine if you have your own porters because you can then dictate when patients come to, which patients to bring. Whereas if it's a general pool I can't say: "Ok, my patient needs to come for...the patient has to go to the theatre or the patient has to go to outpatients or whatever."

27. **Is your department involved in research studies with external institutions? (If not, what is the importance that you give to research?) (If yes, what are the implications in the budget and importance to the department?)**

Yes. I think it's always good for staff, education, you keep them on the ball, it makes the job more interesting. In the long run it benefits the patients because the research also recruits treatment for patients. It does bring an income but I don't know how much and I don't know what difference it makes to the budget.

28. **According to National Framework for Service Improvement in Radiology (NFSIR) there are two important methodologies for service improvement: ''lean'' thinking and process mapping. Is the patient pathway according to these practices?**

I have heard of it but you might need to define them again… (Explanation given).

Especially with the cancer patients we tried to make sure that when the request comes, one particular person will pick up and then that person will book them so that those patients don't have to wait for a long time. We also have things in place like we will

check the referral list regularly and on a regular basis to make sure that all patients have been booked and there is not anymore waiting on the list for a long time to be booked. Mainly cancer patients we make sure that they are booked within two weeks. So we have processes in place that will allow as soon a request comes on, someone will look at that request and schedule that patient because cancer patients are normally done in two weeks but obviously other studies can wait up to 6 weeks. So we have different guidelines in place but we try to book all our patients within 6 weeks of the referral.

29. Do you have specific weekdays for determined exams and why do you have that structure?

Yes, we do and if necessary we make changes. We do our cardiacs on a Wednesday, on Monday and Wednesday we do our V/Q scans, on a Friday and Monday we also do DATScans but these are normally in place because it's cheaper to get radiopharmaceuticals on those days so things like DATScans we are trying to put them together because we have to pay the delivery cost and we have to pay for the personnel charge that is paid for Iodine-123. If we can group them together then we only get charged once so that's why we tend to group our patients together. We also do our paediatrics on a day and that's because the department is just having one waiting area and you are not supposed to mix paediatrics and adults.

I think sometimes it probably makes the department run a bit smoother if we can group studies together so for instance if on one day we do thyroids you don't have to swap between collimators all the time. So it does help to make the department run a bit smoother.

Patient level:

30. What measures are taken when patients do not attend?

It depends on what the study is and what the history is. For all patients if they do not attend a letter goes out to the patient to say: "You didn't attend for your appointment." A letter goes also out to the referrer to say: "Your patient did not attend." If it is a paediatric the patient would be automatically re-booked twice, they have two more chances. If it's a cancer patient they get one more re-booking automatically. If it

was not a cancer patient and it was not paediatric the letter goes to the referrer. If they want another appointment they have to go back to the referrer and he/she needs to refer them again and then we will book it. But we don't do automatically bookings.

31. What measures are done to decrease the rate of DNA?

We call all our PET patients but we don't call all patients here. We also encourage patients to call us to confirm their appointments. On the letter we say: "You need to call us to confirm the appointment." We try to make as much appointments by phone as possible but that is not always practical. We always send a letter by first class but when possible, we try and book it directly with the patient.

32. What measures are you taking to decrease the cancellation rate in inpatients due to human resources mistakes (e.g: wrong preparation, late transport)?

If it is an inpatient that we have to book we normally call the ward, we normally fax the details to them and tell them: "This patient has an appointment." We'll also fax the appointment letter to them to make sure that the ward gets the appointment letter. In that letter would be the preparation. For our PET patients now in addition we will send them a letter that says: "This patient is having an appointment and you need to fax this back to us and tell us that you've got it and you understood everything and you will follow the instructions." If the patient turns up, they're not prepared and we have to cancel them, we put an incident form. Then it gets investigated by their team to see why it didn't happen.

Did it make any difference?

I've kind of getting it. I don't think this is as bad as it used to be. We are slowly educating the wards that they need to prepare the patients.

33. What time targets do you have for the time between the patient arrival and then being seen?

As soon as possible.

