

# South Tees Hospitals

## NHS Foundation Trust

<b>Meeting committee:</b>	Board of Directors Public Meeting	<b>Meeting date:</b>	June 2013
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<b>This paper is for: (Only 1 column to be marked with x as appropriate)</b>	Action/Decision x	Assurance	Information
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<b>Title</b>	Briefing Paper on the future provision of Magnetic Imaging Scanning
<b>Purpose</b>	To inform the Board of development of proposals for a phased expansion of MRI capacity within the Trust to meet demand and meet hanging clinical requirements.

<b>Summary</b>	<p>The more complex forms of imaging i.e., US, CT and MRI provided within the Trust are experiencing very significant increases in demand and this increase has been particularly high in MRI (averaging &gt;10% per annum) where its application in aiding clinical diagnosis, treatment planning and disease surveillance has raised clinical expectations. It is now the imaging of choice for many tumour sites, cardiac/vascular disease and musculo-skeletal imaging and as such represents an important contributor to achievement of the Trust's clinical services strategy.</p> <p>Annual Planning processes have exposed the constraints on existing MRI capacity and highlighted the probability of an increase in fixed capacity being required from 2014. The Board of Directors has previously had discussions that the preferred site for an additional scanner would be at the Friarage Hospital Northallerton (FHN). This paper provides a summary of the demand and capacity issues facing the Division of Radiology; confirms that a step increase in capacity is required; describes in outline a phased plan being developed to address this which involves upgrading MRI capability at James Cook University Hospital (JCUH); use of a mobile facility at FHN to respond to unmet demand and deal with down time whilst a replacement machine is installed at JCUH and the installation of an additional machine at FHN.</p> <p>There is a very significant capital and revenue cost associated with this proposal which the Trust will struggle to meet within its predicted resources in the current planning period (2013/4 to 2015/16) and , although changes in the remuneration arrangements for scanning mean that it does now attract an income stream in its own right, as the indicative financial template provided with this paper shows there will be an initial negative impact on the Trust's overall financial position through implementation of the proposed changes. The Board has previously endorsed the use of additional resources as a means of supporting quality of service and patient experience through the purchase of an additional scanner and the business case being prepared provides supporting evidence that this would be invaluable in allowing an important expansion of capacity to happen sooner rather than later.</p>
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<b>Recommendation:</b>	That the Board notes the growing gap between capacity and demand for MRI scanning, the developing proposals to address this and where the previously agreed approach of installing an additional machine at FHN fits into this plan as well as the background to as yet unapproved proposal to introduce 3T MRI for general radiology into the Trust. A formal business case addressing the totality of this plan will be presented to a future meeting for formal approval.
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<b>Implications</b>  (mark with an x in appropriate column(s))	Legal	Financial	Clinical	Strategic	Risk & Assurance
		x	x		

## BRIEFING PAPER ON THE FUTURE OF GENERAL MAGNETIC IMAGING SCANNING

### 1 INTRODUCTION

General Radiology provides a full range of diagnostic imaging across all modalities i.e., Plain film, ultrasound (US), mammography, fluoroscopy, CT, MRI and a wide spectrum of Interventional Radiology. It has a skilled workforce with a dynamic and forward thinking Consultant team that embrace new technology and procedures.

Imaging has experienced a year on year demand growth and has increased capacity accordingly, incrementally providing increased access to its services culminating in the current service provision of 84 hour core service across 7 day working in most areas and in MRI this increases to 90 hours per scanner per week.

However, whilst plain film has only seen a marginal growth year on year the more complex imaging i.e., US, CT and MRI have seen very significant increases. This demand increase has been particularly high in MRI, (averaging >10% per annum making it one of the fastest growing area in diagnostic imaging), where its application in aiding clinical diagnosis, treatment planning and disease surveillance has raised clinical expectations. It is now the imaging of choice for many tumour sites, cardiac/vascular disease and Musculo-skeletal imaging. The demand growth in MRI poses the most significant physical capacity constraint consequently increasing MRI capacity is the Divisional priority

The Trust has invested in Digital Imaging realising the benefits in financial efficiency, productivity and capacity that this technology offers. However, particularly in MRI the benefits provided by technology are exhausted. Without investment in next generation equipment and additional facilities the trust will not be able to respond to clinical need.

