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Towards best practice in interventional radiology

June 2012

British Society of Interventional Radiology

This document sets out case studies using service delivery models that provide benefits for patients and staff. The clinical teams have shared their learning so that their experiences may be a stimulus to others to improve local interventional radiology (IR) services.

Towards best practice in interventional radiology

Contents

Executive summary

Towards Best Practice in Interventional Radiology draws together the major findings that came out of the visits to interventional radiology (IR) services at the proposed major Major Trauma Centres during 2011/12. Examples of best practice to provide benefits for patients and staff are described.

The work by the NHS Improvement team to review IR services across England confirms that further improvements in IR are necessary to ensure equitable access to IR services for patients. The clinical teams at these centres shared their learning so their experiences may be a stimulus to others.

We urge you to read this report and to review the IR services you provide for those in your care. This report will support you to improve local IR services.

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*The views of Professor Erika Denton and Professor Keith Willett are given in a clinical capacity and as national experts in the field. They do not in themselves impose any mandatory requirements on NHS organisations although commissioners are expected to take them into account.

Key messages

- **High quality IR services are essential for safe and effective patient care.**
- **There is variation in provision of IR throughout England, particularly for potentially lifesaving emergency and out-of-hours procedures.**
- **Despite this there are already many examples of good practice and service delivery across the country.**
- **Networking will be essential to improve access to IR. There are challenges in developing effective operational delivery networks but there are already good examples of these in the UK.**
- **A good well resourced IR service can contribute to significant savings (both financial and non-financial) along care pathways in both planned and emergency care.**
- **The opportunity exists to use improvement techniques of standard work and visual management to create agreed standard operating procedures. This can support a network approach to providing on-call across a number of organisations.**

Patient foreword

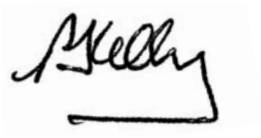
Provision of IR services enhances better outcomes for patients receiving elective and non elective care for many conditions. Both commissioners and providers, including the medical profession and specialist IR staff need to recognise that patients and their carers need more information and knowledge about IR services. Communicating the value of IR is vital to address the differences of providing acute care, such as when the patient arrives unconscious and elective care which requires the patient's consent for a booked procedure.

Importantly, patients and their representatives want to be assured that best practice in IR is provided to all service users on an equality of access basis across the country. This is an aspirational objective while services are being improved and evidence gathered. The challenge for commissioners and providers of health care will be to ensure that good health care outcomes requiring IR are equally available wherever one lives.

To be perceived as a world class service, providers have to recognise that patients' groups are frustrated that examples of best practice from within and outside of the UK, be it in patient management, practitioner training or in communicating the value of IR are often overlooked 'because our organisation is different.' This is wasteful and arrogant. IR has the capacity to transform patient management, but the benefits appear, to date, mostly only recognised by a small group of highly committed, specialist and personally motivated practitioners. Confusion about who performs IR persists - surgery, or radiology? It does not help the patient that this debate has persisted unresolved for over twenty years.

Patients' representatives have to be in a position to challenge commissioners and providers on the true role of IR including a patient journey based on examples of best practice, including adequate access to out-patient clinics, admission rights and support staff.

From a patient's perspective IR offers the opportunity for a better patient overall experience including reduced length of stay and improved clinical outcome.



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Glossary of terms

A&E	Accident and Emergency
AAA	Abdominal Aortic Aneurysm
BSIR	British Society of Interventional Radiology
CCG	Clinical Commissioning Group
CEO	Chief Executive Officer
CPX	Cardiopulmonary Exercise Testing
CT	Computed Tomography
CIP	Cost Improvement Programme
DCC	Direct Clinical Care
DGH	District General Hospital
DOQI	Disease Outcome Quality Initiative
ED	Emergency Department
eEVAR	Emergency Endovascular Aneurysm Repair
EPR	Electronic Patient Record
EVAR	Endovascular Aneurysm Repair
EWTD	European Working time directive
HDU	High Dependency Unit
HPB	Hepato-biliary
HR	Human Resources
HRG	Healthcare Resource Group
IR	Interventional Radiology
IT	Information Technology
ITU	Intensive Therapy Unit
IV	Intravenous
IVC	Inferior Vena Cava
MHRA	Medicines and Healthcare Products Regulatory Agency
MR/MRI	Magnetic Resonance Imaging
MDT	Multidisciplinary Team
MTC	Major Trauma Centre
NICE	National Institute for Clinical Excellence
NVD	National Vascular Society Database
OC	On Call
OP	Outpatient
PACS	Picture Archiving Communication System
PbR	Payment by Results
PCI	Percutaneous Coronary Intervention
PICC	Peripherally Inserted Central Catheter
PPM	Planned Preventative Maintenance
QA	Quality Assurance
QIP	Quality Improvement Programme
RCR	Royal College of Radiologists
RETA	Registry of Endovascular Treatment of Aneurysms
RIS	Radiology Information Systems
SLR	Service Line Reporting
SVS	Society for Vascular Surgery
TACE	Transcatheter arterial chemoembolisation
TEVAR	Thoracic Endovascular Aneurysm Repair
TIPS	Transjugular intrahepatic portal systemic shunt
UAE/UFE	Uterine Artery (or Fibroid) Embolisation
US	Ultrasound

Procedure descriptor

Embolisation	A minimally invasive procedure which involves the selective occlusion of blood vessels to prevent haemorrhage.
EVAR	Endovascular repair used to treat an abdominal aortic aneurysm A graft is placed in the aorta via the femoral arteries, without an abdominal incision, using X-rays to guide the graft into place. When this procedure is performed in an emergency setting it is called an Emergency Endovascular Aneurysm Repair (eEVAR)
Fistulogram	An X-ray taken of a fistula after a contrast medium has been injected.
Hepatobiliary	A term used to describe the liver, gallbladder and bile ducts.
Nephrostomy	An artificial opening created between the kidney and the skin used to drain urine from the kidney to a bag outside the body.
TACE	A minimally invasive procedure to restrict the blood supply to a tumour.
TEVAR	A minimally invasive approach to repair a thoracic aortic aneurysm. A graft is placed in the aorta via the femoral arteries, using X-rays to guide the graft into place.
TIPS or TIPPS	A procedure where a metal tube is passed across the liver


2

Introduction

The White Paper, *Equity and Excellence: Liberating the NHS*[1] and the *Health and Social Care Act 2012*[2] details how the improvement of healthcare outcomes will be measured using outcomes achieved for patients rather than the processes by which they are achieved.

Building on this aim, one of the major purposes of The NHS Outcomes Framework 2011/12[3] was 'to act as a catalyst for driving quality improvement and outcome measurement throughout the NHS by encouraging a change in culture and behaviour, including a stronger focus on tackling health inequalities.'

The NHS Outcomes Framework is structured around five domains. Each of the five domains will be supported by a suite of NICE quality standards which will provide authoritative definitions of what high-quality care looks like for a particular pathway of care. These quality standards are currently being prepared.

Towards Best Practice in Interventional Radiology sets out case studies using service delivery models that provide benefits for patients and staff. They are set around seven key themes:

- **Networking**
- **Funding**
- **Facilities**
- **Staffing/MDT working**
- **Patient experience**
- **Leadership**
- **Low volume procedures,**

and align the case studies to the five domains (table 1)

Table 1

Domain 1	Preventing people from dying prematurely
Domain 2	Enhancing quality of life for people with long term conditions
Domain 3	Helping people to recover from episodes of ill health or following injury
Domain 4	Ensuring that people have a positive experience of care
Domain 5	Treating and caring for people in a safe environment and protecting them from avoidable harm

[1]www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_117353
[2]www.legislation.gov.uk/ukpga/2012/7/contents/enacted/data.htm
[3]www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_122944

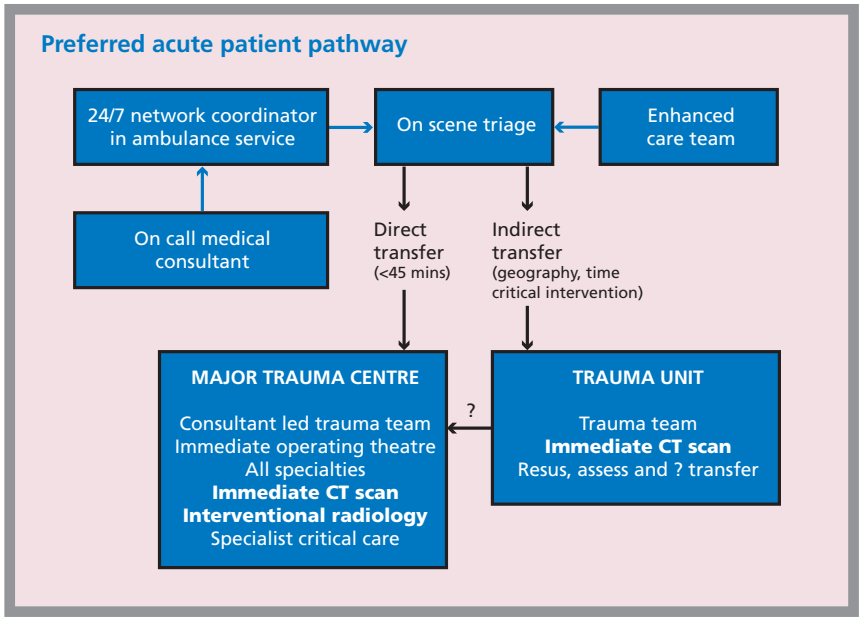
The site visits and this report were inspired by the two reports on interventional radiology published by the Department of Health in 2009 and 2010[4,5]. The 2010 report *Interventional radiology: guidance for service delivery* discussed how the NHS can improve quality, safety and productivity while delivering comparable or better outcomes for patients with shorter hospital stays and fewer major complications. It suggests and describes how IR services can help to ensure patient safety whilst delivering the highest quality care.

A further driver was the 2010 report by the NHS Clinical Advisory Group *Regional Networks for Major Trauma*[6] stated that 'the delivery of effective ongoing trauma care and management relies upon appropriate availability of imaging techniques.'

The key themes section within the document identifies 'Acute Intervention including... interventional radiology,' and laid out a key recommendation:

At Major Trauma Centres interventional radiology capability will attend within 60 minutes 24 hours a day. Interventional suites should be ideally co-located with operating rooms and/or resuscitation areas.

Interventional radiology was felt to be a significant challenge by many of the proposed Major Trauma Centres (MTCs) and a series of site visits were undertaken.



Towards Best Practice in Interventional Radiology builds on the work done in 2011/12 to visit all of the agreed and proposed Major Trauma Centres in England. It draws together the major findings that came out of the visits and cites examples of best practice. These examples are provided as an appendix to the document and also on the NHS Improvement website at (www.improvement.nhs.uk). Additional case studies will be added on the website as they become available and new examples of best practice are identified.

[4]www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_109130
[5]www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_121904
[6]www.excellence.eastmidlands.nhs.uk/welcome/improving-care/emergencyurgent-care/major-trauma

Networking

DOMAIN 1 DOMAIN 3 DOMAIN 4 DOMAIN 5

The recent Vascular Society publication, T*he provision of services for patients with vascular diseases 2012*[7] emphasises the importance of good clinical operational delivery networks. Whilst this document largely refers to vascular surgery and interventional radiology (IR) related to vascular surgery the same principles apply to all forms of IR.

In many UK hospitals there are difficulties in providing interventional procedures required to support the full range of clinical activity taking place within that centre. This has been confirmed by a recent detailed survey that shows variable and patchy provision of IR throughout England[8]. For example, many hospitals admit acute medical and surgical emergencies but have no provision for emergency embolisation for haemorrhage.

The areas of greatest difficulty are complex, low volume procedures and the provision of emergency out-of-hours IR in general. This particularly applies to smaller acute hospitals where there will never be sufficient numbers of specialised staff to create a stand-alone on call rota. It is likely that effective networking between centres is the only means of achieving a sustainable solution that will enable equitable access to IR services across the country.

Setting up a operational delivery network can be challenging with difficulties that may include:

- historically poor communication between sites;
- possible threats to income flows;
- reluctance of staff to work on new and unfamiliar sites;
- risks of transferring critically ill patients;
- bed availability if patients need to be transferred between sites;
- staff shortages;
- differing practices and skill sets on different sites; and
- standardising equipment and pathways across sites.

As with any service improvement, where these issues have been overcome there has been engagement and good communication between clinicians and managers on all involved locations. Examples of successful operational delivery networks in different geographical environments are given below.