IT level:

34. What are the advantages/disadvantages of your IT system?

The referral comes computerised and goes to the hospital system and then that comes down to the radiology system. But once it comes to the radiology service system we still print off lots of, we get the doctors to vet it, then the hardcopy gets vetted and we use that one to bring the patients in and out and scan the patients and we put details on that. At the end of the study we then scan that document into the radiology system and the radiologists will report from that. So the only part that is not computerised is in the middle.

Why is the process not all computerised?

Because it's a matter of training. The radiologists need an educating radiologist because they still need to vet the form to nuclear medicine so we don't protocol. The radiologists protocol. It's a matter of getting the radiologists trained up to protocol on RIS and we go to RIS and do it. They are not trained to do it and they don't want to do that. But I think with time it will come.

I think if we have all the resources to manage it computerised I think it's a better system. There are bits of paper that gets lost and the wrong person may have a piece of paper. What we are trying to do is that the doctors would go onto RIS and they will check all the requests of the day and they will vet them, then it means that no matter what site, all the requests are vetted and you can then pick them up and you can then book them. But as it is at the moment we are printing them, we have to rely on the radiologist to be at the site and you are printing it to vet it so that can cause delays but if it's all automated and it's all on the computer you can access that data wherever you are and the doctors can access wherever they are.

35. Does the NMD website have updated information for referrers/patients?

We don't have an up-to-date website. There is one if you are going to the Trust that has got some very basic things on it. We did it last year.

36. Does the NMD website contain the prices for private services?

No. It's not something that we do. Private patients come to us through a private wing so all goes to them.

Final Questions:

37. What are your future steps to improve the budget/operational management for the department?

Our future plans are to get new equipment, replace our old equipment. We then would like to extend the working hours from 8 to 8, particularly in PET-CT. That's something that we are looking to do. But obviously we then would need the staff in to do that, on the weekends as well.

Why haven't you done a business case for the cameras?

Not necessarily for the cameras. I will tell you what the issue is here. Originally there was going to be a re-development of this department so nuclear medicine was supposed to be refurbished and this goes back about 5-6 years. We've seen all the plans and everything it was supposed to be here. Then the plug was pulled on it so 7 years ago when they should have been replaced they hold on to replace it. The idea was that they would be replaced when the department is refurbished which made sense and the money was available and everything done as well. But then the plans weren't accepted and when the plans weren't accepted there were loads of issues. Then they got to put in back burner and there were lots of other issues and stuff. So their plans to re-develop the department have been put on hold for other developments so that's why the cameras haven't been replaced. But we are now going to see if the cameras can be replaced irrespective of the plan of changing and also the plans for the actual hospital have changed as well so within the last year the plans have changed so that one of the sites may close and it made sense to try and hold on to find exactly what is going to happen before you actually replace the cameras. Otherwise you end up replacing them and having to move them. That's one of the reasons why the cameras are so old. They are consequently put on hold because of the plans to refurbish the department. But it has reached the stage now where they have to be replaced and will have to be moved necessarily. So there have been business cases, loads of business cases over years and because the downtime is so much now that we need really to put another business case….

38. Do you have any questions or comments

Interview no. 10

Duration: 00h45min

Date: 11/08/2015 at 15:33

Part 1- Department Characterization

1. **What divisional group does your department belong to?** Radiology.
2. **Which scans are the most common?** Bone scans.
3. **How many:**

b) Gamma-Cameras- 3 (2 are SPECT/CT) **b) PET/CT-** 0 **c) DEXA-** 0

d) Injection Rooms- 1 **e) Consultants-** 3

f) Technologists/Radiographers (Band 5- 0**) (Band 6-** 0**) (Band 7-** 4**) (Band 8a-** 1**)**

g) Nurses- 0

4. **What is the mean number of patients per day?** 20 NM.
5. **Opening time:** 8.45am-5pm.

Part 2- Interviewee Characterization

6. **Job title:** Superintendent Radiographer.
7. **Qualifications:** Diploma of the College of Radiographers and Diploma in Radionuclide Imaging.
8. **How long have you been working as (job title) in this organization?** 13 years.
9. **How long have you been working as (job title)?** 25 years.
10. **What do you consider to be the most important tasks of a (job title)?**

Ensuring that the patients get the best service they can from the department so ensuring that the day-to-day running is efficient.