The last investment in MRI capacity within the Trust was the 3 Tesla (3T MRI) Functional Magnetic Imaging within the Neuroradiology department (with the scanner funded by the University of Durham and the Trust funding the enabling works). This unit is however a “very high end” Neurological scanner with the associated limitations for general use. The main benefit has therefore been for Neuroradiology imaging however, transferring work from the Neuroradiology 1.5T scanner to the 3T scanner has released some capacity to general radiology. This is a benefit of 3 scan sessions per week which has allowed the development for some Cardiac MRI to be performed in General Radiology.

The purpose of this paper is to set out a phased plan for the Trust to have the capacity to respond to demands for general MR and Musculo skeletal imaging; to modernise the service offered in line with other teaching centres and to support research capability and service developments e.g., Radiotherapy planning. Additional capacity will also provide the potential to regain some private practice work which has drifted into the private sector. The phasing includes:

- upgrade of the current 1.5 Tesla (T) MRI due for replacement at JCUH to a 3T scanner
- installation of a fixed MRI scanner at the FHN
- and a temporary mobile scanner based at FHN to sustain capacity throughout the project where required.

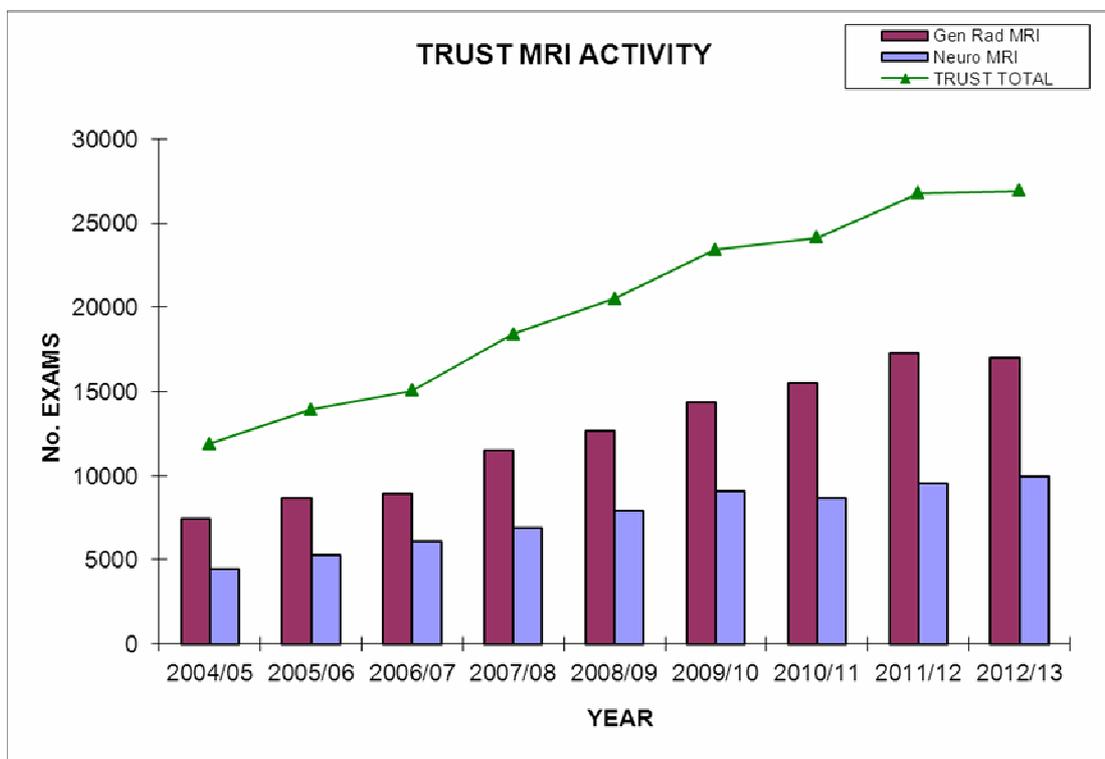
The paper references Neuroradiology because of the interrelationship between the two imaging departments but does not deal with future capacity requirements for this function.