Examples of good practice

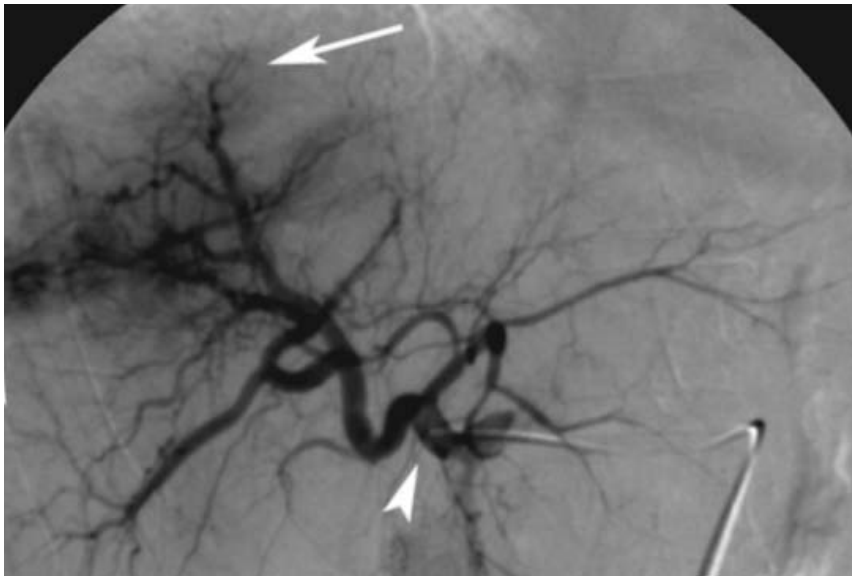
1. Networked on call IR services between several major centres around Glasgow with radiologists and nurses travelling to the patient's location. To overcome the issue of availability of specialist consumables the travelling staff carry a large box of IR equipment such as wires, catheters and embolisation coils. This good practice example is described in more detail in the Appendix A.

2. Networked on call IR services between a large hospital in Coventry with four interventional radiologists and a smaller hospital in a nearby city (Nuneaton) with two interventional radiologists. The emergency on call service is based in Coventry. In order to overcome the issues of different skill sets, experience and working practices and the challenge of working in an unfamiliar environment the Nuneaton radiologists have regular elective IR lists in Coventry. This good practice example is described in more detail in the Appendix A.

[7]Vascular Society of Great Britain and Ireland. The Provision of Services for Patients with Vascular Disease. London 2012. www.vascularsociety.org.uk/library/vascular-society-publications.html

[8]www.improvement.nhs.uk/diagnostics/InterventionalRadiology/IRServiceProvisionMap/tabid/114/Default.aspx Interventional Radiology Service Provision Mapping 2011

3. Networked on call IR services between two similar sized hospitals in a rural setting (Exeter and Torbay), each with three interventional radiologists. Week days and evenings are covered locally with the radiologists on a 1:3 rota Monday to Thursday on each site. Over weekends there is one interventional radiologist on call for both sites, resulting in an acceptable 1:6 weekend rota. The radiologist usually travels to the patient's hospital and there are interventional nurses and radiographers on call on both sites to enable this. This good practice example is described in more detail in the Appendix A.



4. Agreed pathways between centres for low volume/specialist services such as hepatobiliary or thoracic aortic intervention.

5. Implementation of radiology nursing cross site rotation. The system supports safe practice, increased knowledge base and nursing job satisfaction, plus aids recruitment. Cost savings can be made by reducing two on call rotas to one. This good practice example is described in more detail in the Appendix A.

Funding issues

Almost without exception during the site visits to the MTCs, funding issues and concerns were raised by all of the teams visited. The issues fell largely into five categories.

Getting income for referrals from other hospitals

This was a significant cost pressure for many departments. There were few examples of agreed referral pathways and funding streams. Where a referral protocol was in place it was mostly between clinical specialties and the first IR knew of the origin of the patient was when they received the request.

This was reported as a much more significant problem where DGHs provided an in hours or simple IR service but did not undertake complex procedures or provide an out of hour's service.

Tariffs

Despite significant progress centrally many sites reported that the tariff did not adequately reflect the actual cost of delivering the service. This was particularly apparent in centres offering a tertiary level of care where they were asked to undertake the most complex cases and often the out of hours work for surrounding DGHs.

Clinical coding

Interventional radiology cases often proceed or change once the patient is 'on the table' and this is not always reflected accurately in the notes or on the Radiology Information System (RIS). This makes accurate clinical coding impossible. Clinical coding is most usually done by a team of admin staff remote from radiology. In some centres there was little recognition of why it is important to accurately reflect the procedure codes and in others frustrations that they felt powerless to influence the process.

Internal re-charging

Several sites had set up a system of internal charging. Setting up the system had proved to be a lot of initial work but where it was working well was felt to be hugely beneficial.

The two primary reasons cited were;

- to influence decisions that affect the service by showing how much 'income' the service could generate; and
- to reflect back to referrers the true costs of an IR intervention.

Service line reporting (SLR)

SLR measures profitability of its services by monitoring cost, income, activity and use of resources. It can enable a trust to increase its productivity by providing financial information to make informed decisions, prioritise new service developments or plan new clinical investments. However where a service costs more to deliver than the income it receives for delivering the service it takes a team with foresight to recognise the non financial incentives of delivering this service.

Examples of good practice

1. Accuracy of coding for IR procedures is vital to reflect workload and ensures maximum income for IR departments. This ensures that resources follow clinical activity. This good practice example is described in more detail in the Appendix B.

2. Internal recharging was seen working well in several of the sites visited. At least two sites demonstrated that it was possible to reduce unit costs.

3. Sites delivering an OP service or post procedure telephone follow up were working with their clinical coding teams to secure the tariff for imaging services.

Facilities

DOMAIN 4 DOMAIN 5

Equipment and site

Theatre design should ensure that all consumable equipment (catheters stents, embolic material etc) is in a suitable equipment storage area immediately accessible from the IR theatre. Consumable equipment should include a full range of equipment suitable for embolisation to control haemorrhage, stents and stent grafts suitable for major and minor vessel repair and a 'bail out box' with everything needed for complications.

Major Trauma Centres should be able to provide Thoracic Endovascular Aneurysm Repair (TEVAR) for appropriate cases and facilities, pathways and workforce should be in place to support this activity.

At present, there is variation in the provision of emergency Endovascular Aneurysm Repair (eEVAR) for ruptured abdominal aneurysms. Trial data on open surgical versus endovascular repair will report in the near future and are likely to inform future practice. Where the service is provided, the Interventional Radiology facilities should preferably be of theatre standard ventilation and if being used for endovascular repair should comply with the relevant MHRA (Medicines and Healthcare products Regulatory Agency) guidance – *Delivering an EVAR Service (2010)*[9]. It should be of sufficient size to permit full anaesthetic facilities, including piped gases, drugs and anaesthetic equipment.

The theatre environment should have a staffed recovery area to allow reception and onward transfer of patients to other environments.

The theatre should be located as close as possible to the emergency CT scanner and care taken to ensure a rehearsed rapid transfer facility.

IT links

Access to Picture Archiving & Communication Systems (PACS) workstations and RIS systems should be available within the IR theatre. Teleradiology links are vital and access to a robust and rapid transfer of imaging scans from hospitals throughout the local trauma operational delivery network is essential. If image exchange portals are required these must be tested regularly and robustly to ensure there are no delays in image transfer and should be available 24/7 at both sending and receiving hospitals.

Examples of good practice

1. Monthly QA checks on dose and image quality are recorded on a database and displayed graphically. This allows trends to be quickly identified and in one site had supported a dose reduction of approximately 30%.

2. Having procedure trolleys made up and ready for quick access when required in an emergency was in place at several of the sites visited.

3. IT resilience for CT scanners that may be required for major trauma, had been achieved by hardwiring a PC for each scanner separate from PACS within the CT control room.

[9]Joint Working Group to produce guidance on delivering an Endovascular Aneurysm Repair (EVAR) Service. (2010) www.mhra.gov.uk/home/groups/clin/documents/news/con103000.pdf

Staffing and team working

DOMAIN 4

The provision of an IR service requires teamwork both within radiology and with other specialities. Planning service provision will relate to demand which in turn will vary depending on clinical commitments locally and use of other resources (see networking above). Staffing levels will reflect this and will need to be tailored for individual departments. The IR team usually comprises radiologists, IR nurses, IR radiographers, clinical assistants and support staff including clerical staff, porters and managerial support.

24/7 availability of IR nursing staff and radiographers with experience of IR theatre is essential. All day, every day availability of an Interventional Radiologist with experience in embolisation for haemorrhage control and treatment of vascular injuries with stent and stent grafts is essential.

There are different issues relating to each of the groups involved in the clinical care of IR patients.

Radiologists

Interventional radiologists' portfolios and workload vary enormously and there are many different IR service models across the NHS.

IR as part of a vascular service.

At least two NHS trusts now provide IR services under the umbrella of vascular services, separated from the Imaging Department.

Advantages:

- integrated working with vascular surgery;
- easier separation/identification of funding;
- protection of demands from non-IR radiology;
- autonomy for service provision; and easier access to outpatient facilities.

Disadvantages:

- IR radiologists will usually drop other radiology skills. Although this may mean greater individual experience, the workload will need to be greater to provide the elective work and therefore justify enough IR radiologists to maintain an on-call rota;
- maintaining a non-vascular IR service and on call rota; and
- vascular surgery contributes a variable proportion, often less than 50%, of the IR vascular workload.

IR as part of the radiology service.

Advantages:

- IR radiologists with other subspecialty skills can be employed. This can justify a greater number of IR radiologists and aid provision of on-call IR.

Disadvantages:

- maintaining competency with non IR demands a fixed time commitment;
- identification of funding and funding streams.

IR as part of a operational delivery network service.

Please see 'networking' section.

Interventional radiographers

All IR units will have radiographers on call for IR procedures. In larger units the radiographers will all be trained in IR and probably assisting in elective IR procedures for most of their time at work. However, even in larger units the number of trained IR radiographers may be small and the on call may therefore be onerous. Combining the on call with radiographers from e.g. CT, Cardiac Labs and Neuro-intervention could have the advantage of creating a larger pool of radiographers; however, careful local planning is required as Percutaneous Coronary Intervention (PCI) and neuro-intervention can use up a lot of radiographer time. Maintaining competency across these different subspecialties would then be required.

Interventional nurses

The RCR document *Guidelines for Nursing Care in Interventional Radiology (2006)*[10] emphasized the importance of nurses in IR departments. Effectively all radiology departments that undertake IR procedures now have their own nurses. However, the job description varies widely between trusts. Almost all units with significant IR demand will also provide an on-call IR nurse service. Some larger institutions even provide two nurses on call. Pooling nurses from other departments has been introduced to facilitate this and may involve cross covering of neuro-intervention and cardiac theatres.

Extended role of IR nurses has been successfully introduced in a number of institutions and includes amongst others:

- involvement in an IR out-patient clinic;
- pre-assessment of patients;

[10]www.rcr.ac.uk/docs/radiology/pdf/GuidelinesforNursing

- insertion of central lines;
- undertaking arterial punctures;
- ascites drainages; and
- nurse led pain control.

The role of an IR nurse in the patient pathway is variable. There is potential for involvement in the pre-operative, pre-procedural, procedural and recovery components. Many hospitals have recovery areas managed outside the radiology department. One of the advantages to this arrangement includes the flexibility in staffing a larger unit. Having recovery 'in-house' has the advantage of protected beds and specialised skills.

Examples of good practice

1. Radiology matrons were in place at several of the sites visited. This role gave the service opportunities of support and input at a senior nursing level that was found to be invaluable.

2. A cascade system has been established to ensure that the IR response in an emergency situation of a ruptured aortic aneurysm is efficient and timely and that each member of the team is aware of their role. *This good practice example is described in more detail in the Appendix C.*

3. Many IR departments find additional pressure on a Friday afternoon and Monday morning IR lists due to bottlenecks of in-patient demand. Friday afternoon lists over run with procedures that could wait until the following day but not over a whole weekend. One site has instigated regular weekend daytime IR lists to overcome this issue. This has helped to relieve pressure on beds and reduced length of stay. *This good practice example is described in more detail in the Appendix C.*

4. Historically, surgical placement of lines required an in-patient stay, theatre time and a surgeon / anaesthetist. This service was identified as ideal for advanced practice and several sites have moved to the placement of lines by radiology nurses or radiographers. *This good practice example is described in more detail in the Appendix C.*

5. Where the IR out of hours workload is insufficient to warrant a shift system a 'light duties' rota can be introduced. At one site each IR performs a week on call and full week-end cover. During this week no routine lists are booked for the on call IR. The diagnostic and non clinical components of an interventional radiologist's job can still be covered during this week, but at hours that are more flexible to allow sufficient rest after an onerous night on call. *This good practice example is described in more detail in the Appendix C.*

6. Patients treated by EVAR require surveillance scans at one month, 6 months, 12 months and annually thereafter to monitor aneurysm sac size and check for the presence of endoleaks as per Society for Vascular Surgery (SVS) guidelines. Patients can be lost to follow up. One site has developed a robust system to ensure that patients are invited for their surveillance scans in a timely manner. *This good practice example is described in more detail in the Appendix C.*

7. Patient selection and prioritisation of elective patients requiring EVAR led one site to develop a database with a scoring system to aid the decision making process. The database tracks elective patients through their work up for EVAR and subsequent post-procedural surveillance. Additionally, the database allows prospective data collection on aneurysm morphology, device performance and unit mortality, morbidity and the requirement for secondary intervention. *This good practice example is described in more detail in the Appendix C.*

8. *Extending the role of the radiographer has been developed in an IR department, underpinned by protocols approved by the Trust protocols group. This good practice example is described in more detail in the Appendix C.*

Patient and public engagement and experience (PPEE)

DOMAIN 4

The Government has shown an ongoing commitment to involve people in their own healthcare and in the planning, review and delivery of health care. *Equity and Excellence – Liberating the NHS*[1] states 'Too often, patients are expected to fit around services, rather than services around patients….' Patient and public engagement and experience has become a statutory requirement of all NHS organisations. It ensures that service providers have the opportunity to listen, understand and respond to service user needs, perceptions and expectations. This can then be used to inform continuous improvement and service transformation.