11. **What do you consider to be the most demanding tasks that you carry out and why?**

Currently it's managing to fit everything in according to the current schedules, like the two week rule. Those sorts of things. Actually managing to get the patients in as quickly as you'd like to given with the current staff team and restrictions.

Part 3- Financial related questions

12. **In your opinion, what has PbR introduced compared with the previous financial model in terms of patient and financial outcomes?**

I don't know what that is. Nuclear medicine is always very much short changed. Often the coding that it's in, doesn't actually even cover the cost of the radiopharmaceutical. A lot of the expensive tests, *e.g.* octreotides, MIBGs, things like that, if you are not careful you can lose money because it doesn't actually…if you do true costing of the study.

13. **In the context of Radiology, is the PbR system improving or worsening the patients´ outcome?**

I don´t know.

Do you think that the quality provided to the patient has changed?

No. The costings haven't effected the referrals or what we do. It has improved as you have got better technology *e.g.* with SPECT-CT compared to an ordinary gamma camera. But the difference in costings whether they are bundled or unbundled has no impact on the service.

In your opinion, did the scan number increase with the implementation of PbR?

No. I don't think referrers have any idea about it, the referring consultants are not aware. If the patients need a scan they need a scan. They are not going to take into consideration any financial model.

14. **According to the amount of requests that your department receives...**

d) **Is there any area that you may think that your department may need to increase the capacity?**

SeHCATs

e) **Or decrease the offer?**

Not really.

f) **If yes, which factors are against those changes?**

Financial restraints. There is no funding for additional staff or weekend working. That's why we can't do anymore.

15. Is the department budget covering all the expenses?

Yes, it is now.

16. Do you feel the need to save/reduce expenses?

Yes, continuous pressure within radiology but also from general managers and ultimately the Trust. Every meeting is always cost reduction programme, how are you going to save money…

17. Since you have been working at this Trust, have you put in practice any measure to decrease costs...

a) In staff?

We are not allowed agency staff and no overtime payments. For example the Saturdays you might want to say: I'd like to do SeHCATs on a Saturday. There is no funding.

b) In equipment?

We just got the three new cameras. Equipment-wise we are alright now. So we increased the equipment but also because you can do SPECT-CT, you get increased income because SPECT-CT is a higher tariff so you actually increase the income. It almost compensates that. You just spend money to make money.

c) In consumables?

Because we get from different suppliers, the radiopharmacy looks to see which is the cheapest but only with the major manufactures. I know that there are some others out there now selling pharmaceuticals but at the moment we still currently stick into the two main ones due to quality and reproducibility and stuff. Because we have contracts with them we get better deals.

18. Do you consider that the tariff for NM procedures corresponds to the reference costs and why?

No. But I think it's only the specialised ones. Bone scans and MAG3 you cover your costs. But not only the radiopharmaceutical time, the imaging time, the radiographer time and the camera time, when add all that up I don't think it's covered by

the tariff. Particularly probably in a London hospital where you have got higher banding. If you have got band 5 and band 6 that may not be as much as band 7s do.

Have you ever considered decreasing the type of scans whose procedure cost overweighs the earnings?

No. You do what is required. If it's the appropriate test you do it.

19. **Have you ever done any analysis on the real cost of a specific exam against the cost paid for the exam?**

One of the managers does that, auditing. You discuss that at different meetings but a lot of the time with the banding and stuff and things you've got no choice. That's why we try to minimise the costs within the department. I used to look at it, manage it and discuss but we don't formally do it because it's too depressing.

20. **What strategies do you put in action to attract income?**

We've got SPECT-CT so new equipment attracts new referrals because some of the patients were going elsewhere to have SPECT-CT so then we have got those back. Also as they realised how useful SPECT-CT is they then started sending us more patients. It's a sort of generating work.

We made sure that the Trust was aware so you know, the local intranet. We made sure that the referring clinicians were aware.