## 2 DEVELOPMENT OF MRI AS A MODALITY

### 2.1 Growth in demand and capacity

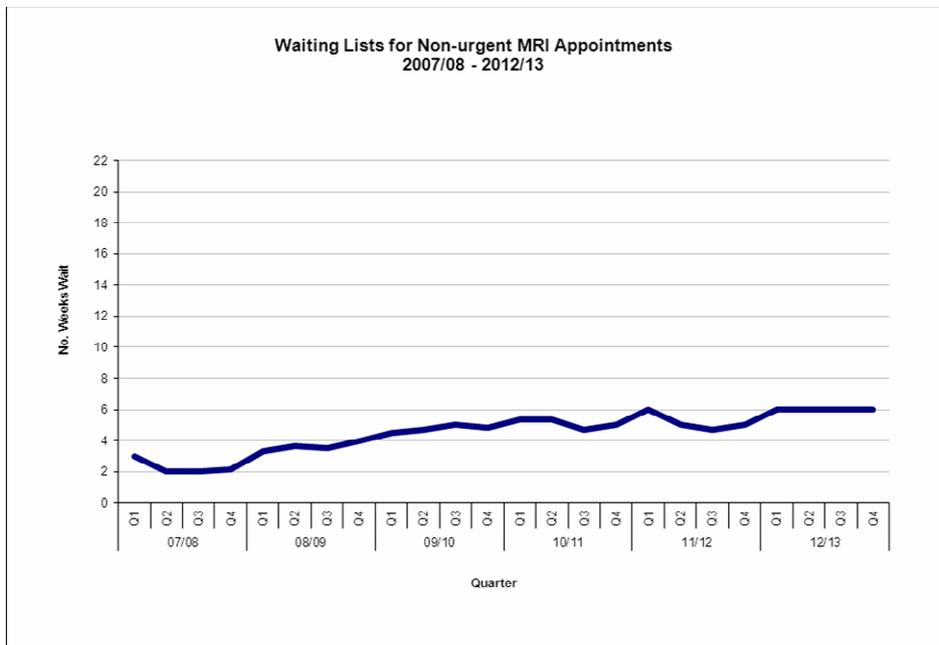
In 1992/3, South Cleveland hospital commissioned its first MRI scanner purchased through National Opportunity Funding (NOF). This service was initially provided on a 9-5 Monday to Friday basis and at that time was mainly for Neurological indications. This developed into 8-8 Monday to Friday and then also a 7 day service as demand grew.

Single site developments in 2003 saw MRI capacity increasing on the installation of two additional scanners; one in general radiology and one dedicated to neuro radiology. As demand grew, as demonstrated in the graph below, extended day and week working was introduced incrementally in general radiology to accommodate the growth, ultimately leading to the current service level of 180 scan hours per week for 50 weeks per annum. The slight reduction in scans performed between 11/12 and 12/13 is explained by an increase in more complex imaging.



Graph 1: Trust wide year-on-year MRI activity 2004/5 to 2012/13

As demonstrated by graph 1 there has been a 100% growth in activity from 2004 with little sign of slowdown in demand and an increase in waiting times as the mismatch between capacity and demand continues to grow as shown in graph 2 below.



**Graph 2 demonstrates the incremental increase in waiting times for routine MRI scans despite increased capacity**

The data from Organisation Economic Cooperation and Development (OECD) shows the average scans per 1000 capita for OECD countries to be 46.3 scans – this does not allow for specialist imaging. To match this average for our local population of 420,000, we would expect to provide 19,466 scans per annum. This activity level is our projected demand for 2013/14 however this is still significantly less than other European and Scandinavian countries and does not account for imaging such as CMR (cardiac MR). Using an average from France, Netherlands, Germany and Spain shows that we could expect our demand to be greater than 35,000 scans per annum.

Clinical applications and demand for MRI continue to grow significantly alongside technological advancement

NICE guidelines are increasingly recommending MRI as one of the investigations of choice for patients with various cancer groups. Recent guidance includes:

- Breast cancer (approx. 100 cases per year currently not provided)
- Colorectal cancer : limited access (approx. 50 cases per year currently have their scans outside the Trust)
- Ovarian and endometrial cancers : i(t is expected that recommendations for lower grade cancers to be referred for MRI staging are imminent. There is currently no intelligence available to quantify the number of cases per year).