Stakeholder engagement including patient representation will be required in development of care pathways. The Regional Trauma Network Engagement Project[11], using a multi strand engagement approach, appeared to ensure that sufficient breadth and depth of contributions were achieved. The combination of activities facilitated both quick and easy responses from a high volume of self selecting respondents as well as supporting in-depth and considered contributions from a carefully selected mix of stakeholders including patients exploring their experiences and making recommendations. Although a number of patients were not able to comment those that did were able to describe the reassurance that clinical staff provided. On reflection, patients were able to identify a number of weaknesses through their trauma pathway including:

- the need for better pre-hospital assessment to ensure people are transferred to a hospital best equipped to treat their injuries;
- a number of hospitals which they were taken to were not equipped to deal with their needs;
- in some instances ambulances caused great discomfort and were not adequately equipped to transport them;
- sometimes care was perceived to be sub standard by professionals who did not have the expertise to deal with their injuries and in some instances wrong treatment resulting in prolonged and multiple treatments and delayed recovery; and
- a complete lack of co-ordination and support once people are discharged from acute hospital care.

This is the type of structured process which is required to further develop services in ways which ensures patient confidence in service delivery.

Most of the sites visited recognised the value of engaging with patients and service users in a variety of ways.

- Evidence suggests a strong link between good communication and patient satisfaction and many of the sites visited invested time in direct communication between the IR team and the service user.
- Almost all undertake regular patient audit review of services, however it must be recognised that the gathering of feedback to make changes or improvements to services, is of little use if sites then fail to act upon the feedback within the organisation.
- All sites used a variety of information leaflets, both national and local however it must be kept in mind that studies[12] show that health information for patients and the public is written at an above average reading ability, making it difficult for some service users to understand.
- The British Society of Interventional Radiology (BSIR) have developed a number of patient literature leaflets these have been developed to provide standard and consistent messaging for patients and reduce the need for local IR teams to spend time developing their own.

[11]Department of Health. Regional Trauma Networks. Engagement Strands Report (2010) London
[12]Coulter A and Ellins J. (2006) The quality enhancing interventions project: patient focused interventions. London: The Health Foundation.

- Patients must be made aware of the risks and benefits of IR when compared to more conventional surgical or medical procedures. This is not always possible when urgent intervention is required in trauma situations. Patients can be assured by good clinical governance that risk is minimised and managed by robust clinical protocols based on best evidence and constant review of critical incidents.

Examples of good practice

1. Several sites have set up new and follow up patient clinics in imaging or out-patient (OP) departments for interventional radiologists to see, counsel and consent new patients and to see follow up patients. An increase in patient satisfaction has been demonstrated. *These good practice examples are described in more detail in the Appendix D.*

2. Other sites follow up their patients post procedure by telephone. This attracts a tariff.

3. Patient feedback following fistuloplasty revealed that patients found the procedure extremely painful and traumatic and also suggested that some patients may refuse further interventions. This poor quality experience needed to be addressed and a nurse led pain management service using an opiate analgesia was introduced. This has had a major impact on effective pain management. Results from a pain audit tool showed that a large percentage of patients subsequently reported a pain score of less than five and patients were happier to return for further procedures. *This good practice example is described in more detail in the Appendix D.*

4. Several sites have introduced dedicated written care pathways to ensure consistency of care in patient needing either elective or emergency intervention.

5. An IR patient satisfaction survey has been undertaken to gain feedback about the quality of the service. The aim was to determine the patient experience and highlighted any potential areas for improvement. *This good practice example is described in more detail in the Appendix D.*

Leadership

A good IR service requires close team work and cross discipline co-operation to ensure correct patient and procedure selection and timely service delivery, particularly in the setting of acute trauma. Skilful and inspirational leadership at all levels in the team maintains morale under working conditions that are often at high stress levels. Developing IR teams into effective components of a major trauma team needs strong executive leadership, particularly with the forthcoming challenges of vascular reconfiguration adding to the pressure for services.

Executive leadership has been seen to have an important role in the development and function of IR teams. Where good leadership was seen the importance of IR was recognised and the teams were more likely to be supported by adequate resource in terms of equipment and manpower, and to figure in the strategic plans of the Trust. Where this was not evident IR teams are more likely to be understaffed and working with substandard or outdated facilities, struggling to identify the way forward.

Financial solvency is clearly a key component of the ability of the Trust to achieve success in this field as IR is an expensive modality, although IR may be (and usually is) considerably cheaper than other treatment options[13]. Good financial leadership at executive level however will realise the potential of IR to generate income by appropriate operational delivery network arrangements, and by ensuring that activity is correctly captured and charged.

Within IR teams we have seen examples of good leadership from clinicians, radiographers and nursing staff. Conversely we have seen examples where elements of the team are dispirited by a sense of lack of involvement and integration either owing to lack of leadership by their professional peers or of the wider team. Good leadership supports all members of the team to make them feel useful and valued, and also provides the possibility of professional development of team members within their own sphere. Co-operative working across traditional boundaries can lead to a greater sense of teamwork and enhance the robustness of the service. An example of this would be non consultant led services such as line insertion developed by nursing and/or radiographic staff with the necessary support from consultant colleagues. Patients and clinicians have benefited considerably where this has been achieved.

Clinical and strategic leadership is vital in developing links with neighbouring Trusts both in terms of establishing appropriate referral pathways and protocols and in creating effective clinical operational delivery networks. This might assist with managing demand and ensuring that appropriate patients are referred on to IR centres.

Leadership and support from IT services is also important to ensure that communications are maintained 24 hours 7 days a week, particularly in relation to image transfer, and we have seen several examples where teams have struggled to provide optimum patient care because images cannot be transferred to the tertiary centre in a timely manner.

Across the country the effectiveness of leadership is very variable, notably at executive level. Sites exhibiting good leadership are often hard pressed but cope with enormous pressures, whereas demoralisation and stress are the hallmark of sites where some elements of this effective leadership are missing.

Examples of good practice

1. The introduction of a 'radiologist of the day' to whom all queries are directed allows other IR staff to get on with work without interruption. This system has improved productivity and made managing the workload simpler. All work is clearly displayed on a white board and this is constantly updated. It contains a list of pending cases so the team are aware of outstanding cases, priority can easily be re-ordered or if an opportunity presents the appropriate case can easily be added. The interventional radiologists cross cover for each other, vet and add cases to each other's lists.

2. A monthly diary meeting attended by all IR consultants where commitments are discussed in advance so that the team know who to approach on any given session to discuss or perform emergency interventions. Where possible absences are covered but lists are not booked if a session cannot be covered. This prevents patients having to have their procedures cancelled. *This good practice example is described in more detail in the Appendix E.*

Low volume procedures

Some clinical scenarios and procedures occur sufficiently infrequently that it may be difficult to maintain clinical and technical skills. Given the complexity and differences of this across organisations an exact definition of what constitutes a low volume procedure is not possible. It has been suggested that, as a rule of thumb, a procedure should be considered to be of low volume if, typically, an operator is exposed to a clinical scenario at a frequency of less than once every three months. In the context of trauma, this threshold may be reached for procedures such as thoracic stent grafting for aortic trauma. More generally even common presentations may become low volume for an individual if he/she is not exposed in day to day practice because others have a special interest. In reality, IR practitioners will know when skills and experience are being eroded through lack of exposure and must be expected to take steps to maintain skills especially where these skills are likely to be required in the emergency setting.

Analysing the problems posed by low volume procedures, and thinking about solutions, is best done by considering the initial clinical presentation, the technical skills required and the post operative care that will give the patient the best chance of survival.

Patient selection

Selecting the right patient for a particular treatment pathway requires experience. Even if the technical skills are well honed poor patient selection can have disastrous consequences. Practitioners are encouraged to:

- have a low threshold for calling and discussing cases with experienced colleagues, both locally and at other centres of excellence. Teleradiology and data transfer can play a major role here. All IR radiologists providing emergency IR cover should be able to access images at home;
- where possible develop written referral criteria and appropriate treatment algorithms for all clinical scenarios particularly those which might be considered low volume for everyone in the department. These should be updated through direct experience and new literature;
- set up regular morbidity and mortality meetings both within departments and within regions to share experience. Such meetings must be recognised in job plans; and
- remember that informed consent needs to include the information to the patient that the clinical scenario is unusual and experience is limited and that there is an alternative outside of IR.

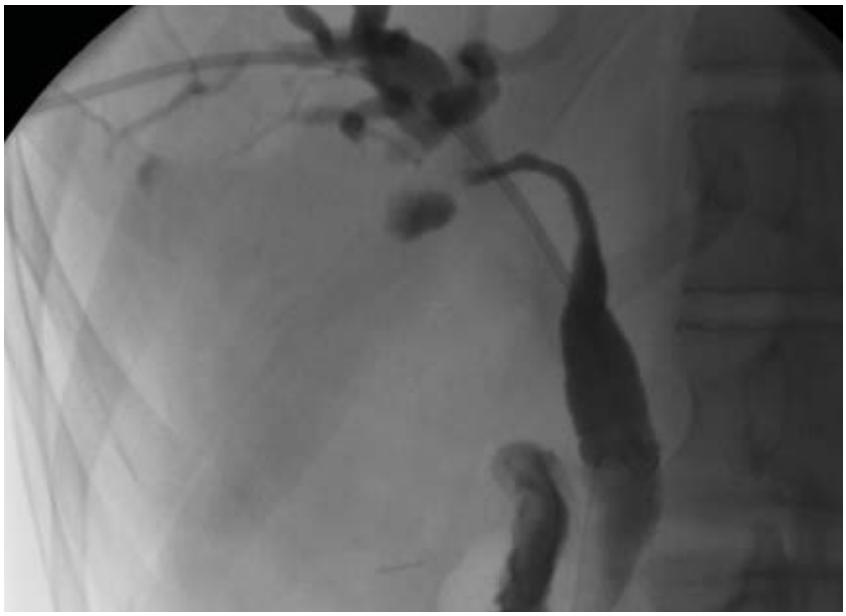
Procedural

All members of an IR team need to maintain technical and clinical skills. This applies equally to radiologists, radiographers and nurses. However within a team at any one time there may be different levels of experience. For example a radiologist of limited experience of bronchial embolisations might be working with a nurse or radiographer who has experience of many bronchial embolisations. Good teamwork is key to successful outcomes in all clinical environments but perhaps more so when dealing with low volume procedures. Equally anaesthetic support is vital and allows the IR team to concentrate on procedural technical skills.

Optimise the chances of a successful outcome by:

- good honest pre-procedural team briefing that MUST include all who will be involved;
- having written procedure guidelines to use as a refresher;
- maintaining competency in all procedures that might happen as an emergency out of hours. Remember that many technical skills are transferable e.g. UAE provides perfect high volume skill sets that can be transferred to the occasionally performed embolisation for post partum haemorrhage. Emergency TEVAR will be more familiar to those carrying out many abdominal aortic EVARs;

- maintaining competencies by doubling up i.e two radiologists working together during elective or day time emergency procedures. Again it is important that the absolute need for this is recognised by hospital management and that it is built into job plans and costing of procedures;
- considering external training where feasible;
- using simulation techniques where available to maintain familiarity with devices and clinical decision. Such facilities exist and will become more widely available in the future;
- signing up to a 'maintenance of competency agreement' and clarify what procedures the IR team is happy to undertake, both in an elective and in an emergency setting. Stick to the agreement and review it regularly; and
- recognising where there are scenarios where skills cannot be maintained, formal pathways must be available to other hospital clinicians, preferably published on the hospitals trust intranet. Formal agreements must be made with the referral hospitals and commissioners involved in such decisions and pathways. An example of a procedure that might require such action would be TIPS for uncontrollable bleeding.