Most of our private income comes from sentinel node studies where the referring consultants send the patients to the consultants here at (institution) because they are the specialists in their area. They also bring their private work as well so therefore we benefit from that because no one else can do what we do. But otherwise general private work we don't have a huge amount because there is a private nuclear medicine department just down the road. We don't get much of general things like bone scans. Our consultants work at the private unit. It's also difficult to respond quickly enough for routine private patients. For example if (private institution) receives a request today for bone scan they probably ring the patient this afternoon and book them tomorrow. We can't do that because we have loads of other things.

21. In which activities does the department receive higher income?

The sentinel node studies. We also do defecating proctograms and colon transit which other places don't do so we do a lot of private patients for those.

22. In your opinion, what is the effect of non NHS income in NHS patients?

I suppose it's essential because it helps to pay. They all bring in income. If you think on how much money the Trust loses from patients who have studies that are not probably entitle to them, there are a lot of times when the NHS loses money. The difficulty is that lots of times you are not supposed to do private patients within NHS time which for us is very difficult because we can only work from 9 to 5 so you can't have private patient sessions. Some areas will do private patients after hours and things like that. But I am not sure where the private money actually goes to. If we do private patients in nuclear medicine it doesn't come to nuclear medicine. It just goes into a pot somewhere. You don't physically see the money so for us there is not really an incentive to do it. Private patients are a completely different way of working. You need the admin and clerical infrastructure there to support it so that you can respond to patients quickly and efficiently and get everything sorted and done.

23. In your opinion, what implications does the bank/locum staff have on the budget?

They take it all away. They have a huge impact on the budget. The trouble is that sometimes they are essential to be able to run the department but I think the agencies now have priced themselves out of the market. Several years ago when all of the sudden the costs for agency staff, when everybody was so desperate, they put the prices up so much that all of the sudden...you couldn´t afford unless 3 people go down and cannot work, you just have to get on it. They are paid twice as much as a normal member of staff and half of the time they can't actually do the full job because they don't know what happens. They are essential but expensive.

24. **What implications on the budget/management would your department have if it belonged/not belonged to an NHS FT?**

Currently, no. Apart of saving money. I think there is more pressure to save money but there is no increase of income, not within the nuclear medicine.

25. **In your opinion, what advantages and disadvantages would your department have if it worked 7 days per week?**

Our turnaround time would be much quicker so it would be much more responsive and have more flexibility for both us and patients in booking appointments.

But ultimately you are still going to do the same number of patients that come through your door. It's just that you do them quicker but you need a lot more staff to be able to do a 7 day week. So I don't think the income would necessarily be any greater because you are still going to do the same patients that you would have done except you are doing and scanning them this week as supposed to two weeks time. So ultimately the people who really gain are the patients because they all get done quicker. At the moment the budget wouldn't cover staff for a 7 day week, that's why we don't do it.

Part 4: Operational management related questions

Departmental level:

26. **What are the advantages or disadvantages of having an own porter/central portering system?**

Our system is called "TeleTracking" so you can track where the patient is, where they have send the porter, has the porter gone... it's an online system. There is just a big pool of porters. The advantages are that it's all online and trackable, the disadvantages are that you don't have a one-to-one communication: "Can you go and get this one?" It is all electronically decided by the people in the control room.

The disadvantages of having an own porter are that you are limited to one or two porters so if you need two beds at the same time you can't have them whereas now we can…if you want two beds at 10 o'clock, they sort it out and we get two beds at 10 o'clock whereas you would never have that number of porters particularly for the nuclear

medicine department, you have one. The advantage is that you would have close communications.

Initially when our system started it was rubbish but now it's working well, it is actually an advantage. I wouldn´t go back.

27. **Is your department involved in research studies with external institutions? (If not, what is the importance that you give to research?) (If yes, what are the implications in the budget and importance to the department?)**

We have been involved in one multi-centre trial with the SeHCATs actually. I suppose you learn, you gain information, you then see how you are compared to other similar sites. We didn't receive income but I would consider it advantageous to have research studies. I think we don't have more because it's the nature of the department and also the Trust. It is a teaching hospital and they do a lot of research in the medical school but nuclear medicine isn't a huge part. Our consultants do loads of other things as well as nuclear medicine so they are not purely nuclear medicine so they are not involved in anything.