The increase in the use of MRI in cancer is ever evolving. Oncology and Radiotherapy are in dialogue regarding additional capacity for their use in cancer management. Both our neighbouring Cancer Centres - Newcastle and Leeds - have dedicated MRI scanners. As a cancer centre we need additional MRI capacity to support our status as a regional centre and to support the many associated research trials. The Radiotherapy team have recently advised that they envisage the requirement for MRI to inform planning will increase over the next 4 to 5 years with the following phasing:

- First 6 months: 1 session per week
- 6-18 months: 2 sessions per week (13/14)
- 18 months-36 months: 3 sessions per week (14/15)
- 48 – 60 months: 4 sessions per week (2016/17)

Cardiac imaging is an additional area of service development utilising MRI with around 300 scans per annum being provided. Currently however, this is a significant under provision. The service was introduced a year ago in general radiology with some replacement capacity for general scanning from Neuroradiology scanners. However, scan time for this procedure is significantly higher than non-cardiac imaging taking approximately one hour per patient and has therefore impacted negatively on overall Trust capacity. Cardiology has modelled a capacity requirement based on relevant guidelines of approximately 1300 scans per annum. Therefore the current three sessions provided per week is not sufficient to meet clinical need in this area.

Activity data demonstrates that demand for MRI increases by more than 10% per annum. Without investment in additional resource the Division cannot respond to further demand growth within access targets or comply with all NICE and IOG guidance. The implication in terms of current demand are as follows :

*Summary Table :*

		13/14	14/15	15/16	16/17	17/18	18/19
	<b>Demand</b>	<b>18,923</b>	<b>21,164</b>	<b>22,992</b>	<b>25,021</b>	<b>26,976</b>	<b>29,670</b>
as now	Capacity	17,116	17,116	17,116	17,116	17,116	17,116
	Gap	1,807	4,048	5,876	7,905	9,860	12,554
	Backlog	2,607	6,655	12,531	20,436	30,296	42,850
	backlog in weeks	7.9	20.2	38.1	62.1	92	130.2

## 2.2 Developments in technology

The Trust does not currently offer 3T MRI in general radiology – other than the limited work carried out on the neuro machine, 3T magnetic resonance imaging was developed for use in research applications. However, as MRI technology has evolved, 3T MRI studies (as opposed to 1.5T) are increasingly common in the clinical setting. The majority of UK university teaching hospitals and Radiology training schemes are able to provide experience at 3T for musculoskeletal and body imaging. A 3T scanner has twice the field strength of the 1.5 T scanners; the main advantage is that the signal received is stronger and this can be utilised to maximum effect in two ways.

- Reduced acquisition times: A diagnostic scan can be obtained in half the time of a 1.5T scanner, inherently increasing the capacity/throughput of the scanner. Shorter scan times improve the diagnostic quality of scans in patients for whom remaining still because of fear or illness is difficult. This reduces the need for a patient to be scanned under GA and improves overall patient safety
- Increased resolution of scans: improved image quality. The increased field strength can be utilised to produce a more detailed scan providing higher resolution images and enabling greater diagnostic accuracy, in the same length of time as a standard 1.5T scan.

### **Advantages of 3T for specialist imaging**

- **Cancer Services:** Increased resolution is of particular value in cancer imaging. Increasing numbers of Tumour groups are indicating MRI as the imaging modality of choice for diagnosing, staging, treatment planning and monitoring disease in patients with cancer. Shorter scan times allow patients in pain to be scanned more quickly. 3T offers increased capacity and or increased resolution, improving patient outcomes and fully supporting the development of Acute Oncology Services. The development of MRI radiotherapy planning and whole body diffusion imaging would be possible.
- **Trauma & Orthopaedic Services:** Faster scan times provides an overall increase in capacity, providing potential for faster access and shorter scan times. This is of particular value in the acute setting, allowing a diagnostic scan to be obtained more quickly on A&E patients. This supports our position as a Major Trauma Centre. Increased resolution is of particular value in orthopaedics where diagnoses can be achieved without other more costly invasive diagnostics.