Despite the above it is recognised that in the emergency setting it may be in the patient's best interest to attempt a life saving procedure even if inexperienced in that technique. With use of the measures discussed above it may be possible to mitigate against any potential adverse outcomes should this scenario occur.

There are ways in which clinical and technical skills can be maintained to cover all clinical scenarios. Patient safety demands that every effort is made to do this on the part of individuals and teams. Management must play their part in providing an environment that patients can have confidence in. All IR teams will come across clinical scenarios which will present them with new challenges. The recognition by all involved of their limitations in such situations, seeking advice and help acutely but thinking ahead electively will ultimately provide the best possible outcomes.

Examples of good practice

1. In Nottingham the radiologists double up for low volume cases such as TEVAR and TIPS and they keep a record of who has done what, making sure that they all maintain sufficient numbers of cases.

A: Networking

Delivering an out of hours IR service utilising consultants from a neighbouring hospital

University Hospital Coventry and Warwickshire NHS Trust

Summary
Since October 2011, a full out of hours interventional radiology service has been provided at the University Hospital Coventry and Warwickshire NHS Trust (UHCW) site on a 1:6 basis. This has involved four consultants from UHCW with agreed contractual support from two further consultant interventional radiologists from a neighbouring Trust (George Eliot Hospital, Nuneaton). UHCW is a large 1200 bed modern teaching hospital which now has major trauma centre status. George Eliot Hospital is a smaller district general hospital. The two sites are around 10 miles apart.

Context and background
UHCW is set up to be a Major Trauma Centre. Vascular services for the three acute Warwickshire Trusts had previously been reconfigured successfully with six vascular surgeons participating in a centralised on-call service at the UHCW site. A fourth consultant interventional radiologist was appointed in September 2010. This allowed the move to a full cover out of hours IR rota for vascular and trauma services. The Trust has all major medial and surgical sub specialities on site with the exception of specialist paediatric surgery.

How was the change made?
Informal clinical level discussions between consultants from the two hospitals with subsequent discussion at clinical director level. Once broad principles were agreed, management meetings took place to agree precise operation and clinical governance structures.

The two George Eliot consultants operate on a 1:6 rolling general on-call rota at the George Eliot site and perform a dual on-call being available concurrently for the UHCW IR rota. The UHCW general and neuro rotas were reconfigured to release Intervention consultants for the IR rota who in turn dovetail with the George Eliot rota.

It was agreed that UHCW would pay for one weekly in hours direct clinical care (DCC) of intervention activity for the two George Eliot Radiologist on the UHCW site for basic service delivery and so that they could play a central role in the Trust's IR activity. These sessions started three months in advance of the on-call rota to enable familiarisation with local staff, rooms and equipment.

A clinical lead for IR was appointed and a specialist group formed. The clinical lead co-ordinated all the arrangements and made presentations to relevant clinical colleagues (Emergency Department, Anaesthesia, General Surgery and Orthopaedics).

What resources/ investment were needed?
A sterile ultrasound (US) needle guide was purchased to enable US guided intervention for consultants who required it. A document detailing the agreed clinical service was developed following the template provided by the Royal College of Radiologists. With this information, a review of on the shelf stents and embolisation coils was undertaken to cover the emergency workload; essentially the stock was doubled.

The realignment of the diagnostic imaging rotas demanded a significant change for all UHCW consultant radiologists (body imaging 1:7, neuroimaging 1:9 and intervention 1:6). The number of specialist registrars assigned to the department was increased enabling a 1:7 out of hours compliant registrar rota to support the diagnostic service.

The George Eliot consultants are paid an agreed number of DCCs to cover their daytime and out of hours IR cover.

Results
Overall impact
The changes have been very positively received by our clinical colleagues. Provision of the rota enabled UHCW to achieve full Major Trauma Centre status. This has been a major advance in delivery of specialist care to the patients of Coventry and Warwickshire and provides an excellent base for further development of IR services in the future. In the first few months of operation, numerous patients have benefited from prompt percutaneous intervention and avoided open surgery.

How was the change measured?
A log of out of hours interventional procedures has been kept along with an hours monitoring exercise for the consultants involved. In addition, the impact on nursing and radiography staff has been logged over the initial months in order to assess the service impact and requirements for the future.

How has good practice been sustained?

All six consultants continue their normal update, clinical governance and appraisal processes. In particular, the IR group has formed a quarterly meeting for business and clinical case review/presentation. A future specialist IR MDT and morbidity/mortality meeting is planned. All consultants now submit their personal data at the BSIR national registries for both vascular and non vascular index procedures.

Lessons learnt

The collaboration between the two hospitals has resulted in an excellent working arrangement for the provision of a specialist IR service to the local population. The consultants had the vision to see how future service configurations might be shaped and have been commendably flexible in assisting a larger organisation to make the necessary advances. Patients from Coventry and Nuneaton including the whole catchment area for the Major Trauma Centre will benefit as a result of this.

The concept of the two George Eliot consultants being on call for both diagnostic and interventional radiology appears sustainable to date.

Future plans

The rota provides an excellent platform for further developments including acute EVAR/TEVAR and expansion into acute colorectal stenting. A business case for uterine fibroid embolisation (UFE) is at an advanced stage and once these elective patients have begun to attend the department, an appropriately provided service for acute post partum haemorrhage will be enabled.

We plan to develop a local specialist IR MDT with a morbidity/mortality component to the meeting.

From this established base, we plan to build a service which can expand and adapt to the future and changing needs of our local population adopting new techniques and technologies as they become available.

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A: Networking

Implementation of radiology nursing cross site rotation

Newcastle upon Tyne Hospitals NHS Foundation Trust

Summary
Radiology nursing cross site rotation was implemented in Newcastle upon Tyne Hospitals NHS Foundation Trust (NuTH), in order to provide a single nurse on call rota, to support the interventional radiologists. It provides registered nursing cover for emergency out of hours radiological intervention. Registered nurses below band 7 are rostered to work in the radiology departments at the Royal Victoria Infirmary and Freeman Hospitals. Each radiology department performs different interventional procedures, although there is some overlap. This was challenging in terms of skills and experience and required careful and comprehensive planning. This system aims to provide safe practice, increased knowledge base and nursing job satisfaction, plus aid recruitment. Cost savings were also made by reducing two on call rotas, to one.

Context and background
The interventional radiologists at the Royal Victoria Infirmary (RVI) and the Freeman Hospital (FH) implemented a single radiologist on call rota specifically aimed at providing out of hours cover for emergency interventional radiological procedures across both sites in October 2009.

Following this, there was a review of radiology nursing and it was decided that the registered nurses could mirror their system. The idea was to provide experienced nurses who would be knowledgeable, safe and proficient in assisting with all types of intervention undertaken on each site. They would also have good geographical knowledge of both sites and know where equipment was stored.

We believed that the nursing and medical staff would provide a more efficient service when working together on a regular basis, thereby getting to know each other well. We felt this to be an important part of providing a high standard, out of hours interventional radiology service, when the RVI became a level 1 Major Trauma Centre in April 2012.

The aim was also to create a flexible service as the registered nurses would be able to cover their colleagues on either site during holidays, sickness and leave due to the European working time directive. The experience gained would enable safe practice to occur when working on call without the presence and support of other radiology nursing colleagues.

There was also a financial incentive, as savings would be made by reducing two on call nursing rotas, to one. As only one on call rota was now required, changes to the skill mix of staff nurses and health care assistants could be made, resulting in further cost savings for the radiology directorate.

This system would reduce the amount of on call undertaken by the nurses from 1:5 to 1:10, thereby improving their work life balance. In contrast however, it would reduce the amount of on call undertaken, thereby reducing the amount of overtime paid to staff.

How was the change made?
Firstly, discussions between the senior sisters, matron and medical staff were made and it was agreed that it could be advantageous to implement cross site working for qualified nurses below band 7.

Although this system of working had been informally discussed with the nursing staff in previous years, a formal meeting was arranged out of hours in order to avoid any interruptions. Both registered nurses and health care assistants were invited and an agreement was made to give staff who attended, time back in lieu. A matron chaired the meeting and most staff attended.

At that time there were both positive and negative comments made about the introduction of this system. The senior sisters compiled a written staff survey that was completed anonymously. The results showed that some staff were reluctant to make the change in practice whilst others looked forward to the challenge and variety of work.

A nursing rota was developed to include cross site rotation of qualified nurses below band 7, between both hospital radiology departments. This commenced in June 2010.

The two band 7 senior sisters permanently remain on their individual sites as managers, although work closely together and frequently visit the opposite site. One of them previously worked on the opposite site and therefore had a good overview of the service on both sites. This helped in understanding how staff needed to be allocated on each site.

In October 2010, the most experienced radiology nurses began to participate in a single nurse on call rota that covered the RVI and FH. The less experienced joined the rota at a later date when they were deemed competent.

What resources/ investment were needed?

Initially savings were limited as experienced staff (including band 7 senior sisters) provided on call cover for the less experienced, until they were deemed competent to undertake solo on call. In effect, this reverted back to having two nurses on call together, but for shorter periods of time.

Ultimately money was saved on the nursing staff budget by reducing the nurses on call from two to one as only one standby payment needed to be made. Also, the band 7 senior sisters withdrew from the on call rota, thereby reducing the costs created through more expensive overtime payments.

Time investment was required to:

- undertake extra training for staff who were assessed by the senior sisters on an individual basis;
- set up quarterly cross site meetings that alternate across site. Initially these were arranged out of hours, but recently, with the cooperation of the medical staff, they have been arranged for early in the morning to avoid minimal disruption to the work load;
- compile new rotas, holiday and off duty requests spreadsheets;
- improve and update equipment lists on both sites as a learning tool and aid during call outs; and
- create a medical device competency list to include medical devices used across site, and use it as a training guide for staff.

The senior sisters invested a lot of time with staff as they explained regularly, the need for cross site rotation to occur and its advantages for the directorate and Trust. There was some well-established staff who were reluctant to change. We dealt with this by encouraging staff involvement and asking them to discuss how they felt the rotation should be implemented. This allowed staff to feel more involved in the process.

Results

Overall impact

Cross site rotation has given the registered radiology nursing staff confidence to participate in providing a single nurse on call rota that covers two hospital radiology departments. It provides a safe system of working and continuity for the radiologists on call. Staff relationships have developed further during cross site rotation. Patients benefit by receiving safe care from well trained, knowledgeable and experienced staff.

How was the change measured?

Quarterly cross site staff meetings were set up and minutes taken to provide an update for those who could not attend.

The staff survey was repeated after 12 months. The results were fairly similar to the results of the initial survey

How has good practice been sustained?

All new radiology nursing jobs are advertised to work across both sites.

Cross site rotation has continued, although the frequency of rotation depends on staff experience and training required, therefore is organised on an individual basis.

A list of medical device competencies was compiled, training given and sign off when staff were competent. The competencies are undertaken on an annual basis.

Band 7 sisters continue to shadow staff on call when necessary.

Lessons learnt

Although the possibilities of cross site rotation had been discussed occasionally during the previous few years, the staff still did not seem prepared for the change in practice.

In hindsight we feel that formal staff discussions could have been started earlier in an effort to allow staff more time to come to terms with the changes.

Newly appointed staff who were employed on the basis of working across site, were very positive in what they could gain from working in two separate environments and were excited by the learning opportunities presented. Currently they are happy and feel as though their working practice is well balanced.

After 18 months of cross site rotation, the established nurses have settled down well and the whole group are sharing knowledge and best practice across site.

Future plans

Continue with the rotation.

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A: Networking

Networked on call interventional radiology across two sites

South Devon Healthcare NHS Foundation Trust and Royal Devon and Exeter NHS Foundation Trust

Summary
Two neighbouring DGHs, 25 miles apart in a rural location each have three interventional radiologists. In order to provide formal on call IR services 24/7 they have developed a networked solution.

Context and background
Royal Devon and Exeter has a catchment population of approximately 370,000 and Torbay's catchment resident population is approximately 280,000. There are significant increases in transient population during holiday seasons.

At each site there are three interventional radiologists. Emergency out-of-hours IR had been provided on an 'ad hoc' basis. With increasing frequency of cases there was significant risk of being unable to find a willing or available staff member (radiologist, radiology nurse, interventional radiographer) and staff were becoming unhappy about being called in when not on call.

The two Torbay and three Exeter vascular surgeons have been running a successful cross-site emergency on call vascular surgical service for several years. For this service the usual approach is for the emergency patient to be transferred by ambulance to the on call site if required. The interventional radiologists initially favoured a similar model for an IR on call service, feeling unenthusiastic about having to do urgent cases in an unfamiliar environment.

How was the change made?
The Torbay radiologists started their own in-house on call service whilst discussions were ongoing in Exeter. This was on a 1:3 rota, clearly not sustainable in the long term. In the first year of this service the cases were audited and it was felt by the referring clinicians and intensive care teams that a significant minority of patients would not have been suitable for transfer if Exeter had been on call.