28. **According to National Framework for Service Improvement in Radiology (NFSIR) there are two important methodologies for service improvement: ''lean'' thinking and process mapping. Is the patient pathway according to these practices?**

No. I have no idea. I probably know them under a different name.

[Short explanation of the methodologies] If they have got scans in radiology we always try and book them on the same day so the patient only has one trip to the hospital. We've just recently changed our colonic transits so the patients don´t have a 15 minute image so they just have a capsule and come back in 6 hours. But it's more informally, it's just ad hoc.

29. **Do you have specific weekdays for determined exams and why do you have that structure?**

Yes. It's due to radiopharmacy when the technetium generator comes, technetium availability. I am block booking so that you do parathyroids on Monday. It's

making things more cost effective because if you make up a kit and you can get 3-4 patients out of that kit it's much more cost effective than making up a kit every single day. It also can be due to consultant availability for *e.g.* proctogrammes where the consultant does administration and other things are done because that is what fits in the theatre lists.

Patient level:

30. What measures are taken when patients do not attend?

The forms get send back to the referring clinician after the first time. The radiologist has a strict rule.

31. What measures are done to decrease the rate of DNA?

We get patients to ring to confirm that they are coming, it's written in every appointment letter and also we give them the option to e-mail the fact that they are going to come. When we have a receptionist, for certain patients, we will ring them to check that they are coming. There is also a talk of implementing a texting service to remind patients of their appointments and for expensive studies like MIBGs. Octreotide and Datscans we send a letter out that says: "Please contact the department to book your appointment". We do an agreed booking over the phone. We don't book it until they ring us so we don't waste any MIBG or octreotide so if they don't call we won't call them. The responsibility goes to the patient.

32. What measures are you taking to decrease the cancellation rate in inpatients due to human resources mistakes (e.g: wrong preparation, late transport)?

We are not too bad, we send an appointment information up to the ward. If it's booked like a day in advance, they have got all the information they need to know about the scan. We ring the ward a day before to check what's happening and when the patient goes back to the ward (with *e.g.* a GFR where they have to take blood samples at this time and that time) they are phoned to remind them. That normally works here. You still have the case that they have forgotten to take the samples but most of the scans we do, because we don't do cardiacs, it doesn't really matter. We used to do cardiacs for

inpatients but it never worked, they have always given them a cup of tea in the morning. We stopped to do cardiacs when we had the refurbishment and we've got nobody to do the stressing, the consultant that did the stressing doesn't want to do it anymore. We only get a few referrals because the consultants like CT, MRI and stress echo so the nuclear medicine started to be reserved for the patients that didn't want to do any of those.

33. What time targets do you have for the time between the patient arrival and then being seen?

It used to be 30 minutes.

IT level:

34. What are the advantages/disadvantages of your IT system?

Everything is online, the referrals, you can write notes in the computer. But we print the request form, it gets vetted by one of the consultants and then we book the appointment. You can also write notes on that. We still have a book where we make the appointments because we have three cameras so then you can mix and match the appointments. But we are still fighting to have it all completely electronically on the computer. They want us to go to paperless but at the moment you lose all your flexibility if you go completely to the computer, also our radiologists aren't always around so they don't want to vet electronically. We work differently to say CT or ultrasound or whatever.

Now that we have got the computerised requests it's much easier. You got an audit trial for when they arrived, to when it was vetted, when it was booked, when it was reported so nothing gets lost anymore.

35. Does the NMD website have updated information for referrers/patients?

We don't have a website. It's only as useful as how often it is updated, how often it's managed. It would be nice to have a website that people could look at and everything like that but it's not happening here.

36. Does the NMD website contain the prices for private services?

No. They are referred to the private patients unit.

Final Questions:

37. What are your future steps to improve the budget/operational management for the department?

We have got new cameras. I would like to increase the number of staff so that increases our flexibility of our working day and so that we can reduce the waiting times for some scans. With the current restrictions and financial situation of the Trust I can't see that happening in the nearer future unless with the income from the SPECT-CT. But that would be swallowed by radiology, it's a common budget.

38. Do you have any questions or comments?

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