- **Children's Services:** Faster acquisition times either reduce the requirement for GA in paediatric imaging or offer the opportunity for a reduced GA time.
- **Neurosciences:** Many Neuroscience patients are scanned under GA within general radiology. Faster acquisition times reduce the requirement for GA imaging allowing diagnostic scans to be acquired with anaesthetic support but without GA or offer the opportunity for reduced GA time.

Technology developments in MRI are continuous and likely to become integrated with Radiotherapy units. This will make treatment planning and delivery much more integrated and accurate. It is likely that as a cancer centre this approach is one we would want to embrace which would remove this demand from general radiology however it is unlikely that this technology will be commercially available in the near future therefore capacity to respond to demand for Radiotherapy planning must be included in current plans.

### **3 PROPOSAL FOR SCANNING FACILITIES/CAPACITY GAIN**

The Division of Radiology is developing a business case which looks at a phased approach to the expansion of capacity within the Trust to provide an MRI service which supports the Trust's strategy for specialist services and integrated care enhances the quality of the service we offer and patient experience and specifically deal with operational pressures by:

- Dealing with the risk of a growing backlog of patients awaiting a scan;
- Keeping pace with demand;
- Eliminating the risk of diagnostic breaches;

The elements of this business case are:

#### **3.1 Replacement of an existing 1.5T scanner at JCUH with a 3T machine to provide additional capacity and clinical advantages**

It is estimated that an additional 2,800 appointments per annum can be created through the change to 3T, in addition to the patient experience, patient safety and wider clinical application benefits of 3T. 3T machines are significantly more expensive than 1.5T machines and installation will require an increase in enabling costs compared to suggested replacement with a 1.5T machine. There is further evaluation and discussion required on this proposal.

#### **3.2 Provide third general MRI at FHN**

The Trust Annual Plan has set out the capacity constraints within imaging and there has been a previous capacity and demand exercise which suggested that by 2014 the Trust would need to take steps to commission an additional machine.

24% of all patients attending general radiology for MRI are registered within the North Yorkshire & York PCT (greater than 4,100 p.a.). Provision of a scanner at FHN therefore:

- provides additional Trust capacity;
- provides a more local service;
- provides inpatient scanning facilities for FHN patients within normal working hours.

On average a 1.5T scanner provides 2 scans per hour. Working 8.30 – 5pm Monday – Friday 50 weeks p.a. would provide capacity for 4000 scans per annum. The proposal is to increase the working hours over time to provide additional capacity to meet the growing demand : up to 8,400 scans per annum

- Capacity with 8 hours working = 4000 scans p.a.
- Capacity with 12 hour working = 6000 scans p.a.
- Capacity with 12 hour working + 8 hour Saturday = 6,800 scans p.a.

- Capacity as above + 8 hour Sunday = 7,600 scans p.a.
- Capacity as above + extended weekend days = 8,400 scans p.a.

### **3.3 Mobile scanner at FHN**

To sustain MRI capacity and performance targets throughout the enabling schemes needed to replace the existing JCUH scanner and install an additional machine at FHN it is proposed that a mobile scanner is leased. Whilst The FHN site does have a pad suitable on which to site a mobile MRI scanner a breast screening unit is located at the FHN for a 12 month period every three years. This is due on site July – August this year (2013). There is a location which could house a second pad to accommodate the MRI scanner on a continuous basis. Scanner vehicles are self-contained with integrated reception and changing facilities. Any additional support could be provided by the Wensleydale Suite at the FHN.

During the suggested phasing of the project there is an overlap between the mobile scanner commissioning and the removal of scanner 1 at JCUH. This time period allows the Division to eradicate any unmet demand.. The mobile scanner provider can provide a staffed or unstaffed facility and the benefits of each approach are being explored.