The planned model was therefore changed with the default position being that the on call radiologist travels to the site of the patient. The radiologists visited each other's departments to get to know the layout and staff. Consumables such as wires and catheters were similar in each department but all radiologists satisfied themselves that their preferred kit was available on both sites.

On both sites the discussion and planning included radiology department managers, medical directors and senior executives, the radiology nurses and interventional radiographers, and the general radiologists.

On weekday evenings and nights each site covers its own emergency work. From Friday evening to Monday morning and on bank holidays there is one interventional radiologist on call, covering both sites. The radiologists' rota is therefore 1:3 week days, 1:6 weekends. For every night and weekend there are radiology nurses and interventional radiographers on call at both sites. This service has been running for 20 months.

What resources/ investment were needed?
There was a relatively small increase in pay costs, for the changes in job plans and on call frequency for the radiologists and for the formal on call for the nurses and radiographers. (In Torbay this equated to approximately an additional £66,000 per annum and had been built into the business cases for recent general radiologist appointments.)

Results
Overall impact
There is always interventional radiology emergency cover at both sites, 24/7, providing a safe and secure service. This is extremely well-received by the other clinicians within the hospitals. Increased awareness of the service has led to a significant increase in out-of-hours cases compared to the previous ad-hoc arrangements. However, all of these cases are felt to be appropriate and the frequency of call-outs is still relatively low. In order to maintain a degree of control and to ensure appropriateness of referrals the on call interventional radiologists will only take calls from consultants.

How was the change measured?
Diaries of activity are kept and the service audited.

How has good practice been sustained?

The radiologists from both sites meet to discuss the service and cases performed. Now that both the vascular surgeons and the interventional radiologists have cross-site rotas this has encouraged further development of formal cross-site MDT working.

Lessons learnt

As in many radiology departments there was reluctance from the general radiologists regarding these changes as the interventional radiologists would come off the general on call rota. To some extent this was ameliorated by linking these changes with expansion in overall radiologist numbers in response to growing workload. Now that the service is well-established the majority of non-interventional radiologists are very happy with it; they no longer have the difficulty of being asked to arrange an urgent interventional case at the weekend, either feeling forced to do something they are uncomfortable with or having to phone around to find a colleague who is not on call.

As an unexpected consequence for two DGHs, on a few occasions at weekends we have received patients transferred from another hospital because the clinicians there are aware that we have the only formal IR on call service in the region.

The agreed portfolio of work covered on both sites on call includes nephrostomy, abscess drainage, peripheral vascular intervention and embolisation for haemorrhage. Renal access work is only done at Exeter and therefore fistula salvage was not included. Only one of the six radiologists performs TIPSS and two of the Torbay radiologists do not perform PTCs. These procedures are therefore only provided on an ad hoc basis, depending on which radiologist is on call or contactable. We thought that we had thought of everything but did not realise that the Exeter surgeons ask for urgent colonic stenting for obstruction whereas this is not done at Torbay. This is the one procedure that was requested at the weekend by an Exeter surgeon but could not be performed as the on call radiologist was from Torbay.

Future plans

The service is working well and appears sustainable. We continue to strengthen the links between the IR and vascular surgical units at both sites.

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A: Networking

Development of cross-site 24/7/365 interventional on-call service covering nine individual hospital units

NHS Greater Glasgow & Clyde

Summary
A case for change to work collaboratively across several Trusts to deliver a 24/7 IR service to patients every day of the year.

Context and background
There was increasing recognition of the importance of IR in patient pathways particularly for haemorrhage control with variation in access to out of hours interventional radiology across the local areas. There was no formal IR on call rota and the informal rota was placing stress on specific points of the IR team.

There were nine trained interventional radiologists across the area however on-call was part of the general diagnostic rota. There was no formal nurse on-call rota at the time of inception. Equipment and equipment levels across the area particularly of consumables was varied.

How was the change made?
The clinical case for change was established with the clinical team including nurses and radiographers in a series of facilitated meetings. The managerial support was excellent after the case for change was established and resource support was agreed. We did not focus only on OOH services and accepted that we would have to change in hours services as well.

The agreement for new posts was established within an overall framework that included improving cross-cover and working in hours between adjacent units and merging equipment and procurement to both reduce costs and improve cross-site working.

An IR on-call manual was developed. It included both processes and procedures. This allowed the clinical groups to debate the detail of service provision prior to service introduction.

What resources/ investment were needed?
- Additional staff funding was required. This was not seen solely to support out of hours but was framed to improve service provision and equality of access both in and out of hours.
- Medical staff required changes to job plans - this impacted on the diagnostic on-call rota. Further redesign of diagnostic rota occurred.
- Medical staff had to accommodate changes that meant cross-site working both in and out of hours.
- Nursing staff required significant negotiation to terms and conditions - this took a considerable time to work through. For a period reduced numbers of nursing staff participated and this placed pressure on this group. Nursing staff also had to adapt to cross-site working across several hospitals.
- Most sites already had dedicated radiographic staff, however there was concern about undertaking unfamiliar procedures.

Results
Overall impact
- The change has provided a 24 hour IR on call service on every day of the year with improved equity of access to IR services.
- There has been direct positive feedback for the IR team. Having developed the case for change they recognised the impact they were making in acute care.
- Reduced referral time for out of hours work received very positive feedback from all clinical staff and enhanced the profile of IR services across the area.
- Consolidation of consumables across sites was very valuable in service provision and has resulted in a cost saving.
- Using the separate projects of procurement etc did develop a sense of identity among the units.
- The IR manual was very valuable, particularly in the initial stages for both external and internal groups.

How was the change measured?
We have published audits of our service against the RCR guidance for 24/7 IR services. We have a research/ audit interest in outcomes for IR techniques and have submitted for publication a paper on 30 day outcomes after OOH intervention.

How has good practice been sustained?
The on call service requires a consistent focus and evolves as clinical requirements change. We have established an Interventional Forum that meets regularly to discuss all aspects of the service. The forum contains representation from radiographers, nurses and managerial structures.

Lessons learnt

- Clinical leadership within each of the groups was essential and this was enhanced by the projects and an understanding of the case for change.
- The process was at times difficult and required real persistence - this may not have happened without the above.
- Defining the scope of services is essential - the IR team involved would not have signed up to an open ended agreement. In addition, we had to accept that the important targets to cover were the common life threatening emergencies initially haemorrhage. We have since adopted a wider range of procedures.
- We were merging units that did not previously have a close working relationship. We used the development of the discrete projects; procurement of consumable equipment, facilitated meetings and development of IR manual to help form a more cohesive unit.
- There were initial challenges from diagnostic colleagues due to the impact on their rota. We could have perhaps involved them more closely in the development of the case for change.
- Achieving a sustainable nursing on-call has required on going work. The nursing group have very much supported this initiative however negotiation of terms and conditions is time consuming.
- We rationalised equipment across the sites to facilitate cross-site working for all staff groups. We also developed embolisation bags - this is a portable complete consumable kit which includes contrast catheters embolic agents. This is stored at two sites across the area and is transported to cases outside the main units.

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B: Funding

Ensuring accuracy of coding for interventional radiology (IR) procedures to reflect workload and maximise income to IR departments and so ensure resources follow clinical activity

Oxford University Hospitals NHS Trust

Summary
The introduction of Payment by Results (PbR) meant that it was vital to accurately record and code IR procedures in order for the correct tariff to be applied. This project has:

- improved the accuracy and visibility of IR procedures within clinical notes following regular case review meetings with clinical coding department and commissioning manager;
- lead to the implementation of clinical recognition within PAS and the electronic patient record (EPR) (currently in phased replacement of PAS) for clinic episodes; and
- established IR Consultant waiting lists for key IR procedures.

Context and background
IR has expanded rapidly in the last decade to offer a wide-range of minimally-invasive treatments across many different specialties including trauma, vascular surgery, oncology, gynaecology and gastroenterology.

The introduction of PbR rewarded increased clinical activity with increased income based on the tariff for a patient "spell". This system was based on a model of a "spell" being defined as a referral to a hospital clinic with further investigations or treatments thereafter. Traditionally, radiology has been regarded as a support service with locally negotiated global budgets and in most cases has taken referrals from other hospital specialities and therefore the tariff for a treatment has been assigned to the "clinical" specialty. Interventional radiologists are increasingly recognising the need to take on clinical care of patients.

There are examples where this is vital, for instance uterine artery embolisation where patients expect a consultation with the interventional radiologist in an out-patient setting prior to and after the procedure and for the radiologist to take on their care during their hospital spell.

There are barriers to development of IR services including lack of out-patient clinics, lack of junior medical staff, lack of in-patient beds, shortages in radiology nurses and poor provision of 24-hour cover nationally. There is poor awareness of the scope of IR among the public and to some extent referring GPs.

There is a national trend towards centralisation of vascular surgical units and Major Trauma Centres. Although these changes are led by vascular surgery and trauma, IR is often key in delivering services. Traditional funding arrangements can limit investment in radiology infrastructure.

How was the change made?
Coders currently use clinical notes to identify procedures and patient co-morbidities that map to the final tariff healthcare resource group (HRG). Radiology procedures are currently reported on a radiology information system (RIS). This generates a paper report. The coders will only pick this up if this has been filed and is visible, or if there is a clinical entry to flag them to look on RIS. Regular case review meetings were arranged with the clinical coding manager and the commissioning manager for completed patient spells.

A list of key procedural codes was identified for IR procedures and distributed to the IR suites (based on two sites) and also an abbreviated list to ultrasound and CT where image-guided biopsies or drains are performed.

A policy was introduced that all interventional procedures should be recorded on an operation sheet, and a red sticker with "interventional procedure" placed in the clinical notes to highlight the procedure to clinical coding. Radiologists were encouraged to avoid abbreviations, clearly state the procedure and add the procedure code. If there were any major co-morbidities then these should also be stated. One particular example identified was for colonic stent insertion where specifically stating "bowel obstruction secondary to colonic carcinoma" rather than "bowel obstruction" would significantly alter the tariff to reflect the co-morbidity of the patient.

The majority of angioplasty or stent procedures for peripheral vascular disease are currently performed as day-case procedures within radiology. Following referral from vascular surgery there is a radiology pre-assessment clinic to assess suitability for a day-case procedure. A member of the clerical department who had undertaken PAS training identified these clinic episodes were not being recognised and that patients were being admitted under vascular surgery for their day-case procedure, even though care for this episode was completely under IR.

Changes were agreed to recognise the clinic episode for the pre-assessment and to establish the patient onto an IR consultant waiting list so the tariff would pass to the IR day-unit. This puts the unit onto a realistic funding stream as workload is set to expand rapidly due to centralisation of vascular surgery in our region.

The importance of clinic episodes and IR consultant waiting lists was also identified in relation to fibroid embolisation. Patients were being admitted to the gynaecology ward as emergency admissions under gynaecology. Involvement of the commissioning manager and IR clerical staff established the pre-procedure MRI and consultation as a PAS clinic episode with placement of the patient onto an IR consultant waiting list. This enabled the gynaecology ward staff to admit the patient as an elective procedure under the IR consultant for their hospital spell. A similar model has been applied to patients with vascular malformations.

What resources/ investment were needed?

Time to meet, engagement with coding manager, commissioning manager, clerical staff within radiology.

Results

Overall impact

- Better understanding of process and importance.
- Accurate recording of information.
- Positive effect on team morale both in IR and clinical coding.
- New set of useful information for IR team to use when negotiating for additional resources.

How was the change measured?

Subjective improvement in visibility of IR procedures within coding, positive feedback from coding manager.

Increase in radiology income difficult to measure as no separate budget line for IR income within overall radiology budget. However increase in income has been incorporated into Cost Improvement Programme (CIP).

Recently implementation of EPR across the Trust has had teething problems with booking day-case patients, this has been immediately identified as a loss of income.

How has good practice been sustained?

Less frequent but ongoing meetings between clinical coders and IR

Lessons learnt

Worth investing the time which is always at a premium

Future plans

Current clinic episodes are carried out ad-hoc in ultrasound/MRI/day-case/office settings. The next stage of this plan is to create dedicated session in out-patients. The aim is to incorporate this into consultant job plans. The clinic would be used for vascular pre-assessment, fibroid embolisation consultations, vascular malformations referrals and in future extended, for example, to review patients with who have had inferior vena cava (IVC) filter placement. Patients could potentially be referred directly from GP for some of these procedures.

There are further plans to take on junior doctors (F2) doctors to enable greater clinical engagement on the wards following procedures for in-patients.

Plans to improve profile of IR in the local health system, i.e. GP study days, information campaigns, involvement of local media and patient support groups.

Separate work is underway to establish service level agreements (SLA) between radiology and clinical specialities.

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C: Staffing and MDT working

A cascade system for emergency IR

Cambridge University Hospital NHS Foundation Trust

Summary

A cascade system is in place to ensure that the IR response to a ruptured aortic aneurysm is efficient and timely. Each member of the team is aware of their role in the cascade.

The vascular surgeon on-call informs the IR radiologist on-call when a patient with a ruptured/dissected aorta is either in ED or is an expected transfer. The CT images are reviewed by the IR radiologist and the vascular surgeon and if the decision is made that an endovascular repair is appropriate the following cascade system is used.

Context and background

The vascular surgeons and interventional radiologists at CUH have been providing an EVAR service for ruptured abdominal aortic aneurysms (AAA) since 2005. Since then there have been 15-20 cases per year. A guideline has been put in place;

- to identify radiological and radiographic personnel required to provide IR support during emergency EVAR or TEVAR;
- to establish a pathway of communication from vascular surgeon to interventional radiologist to radiographer(s) that is efficient; and
- to identify equipment required.

What resources/ investment were needed?

Time to agree guideline.

Results

Overall impact

Improvement to patient journey.
Reduced stress levels for staff.

How has good practice been sustained?

Guideline passed on to all new staff.

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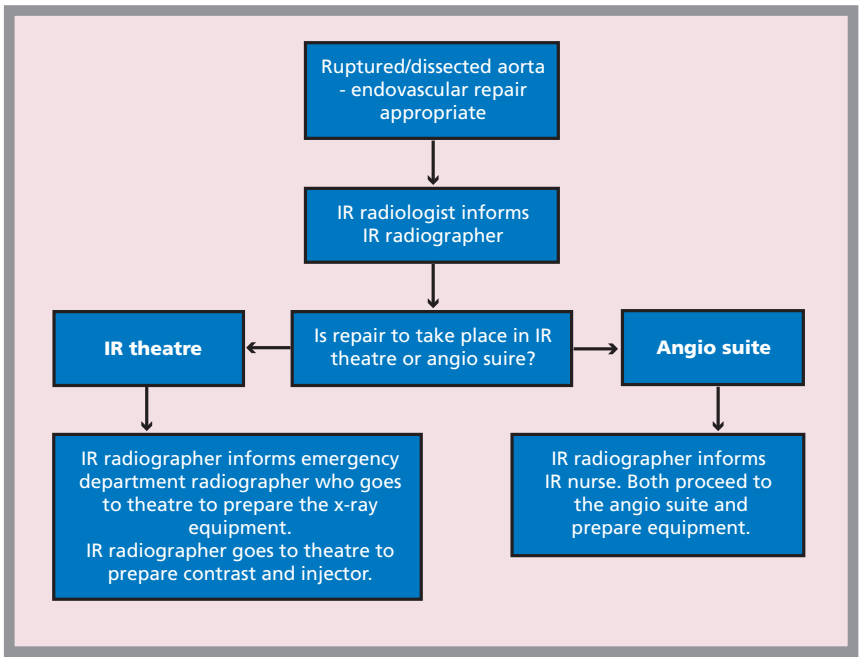

C: Staffing and MDT working

Providing an extended IR service

Heart of England NHS Foundation Trust

Summary

Due to increased demand for services pressure was put on Friday afternoon and Monday morning IR lists. Friday afternoon lists regularly over ran with procedures that could wait until the following day but not over a whole weekend.

Context and background

Pressure on Friday afternoon and Monday morning IR lists due to bottlenecks of in-patient demand. Regularly over-running Friday afternoon lists and requests for IR procedures on call that could have waited until the following morning but could not have waited over a whole weekend.

How was the change made?

Instigated regular weekend daytime IR lists (running 10 -2) in addition to the already extended working day during the week (2.5 sessions of scheduled room activity)

What resources/ investment were needed?

- Negotiated consultant job plans to allow time off in lieu elsewhere in the week (requires adequate consultant staffing).
- Tie the initiative in with Trust objectives on reducing length of stay and In-patient key performance indicators.
- Ensure adequate staffing for radiographers and nurses.

Results

Overall impact

- More even distribution of work throughout the week without the Friday afternoon and Monday morning peaks in demand.
- More flexibility in scheduling inpatient work.
- Less demand for weekend on-call activity with urgent in-patient work accommodated on weekend lists.

How was the change measured?

Data collection.

How has good practice been sustained?

The consultants working weekends chose to do so and are happy with their new working arrangements and weekday time off in lieu (consultants work one day alternate weekends on a rolling fortnightly rota)

Lessons learnt

Once set up, in the future we recommend cover arrangements are agreed for periods of absence, study leave and annual leave to retain continuity of service. At present the weekend working is only one list per weekend, alternating between Saturday and Sunday. The aim is to have a list every Saturday and Sunday, the main limitation being IR consultant, radiographers and nursing numbers. Such provision would further improve the timeliness of service delivery, reduce length of stay and reduce demand for IR on call work at weekends.

Future plans

The initiative has been very successful to date and now needs to be extended to cover both days every weekend. New staff (consultants, nurses, radiographers) joining the Trust are appointed with the expectation of doing some weekend work.

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C: Staffing and MDT working

Nurse/radiographer led tunnelled line insertion

Central Manchester University Hospitals NHS Foundation Trust

Summary
Manchester Royal Infirmary is a tertiary centre for renal and haematology services. Demand for tunnelled line insertion is approximately 350-400 per year. Historically lines were placed surgically but this service is now provided by a nurse / radiographer team. This has reduced waiting times and increased efficiency.

Context and background
Historically placing tunnelled lines surgically required an in-patient stay, theatre time and a surgeon / anaesthetist. Waiting times were long and renal patients often required temporary dialysis access whilst waiting. Failure rate due to poor positioning was approximately 50%. The move to placement of tunnelled lines in radiology led to a sharp increase in workload. This service was identified as ideal for advanced practice. A renal nurse practitioner and subsequently the lead radiology nurse and senior radiographers were trained in tunnelled line placement.

How was the change made?
A protocol for placement of tunnelled central venous lines performed by nurses was drawn up and approved by the Trust Risk Management Committee. The nurses were trained by a consultant radiologist. Following training the nurses undertook uncomplicated internal jugular Hickman and Tesio tunnelled line placements. Audit demonstrated that the skills for successful line placement could be rapidly acquired. Two dedicated lists per week were established and the renal specialist nurse provided liaison between radiology and service users.

A radiographer joined the team and following staff changes another radiographer was trained. The team consists of three staff members, which allow for the service to continue during annual leave / sickness. The team assumes full responsibility for the service including planning the lists, patient information and preparation, documentation and trouble shooting. A specific patient information leaflet has been produced.

Experience has resulted in progression of the service to include difficult access / line exchange and a successful registrar training programme is also being delivered

The consultant renal nurse developed a tool for managing line infections. This "MR VICTOR" tool is now widely used.

What resources/ investment were needed?
The extra lists required investment in radiographic staffing. The list was part of a general expansion in IR which resulted in the appointment of a full time senior radiographer.

Consultant time was required for training/audit/advice.

The job description of the consultant renal nurse was required to be available for line insertion lists. 50% of time is dedicated to the access service.

Results
Overall impact
- The changes have been very positively received by service users. Patients have expressed an improved experience because of staff continuity.
- Dedicated lists on a Tuesday and Thursday mornings mean that there is more availability and regular lists have improved patient preparation.
- Audit demonstrated an average wait of 1.9 days compared to the previous several days to weeks when undertaken by surgery.
- This move to "'right access at the right time' means that less temporary lines are inserted with the associated reduction in infection rates.
- Staff continuity and ownership of the service has meant standardisation of practice and documentation.
- Nurses recognise the procedural information in the notes and have named contacts.
- Costs are reduced. The cost per procedure is halved when undertaken by two radiographers compared with a consultant and scrub nurse.
- Theatre time is not required.
- Length of stay is reduced. The procedure can be undertaken on an out-patient basis.
- Increased job satisfaction for those undertaking the role.

- The success of the original renal and haematology service has led to this becoming a Trust wide service. Lines are now placed regularly for ITU, gastroenterology, gynaecology and cardiology. The renal access service is also offered to neighbouring Trusts.
- New starter nurses from haematology and renal services attend lists.
- Approximately eight hours per week of consultant radiologist time is now available for other procedures.

How was the change measured?

- Audit of waiting times and infection rates.
- All completion images sent to consultant radiologist for assessment of position
- Complication rates compared to DOQI standards.

How has good practice been sustained?

- Recording and review of complications by consultant radiologist.
- Audit of waiting times.
- Training of further staff to ensure numbers of trained staff are maintained.
- Involvement in all Trust initiatives e.g. Trust wide central venous catheter (CVC) audit and 'Matching Michigan – the Manchester Experience,' to maintain knowledge and profile.
- Close liaison with service users, e.g. meetings to ensure the service meets their requirements.

Lessons learnt

- The collaboration between the renal consultant nurse and radiology has enabled this service to flourish.
- Initial problems with patient preparation which led to some complications have been resolved by the design and publishing of a checklist to ensure patients are correctly prepared. This checklist is available on the hospital intranet and is completed for all line insertions.

Future plans

- This provides an excellent platform for further developments including radiographer /nurse led fistulogram procedures and peripherally inserted central catheter (PICC) line insertion.
- The service continues to expand and further lists may be required in the future to maintain the waiting times. Provision of emergency slots in each working day would be ideal.
- Patient booklet to be produced for Hickman lines.

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C: Staffing and MDT working

'Light duties' on call IR rota

University Hospitals Southampton NHS Foundation Trust

Summary

To introduce a 24/7 on call rota adhering to 'European Working time Directive' (EWTD) and rationalising additional cost to the Trust required additional IR posts and a freeing up of IR and other diagnostic workload during the working week.

Each IR performs a week on call. On call starts at 5pm on week days and finishes at 8am the following morning. Full week-end cover provided.

During the week no routine lists will be booked for the on call IR. Protocol CT and MRI lists can continue and MDTs and non clinical activities can also be maintained.

Context and background

Out of hours IR continues to increase in frequency, and although still uncommon this often requires IR involvement during the night. There was little or no flexibility to cancel booked IR lists for the following morning. A shift system was the obvious answer, but since the IRs would not be fully employed during the night a 'light duties' rota was introduced.

The diagnostic and non clinical components of an IR's job can still be covered during this week, but at hours that are more flexible to allow sufficient rest after an onerous night on call.

How was the change made?

- Detailed e-job planning with directorate/ divisional and Trust HR support was required.
- Each IR's normal week day working was examined. Cross cover for lost IR lists was provided where possible, but where not was allocated to one or other of two new IR consultant post planned.
- Assurances were given that plain film reporting, CT and MRI work load should be unaffected.
- Overall worked hours were planned to balance out as closely as possible. An estimate of out of hours work performed in the evenings, nights and week-ends were balanced by hours available for rest at home.
- The on call IR comes in at 5pm. They are then available to perform CT guided drains on five days a week and perform urgent IR on any urgent cases booked during the day, such as nephrostomy. If there is no IR activity then the IR uses the period between 5-7pm to report scans etc.

The on call rota commenced in September 2010. Consultant shortages have limited this cover to five or occasionally four of the one in six slots provided. Shortfalls were made up by overtime payments for additional slots covered until new appointments were made in 2011-2012.

What resources/ investment were needed?

Two new consultant IR posts, a locum consultant initially followed by planned substantive posts.

Results

Overall impact

Since September 2010 we have had an almost continuous IR on call rota covering all on call IR procedures, including abscess drainage, but excluding e-EVAR/ e-TVAR and TIPS.

How was the change measured?

1. The biggest impact was in the number of out of hours CT guided drains performed. These numbers were easy to record and planned changes are being made to re locate these into a five day a week in hours drain service. This has in turn led to reduced delays in drainage and improved patient recovery and earlier discharge.
2. Availability for core IR procedures including emergency embolisation and nephrostomy has been close to 100%.
3. There has been no change in the CT or MRI reporting delays.

How has good practice been sustained?

With good team work, trust support and enthusiasm.

Lessons learnt

The 'light duties' model works well, although added to booked leave it means that each IR is away from the IR suite for many weeks a year. Afternoon IR clinics, audit and mandatory training can also be performed during these 'light' weeks.

Future plans

The fifthIR post has been advertised. The sixth post is well on its way. We will be looking to a group e-job plan to ensure not only 24/7 cover, but 52 week cover for booked leave.

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C: Staffing and MDT working

Improving patient follow-up pathway post endovascular aneurysm repair (EVAR)

Central Manchester University Hospitals NHS Foundation Trust

Summary

EVAR patients need regular imaging follow-up. The radiographers have established and maintained a database to ensure that CT scans are carried out at appropriate intervals.

The vascular lab technicians have conducted an audit to compare ultrasound with CT for follow-up. Ultrasound has been shown to be a reliable method following a satisfactory CT scan at one year. This reduces radiation and contrast medium exposure. The radiographers and vascular lab have developed liaison to ensure that follow-up is transferred from CT to US appropriately. The vascular lab technicians have redeployed staff to accommodate the new workload.