### **3.3 Upgrade (rather than replace) Siemens Avanto 1.5T (current scanner 2) in 2016**

As described previously there is the potential for an upgrade package for the Siemens Avanto 1.5T scanner (scanner 2), which was released on 1st October 2012. Scanner 2 is due for replacement in 2015/16. This is still a high performance scanner and an upgrade instead of replacement at the appropriate time would be less expensive than a full replacement. There are additional savings in upgrading this scanner in terms of reduced scanner downtime and enabling works. It is proposed that this alternative capital option should be considered as an enabler to offset some of the increased capital cost of the procurement of a 3T scanner

## **4 Summary**

The above measures:

- modernise the scanning capability of the Trust;
- provide improved resilience by replacing ageing scanners;
- provide a more local services;
- provide additional capacity
- comply with MRI Safety recommendations

All will involve a lead in time because of the extensive enabling works required which leaves the Trust still facing increasing waiting times and potential diagnostic breaches. The timing of each phase is still to be finalised because of the very tight resource situation the Trust faces over the three years of the plan recently submitted to Monitor.

An indicative financial template is provided – but this needs further work on the sequence of each phase and on enabling costs.

## **5 The Longer Term**

Initial modelling suggests that if the phased plan were adopted there is the potential to provide adequate scanning capacity to meet the Trust needs up until at least 2018/19 by incrementally increasing the working day/week at FHN. However, at that point a further fixed unit would be required. There are potential options for providing a solution

We would expect that combined Radiotherapy planning/MRI units would be available by this date. An ideal location for a further scanner would therefore be the Endeavour unit which would enhance the status of the cancer unit.

There are also smaller scanners available which can be sited within standard imaging rooms. These are ideal for extremity imaging i.e., wrists, hands, knees etc but their applications are currently limited. However, if there is a quantum of transferable imaging to a smaller unit this may be a cost effective solution.

The suggested way forward is that vigilant monitoring against demand modelling takes place and further evaluation of need takes place in 2016 to allow robust decision making of the most effective solution.

## APPENDIX 1 - Financial Appraisal :

### Financial Appraisal - Business Case Finance Template

Business case no.  
Proposal for : MRI Synthesised BC

#### i) Capital Requirement

	1 £000	2 £000	3 £000	4 £000	5 £000	Total £000
Total Capital Requirement	803	1,664	0	0	0	2,467

#### ii) Non Recurring Revenue Implications

	1 £000	2 £000	3 £000	4 £000	5 £000	Total £000
<u>Non-recurring revenue</u>	15	0	0	0	0	15
<u>Fixed Asset Impairment</u>	0	0	0	0	0	0
<b>Total</b>	15	0	0	0	0	15

#### iii) Recurring Revenue Implications

	1 £000	2 £000	3 £000	4 £000	5 £000	Total £000
<u>Income</u>						
Income from activities	0	0	0	0	0	0
Other operating income	(591)	(530)	(685)	(984)	(1,273)	(4,063)
<b>Total income</b>	(591)	(530)	(685)	(984)	(1,273)	(4,063)
<u>Operating Expenses</u>						
Direct:						
Pay	343	407	426	494	525	2,193
Non-pay	169	178	18	27	35	427
In-direct	37	144	270	270	270	992
<b>Total operating expenses</b>	549	729	714	791	830	3,612
<b>EBITDA</b>	(42)	199	29	(193)	(443)	(451)
<u>Interest, Depreciation and Amortisation</u>	161	227	223	216	210	1,036
<b>Retained (Surplus)/Deficit</b>	118	426	252	23	(234)	586

	1 £000	2 £000	3 £000	4 £000	5 £000	Total £000
<b>iv) Overall (Surplus)/Deficit</b>	133	426	252	23	(234)	601

#### v) Financial Performance

<b>Recurring</b>						
- EBITDA as % of Income	7.2%	0.0%	0.0%	19.6%	34.8%	11.1%
- Retained (Surplus)/Deficit as % of Income	0.0%	0.0%	0.0%	0.0%	18.3%	0.0%
<b>Overall (Rec + Non-rec)</b>						
- EBITDA as % of Income	4.8%	0.0%	0.0%	19.6%	34.8%	10.8%
- Retained (Surplus)/Deficit as % of Income	0.0%	0.0%	0.0%	0.0%	18.3%	0.0%
<b>Net cash (in)/out flow</b>	796	1,903	65	(164)	(420)	2,180