Context and background

The majority of aortic aneurysms are now treated by EVAR rather than open surgery. At this centre 102 EVAR were performed in 2009 compared with 23 in 2004. Each patient requires CT surveillance scans at one month, six months, 12 months and annually thereafter to monitor aneurysm sac size and check for the presence of endoleaks as per Society of Vascular Surgeons guidelines. In 2007 it became apparent that patients were being lost to follow up and therefore the interventional radiographers developed a robust system to ensure that patients were invited for their surveillance scans in a timely manner. A database is maintained containing the records of all EVAR patients and the dates of their surveillance scans.

In recent years, many centres have adopted US rather than CT for follow-up. If it is reliable, it saves on exposure to radiation and contrast media. The switch from CT to US follow-up has implications for workload in the vascular lab.

How was the change made?

EVAR database

Initially patients who had undergone EVAR after 2004 were identified, recorded on the database and those who had been lost to follow up were invited for a CT surveillance scan. All patients subsequently undergoing EVAR were placed on the database and referred for a CT scan one month post-op. The database allowed the radiographer to record CT scan attendance dates and identify when further referrals needed to be requested. All referrals to CT were made by the radiographer using the clinical work station (CWS). This extended role was agreed by the consultant vascular radiologists and the CT superintendent.

US audit

CT and US appointments were coordinated in order to carry out a prospective audit of the reliability of US to detect significant findings such as endoleak. This was coordinated by the radiographers. The CT and US were reported independently of each other and reports were compared.

Transfer to US follow-up

A business case was prepared by the Vascular Lab and presented to management. Liaison was established between the vascular radiographers and the vascular lab to transfer follow-up from CT to US after a satisfactory one year scan.

What resources/ investment were needed?

Allocated time was given to the radiographer to keep the database up to date. Vascular lab technicians were redeployed by rationalisation of other commitments. The vascular lab service will ultimately provide 500 scans annually. This equates to a 0.5 WTE technician.

Results

Overall impact

All patients who have undergone EVAR are invited for their necessary surveillance scans on schedule. This ensures that any endoleaks are detected and treated if required. The transfer to US will result in a safer imaging modality for patients and a reduction in the burden on the overstretched CT service by up to 500 cases per year.

How was the change measured?

All surveillance scans requested and performed are recorded on the database allowing for audit.

A study to determine the sensitivity and specificity of colour duplex ultrasonography (CDU) compared to CT in this centre was undertaken using patients enrolled on our surveillance plan. This found 81% accuracy in detecting endoleaks. Of the remaining 19%, 8% were un-diagnostic due to patient body habitus.

How has good practice been sustained?

All radiographers take the responsibility of adding the cases they are involved with to the database and requesting the first follow up scan at the appropriate time.

Initially one member of the interventional team was involved in maintaining the database and referring patients for scans, now there are two radiographers to ensure efficient practice.

Maintaining the liaison between vascular lab and vascular radiographers. We were awarded 'highly commended' in the innovation and efficiency section of the Trust 'We are proud of you awards' this year.

Lessons learnt

Liaison between disciplines was crucial to success.

Future plans

To continue to attempt to secure the resources for vascular lab to allow the continuing increase in workload.

To maintain close liaison between the vascular lab and the vascular radiographers to ensure patients receive timely and appropriate follow up.

To continue to identify suitable cases to transfer to ultrasound at the 12 month scan.

To ensure that follow up is maintained once the patient moves to vascular lab. It is harder for the radiographers to track patients as the IT system is different.

Audit to ensure vascular lab accuracy.

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C: Staffing and MDT working

EVAR database with scoring system which helps simplify the decision making process for selection and prioritising of patients

The Leeds Teaching Hospitals NHS Trust

Summary
This database is designed to aid the tracking of elective patients with abdominal and thoracic aortic- and iliac- aneurysms through their work up for EVAR and subsequent post-procedural surveillance.

Additionally, the database allows the prospective collection of data on aneurysm morphology, device performance and unit mortality, morbidity and the requirement for secondary intervention which will allow subsequent audit of practice and devices performance.

Context and background
The framework for improving the results of elective AAA repair; The Vascular Society (2011) suggested the following:

- all patients should undergo standard preoperative assessment and risk scoring, including cardiac, respiratory, renal, diabetic assessment, assessment of peripheral vascular disease and anatomical AAA assessment with CT angiography to determine their suitability for EVAR (1);
- each hospital should have defined pathways for the correction of significant medical risks (cardiology/renal/respiratory) before intervention;
- all patients should be seen in pre-assessment by an anaesthetist with experience in elective vascular anaesthesia. At this stage, medication should be reviewed and optimised for the intervention (2); and
- all elective procedures should be reviewed preoperatively in an MDT that includes surgeon(s) and radiologist(s) as a minimum.

Ideally, a vascular anaesthetist should also be involved to consider fitness issues that may affect whether open repair or EVAR is offered. Facility to offer both procedures should be available either in house, or by referral through an agreed pathway.

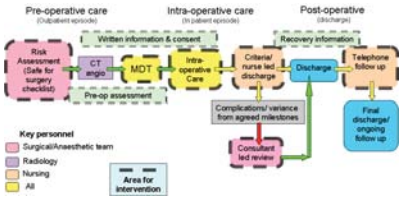

Figure 1: The ideal AAA patient pathway - adapted from the AAA QIP (quality improvement programme) website.

The Leeds EVAR database consists of a single 'flat' table 'main table' with other linked tables for drop-down menu options. The database is a convenient method for surgeons and radiologists to track elective EVAR patients' progress from initial consultation to MDT, procedure, imaging and 30 day, one year and five year follow up.

The database is made up of various forms which interact as information is entered establishing a comprehensive and easy to use dataset and scoring system. It is accessed via any trust PC running Microsoft Access via a trust wide drive. Security is provided by the trust PC and network access software (Novell). The database is only made available to those people with good reason to access it.

Figure 2: Home form

This form has 12 buttons, each corresponding to a different task, and arranged in vertical columns by the general task area, work up, procedure, sizing etc. In general, buttons lower down the page correspond to steps later in the patient pathway.

A button is chosen corresponding to the task to be performed. Each button opens a new form where data entry is facilitated.

The exit button closes the database and quits Microsoft Access

Figure 3: New Patient Data page

Patient data and clinical work-up needed is entered by the surgeon usually in clinic. There is also a link button to enter AAA QIP clinical data (figure 4). From this the AAA QIP clinical traffic-light code is automatically generated.

Figure 4: AAA QIP clinical information.

This is a series of questions mirroring those from the AAA QIP programme designed to easily identify, from easily accessible clinical data, a crude estimate of fitness for AAA repair, and assigning a traffic-light code (red, amber or green) according to this fitness. The traffic light code is automatically generated from the question answers.

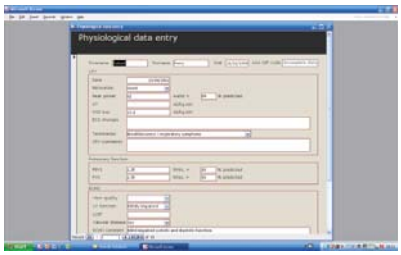

Figure 5: Physiological data

All patients listed to undergo EVAR for AAA should undergo cardio-pulmonary exercise (CPX) testing. The CPX test results and other physiological and biochemical data can be entered on this page. There is a box for free text entry about the patient's physiological fitness and a subjective score can be entered by the anaesthetist, which categorises the patient into low, medium or high risk for EVAR (and also assigned a traffic light colour). This score is not part of AAA QIP recommendations.

The anatomy of the aneurysm is also graded 1-5 based on its anatomical suitability for EVAR - this is derived from the AAA QIP recommended anatomy scoring scale.

- Grade 1 - simple procedure, no adverse features, anticipated procedure time less than two hours,
- Grade 3 - several adverse features requiring adjunctive intervention or surgery, anticipated procedure time >2 hours, or fenestrated case
- Grade 5 - anatomically unsuitable for EVAR.

Figure 6: MDT print outs after patient's data has been entered.

All this information is summarised on a print out which lists all patients currently being worked up or awaiting EVAR. The list is ordered by weeks from referral. The list is discussed patient by patient at a weekly MDT to ensure no-one is lost in the system. Some patients may require little discussion and some are extensively discussed and a decision to proceed or not is made. Patients automatically drop off the list if an active decision is made not to treat. This is recorded elsewhere in the database. The three sets of traffic light codes are easily visible for each patient in boxes in the centre of the printout.

Figure 7: Sizing form

Once a decision to perform EVAR is made, sizing information can be entered. Any pre-EVAR procedures required can be entered here, and these cross-reference to the booking form. The database also keeps all device details in one place so they are easy to cross reference and track when they arrive.

A procedural details form allows entry of how the EVAR was done, how long it took, who was involved and what the blood loss was. This data can be ported across to a predictive model of EVAR outcome (Australasian College of Surgeons predictive database of EVAR outcome). Procedural time and estimated blood loss are data required for the BSIR RETA and RETTaD registries, as well as the NVD.

30 day, one year and five year outcomes and secondary intervention is also tracked using a filter on patients who have undergone EVAR. This allows live interrogation (for example, we know that in Leeds, the 30 day mortality for new patient elective EVAR for 2011 was zero percent)

What resources/ investment were needed?

- Database design took many hours work, and has evolved slowly from a simple register to the more complex design currently implemented. This was done by a single clinician in our unit
- IT input was needed to allow deployment on a specific drive on the hospital intranet, and to limit access.

Results

Overall impact

- Significantly reduced peaks and troughs in EVAR service throughput. We now have a steady 'drip' of cases rather than none and then several all at once.
- Much more nuanced discussion in MDT as all have anatomical and physiological data immediately to hand to assess suitability, and if suitable how, where and when the procedure will be undertaken.
- Subjective impression of overall reduction in work up time for EVAR patients (not formally audited as yet).
- Better communication within department as to how many EVARs there are to do and who will be doing them.
- Instant access to data on EVAR patients, e.g. 30 day mortality, one year mortality, average neck length, average number of pieces inserted, requirement for secondary interventions, etc. Some of this data is mirrored in the NVD but we now have ownership of our own.

How has good practice been sustained?

- Constant encouragement of clinicians and other team members to use the database. Elective AAA patients are not discussed in the MDT unless they have been entered onto the database.
- Issues with lack of access to PCs have been resolved with temporary use of paper versions of sizing and EVAR procedure forms, which are then transferred to the database by hand.

Lessons learnt

- Achieving engagement by all disciplines required some persistence with adoption of a "zero-tolerance" policy (i.e. patients would only be discussed at the MDT if the relevant data were on the database [including patient demographics, imaging reports and physiological assessments].
- The database only tracks AAAs assessed for treatment/treated with EVAR. Open AAA repair is not included.
- Transposing the database to a web-based system would allow it to run on any PC, even those not running MS Access. IT skills for this are development are not currently available 'in-house'. Whilst the database continues to evolve the flexibility to quickly modify the database is useful; this would be lost with a web-based system. Where trusts provide AAA services in a hub and spoke or other networked system a web-based system, with relevant patient confidentiality safe-guards, may be the most pragmatic approach in the future.

Future plans

- Include some models of predicted mortality with and without EVAR based on physiological data entered. This may improve decision making in the MDT.
- Allow date stamping of critical steps to allow delays in the work up of patients to be identified and resources allocated to improve these.
- Possibly link to NVD so that data does not have to be entered twice – a big project, for relatively little gain.
- Offer to other trusts. This has already happened to an extent via AAA QIP programme, distributed under the GNU public licence.
- Consider PPM/RIS integration.

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C: Staffing and MDT working

Radiographer extended role in the Interventional Radiology Department

University Hospitals Birmingham NHS Foundation Trust

Summary
Angiography, angioplasty and stenting being undertaken by a radiographer. Leading to further role extension into venography, fistulography, venoplasty, fistuloplasty and vascular access procedures (line insertions).

Context and background
A vacancy for consultant interventional radiologist led to an increasing workload for the remaining consultant and an increasing waiting list.

How was the change made?
Approval to implement the change was given by the lead radiologist and imaging services manager. We drew up extended role protocols which were submitted and subsequently approved by the Trust Protocols Group. Training was delivered in house until adequate competency was achieved.

What resources/ investment were needed?
- Back fill for radiographer.
- Funding for radiographer re-band

Overall impact
- Reduced workload for radiologist.
- Reduced waiting times.
- Greater job satisfaction for the post holder.

How was the change measured?
By monitoring the reduction in waiting times.

Future plans
Training of other radiographers. Role extension for other interventional procedures e.g. IVC filters.

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D: Patient engagement and experience

Starting an interventional radiology clinic

University Hospitals Southampton NHS Foundation Trust

Summary

Regular new and follow up patient clinics have been set up for fibroid embolisation patients in a dedicated OP room. Formal thermal ablation, hepatobiliary and urology clinics are planned for 2012.

A room has now opened with the radiology department for IRs to see, counsel and consent new patients in advance and to see follow up patients on a routine basis.

Nurse pre assessment is also possible in this room.

Context and background

Outpatient activity for planned IR procedures is increasing. Fibroid and thermal ablation clinics have run informally in consultants offices for the last few years and have been coded on the RIS (Radiology Information System) since 2010.

How was the change made?

- A dedicated RIS code has been applied to OP activity since 2010.
- From 2011 a formal 'Fibroid Clinic' is booked through the hospital computer management system (e-CAMIS).
- This formalised booking and data recording allows IR OP activity to be recorded for the first time for radiology.
- This formal OP activity attracts appropriate OP funding.

What resources/ investment were needed?

Cooperation between radiology and divisional managers as well as OP managers.

Freeing up IR time on tight job plans has only been possible with radiology/divisional support and increasing IR numbers to ensure full IR room utilisation.

Results

Overall impact

Patient satisfaction is improving and patient information sheets and consent in advance is becoming the norm.

How was the change measured?

Repeat consent audits are planned for 2012.

Annual figures for IR activity have been recorded on RIS for 2010-2011 and e-CAMIS figures will be available for 2011-2012.

How has good practice been sustained?

Our insistence that OP clinics are not an option. We must embrace and expand these and allow changes in our working lives and job plans to reflect these changes.

Lessons learnt

Initial informal clinics held in cramped consultant offices with multiple interruptions lead to patient complaints.

This activity could not be recorded in radiology before appropriate codes were available and will still not be seen within the trust until formal approval from the OP managerial team is gained.

Joint clinics (e.g. with vascular or gynae surgeons) have a role, but this usually generates activity for the other clinical specialty and not radiology and so must not be relied upon to raise IRs profile within the organisation.

Future plans

We will be opening formal HPB and thermal ablation clinics in 2012 with more to follow.

Electronic and paper letters will be sent out to referring clinicians and their GPs to raise the profile of IR as an independent clinical specialty.

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D: Patient engagement and experience

Interventional Radiology Patient Satisfaction Survey

Hull and East Yorkshire Hospitals NHS Trust

Summary

A patient satisfaction survey was completed within interventional radiology (IR) to gain feedback from patients on the quality of the service provided by the IR team in the Hull and East Yorkshire Hospitals NHS Trust. The aim of the survey was to determine the patient experience and highlight any potential areas for improvement. We envisage the survey will ultimately provide an ongoing audit of services to ensure continuous improvement of the patient care experience.

- 82% of the patients surveyed found the staff extremely friendly and helpful giving an 'excellent' scoring.
- 84% decided that the privacy and dignity they received was 'excellent' and 14% felt it was 'very good.'
- 69% found the cleanliness to be 'excellent' whilst 29% found it 'good.'
- 99% of patients said the information they received regarding their procedure was positive.

Context and background

Within interventional radiology a recent detailed patient satisfaction survey had not been completed. As a unit we were continuously trying to improve and felt this was an ideal opportunity to find out and incorporate patient views and preferences. The department has just opened a Radiology Day Unit and the survey preceded this development. It is our intention to run the survey again to demonstrate if the unit has improved the patient care experience.

How was the change made?

A survey was developed with the help of the whole team. One hundred surveys were handed to patients post intervention and asked if they would either leave it on the ward before discharge or return it in the post.

Sixty four completed surveys were returned and the results analysed.

What resources/ investment were needed?

The main resource needed was time and a nurse coordinated the survey in terms of delivery, return and analysis. We were assisted by a member of the clinical audit team to prepare and approve the survey.

Results

Overall impact

The survey was an invaluable tool to demonstrate patients' views on their care. It brought to our attention both positives and negatives and has allowed us to act on both.

- We found that the communication from the staff in the department at all levels was excellent from explaining the risks, benefits, complications and what would happen to the patient all coming out at 97% or higher and 96.5% said that if they asked an IR nurse an important question they got an answer that they could understand.
- 100% of patients said there was always a member of staff available to talk to about their worries or fears.
- 98.5% of the patients felt that they were involved in the decision making about their treatment and post procedure care was explained to them.
- Regarding privacy and dignity - 98% felt that they did have enough privacy when discussing their treatment and 100% felt they had enough privacy whilst being treated. 12% unfortunately did have to share a recovery area with a member of the opposite sex and 17% felt the toilet facilities were at an inadequate distance from the recovery area.
- Regarding cleanliness - 58-60% felt the recovery area and procedure room where clean and 38-40% respectively felt they were satisfactory. Most patients (95%) did notice the posters asking staff to wash their hands and the majority (98%) did see that hand gel was available.
- The nursing staff had an excellent result (100%) regarding confidence from the patients however 10% did say the staff discussed other issues in their presence.
- Although 85% did receive a letter that fully explained the procedure prior to admission the information they were given in the IR department varied with the information they received prior to their arrival, possibly from clinic etc.

How was the change measured?

With the opening of the Radiology Day Unit certain aspects from the survey have been addressed. There are two separate four bedded areas which allow for single sex post procedure recovery. A patient is not seen in a theatre gown in any of the recovery areas and in addition the toilets are now in very close proximity to the recovery areas. The staff have been praised for their

communication with the patients but it has also heightened awareness of the fact that patients feel they are spoken over in their presence which is unprofessional.

Hand washing posters, and screen savers are still on display around the department in addition to hand gels. There is now more space and staff to recover patients within the new day unit and this has had a positive effect on cleanliness which will be monitored over a period of time.

How has good practice been sustained?

The issues raised from the survey have been taken on board during planning of care delivery in the new Radiology Day Unit.

Lessons learnt

- We learnt that patient information leaflets alone do not seem to give a complete picture of the procedures that the patient undergoes.
- A pre assessment clinic for the day unit has been started which would help in this regard.
- Issues related to privacy and dignity, location of patient toilets have been solved by the introduction of the Radiology Day Unit.

Future plans

A similar audit will be conducted later in 2012 to measure outcomes of the day unit on patient care delivery / experience.

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D: Patient engagement and experience

Introduction of radiology clinic

St George's Healthcare NHS Trust

Summary

In some areas, inpatient procedures were being cancelled at short notice by patients who changed their minds about proceeding with treatments. This was usually because of poor understanding of what the intervention involved, creating natural anxiety. However this led to poor use of an expensive interventional suite, wasted appointments and beds. A radiology clinic was instituted to ensure these women received the appropriate information before accepting the procedure and formed a relationship with the IR who would be responsible for their treatment.

Context and background

Patients being referred for uterine embolisation for symptomatic fibroids often had unrealistic expectations. They also clearly expected to see the doctor who would be performing their treatment before the day of the treatment and to be followed up by that doctor. With increasing numbers of referrals it was clear that a regular clinic was required to see new patients and follow-up those who had undergone treatment. This clinic would also be suitable to discuss patients referred for other complex interventions to ensure they were suitable and understood the pros and cons of any proposed intervention before proceeding. Patients with vascular malformations are regularly seen in this clinic, having been referred by either plastic or vascular surgery.

How was the change made?

1. Approaches were made to the outpatients department but there was either no space or desire to accommodate a new clinic. There was also a lack of understanding why radiology required a clinic despite repeated explanations.
2. A small, suitable US room in the main radiology department was identified as being free at a time when I would be able to run a clinic.
3. The clinic was set up on the hospital appointment system under Diagnostics (Prof Belli Clinic). This system had a category for "diagnostics" already installed.
4. A clinic was established and my secretary trained to run the clinic and enter patients. No nursing assistance is required. Patients are directed to the waiting room by the staff at the front desk of the radiology department.

What resources/ investment were needed?

The room was available.
My secretary trained.
I incorporated the clinic into my job plan.

Results

Overall impact

Whereas <50% of my patients attended for follow-up before the clinic, now 99% attend as they identify me as their treating doctor.
I receive direct referrals from GPs for patients who wish to explore the possibility of fibroid embolisation.
I see patients with vascular malformations and arrange their treatments.

I receive referrals from many clinicians both inside and outside my hospital who are unsure if an intervention is required and so send patients for my opinion.

Once patients decide to proceed with treatment, it is very rare for them to cancel, usually only if there are extenuating circumstances, rather than a 'change of mind'.

How was the change measured?

1. The number of patients who do not arrive for their appointment.
2. The numbers of inpatient procedures cancelled on the day.

How has good practice been sustained?

At the moment I am the only IR consultant who sees patients in a clinic and have successfully incorporated this into my job plan as an episode of direct clinical care, initially replacing an episode of supporting clinical care.

Lessons learnt

If the normal channels fail, look for unconventional alternatives. I spent a lot of unproductive time trying to see my patients within a vascular surgical clinic where the staff had no time or understanding of the needs of radiology. There is no reason why the clinic has to be run in a busy outpatients department and this would have been set up much earlier if I had appreciated that fact. Very few resources are required. The support of radiology colleagues and an office space followed by setting the clinic up on the hospital appointments system and training of the secretarial staff in the use of this system is all that was needed.

Future plans

This will be rolled out to my other IR colleagues who see patients for intervention.

To incorporate such a clinic in the job plans of new IR consultants.

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D: Patient engagement and experience

Nurse led effective pain management in fistuloplasty

Central Manchester University NHS Foundation Trust

Summary
Introduction of an opiate analgesia to relieve pain effectively during fistuloplasty.

The nursing sister and charge nurse liaised with the vascular radiologists and the renal specialists who identified Fentanyl as a safe and suitable analgesia to trial.

The existing radiology nursing team were all trained and competent in the administration and monitoring of Fentanyl. Nurses have begun to play a primary role in assessing pain, titrating analgesia under the direction of a radiologist and monitoring the cardiovascular status of the patient.

Following the commencement of Fentanyl a further pain audit tool led by the nursing team was utilised to gain a representative sample.

Context and background
The radiology department at Manchester Royal Infirmary delivers a fistuloplasty service to regain patency for clotted and stenosed fistulas. The department works closely with its own internal renal services but also take referrals from other Manchester NHS Hospitals. The department undertakes approximately 250 fistuloplasty procedures per annum.

Patient feedback revealed that patients found the procedure extremely painful and traumatic. Anecdotal information also suggested that some patients may refuse further interventions and opt for central lines for renal dialysis instead. This is not the best option for long-term management. There is evidence that a fistula is the preferred method and should be preserved if at all possible[14]. This poor quality experience needed to be addressed and a change proposal was put into place.

How was the change made?
A date for the commencement of Fentanyl as the analgesic of choice in fistuloplasty patients was agreed at a radiology vascular meeting and cascaded down to staff. Doses of 50mcg of Fentanyl should be incremented throughout the procedure either via an IV cannula for nurse administration for clotted fistula's or via an access sheath by the radiologists for stenosed fistulas. The pain assessment audit tool was devised to gain numerical pain scoring post Fentanyl administration. The desired outcome was to maintain a pain score of less than five throughout the procedure. All of the nursing staff were motivated to implement the change. Other stakeholders within the team were supportive of the change

What resources/ investment were needed?
Nursing staff with the required skills were readily available and the necessary equipment and funding was also in place.

However the availability of two nurses for fistuloplasty procedures has been an issue with one for the existing 'scrub assistant role' and one to be the 'pain nurse.' The radiographers have shown a high level of flexibility in cross-covering roles to ensure that a nurse is available to administer Fentanyl and monitor the patient accordingly.

Results
Overall impact
The use of Fentanyl appears to have had a major impact on effectively managing pain. The patients are more positive and happier to return for further procedures. Frequent attenders express much more satisfaction with the level of pain experienced.

The results from data collection from the pain audit tool showed that a large percentage of patients had a pain score of less than five.

[14] The National Kidney Foundation Disease Outcomes Quality Initiative http://www.kidney.org/professionals/kdoqi/

How was the change measured?

Via an audit tool incorporating a numerical pain assessment tool. The change was measured by collating the numerical pain scores per patients. Pain was measured in 40 patients at different stages of the procedure The data was audited and analysed by the lead nurse and nursing sister. During this time no adverse effects were experienced. An improvement in the management of pain was clearly identifiable and reinforced the need to continue with the implementation.

How has good practice been sustained?

The positive audit findings have been presented to both the IR team and radiology. This has reinforced the need for its continued practice.

The lead nurse has encouraged and promoted the provision of nursing staff for this role using the ongoing flexibility of other members of the team.

Lessons learnt

- The collaboration between the teams has been extremely successful in this instance and has empowered individuals to identify more potential improvements.
- The results show that the proposal was successful and ongoing reviews should take place.
- The utilisation of a retrospective patient experience questionnaire may have been beneficial. This could have identified further patient perspective ideas for improvements to the quality of the patients pain experience.

Future plans

- A business case for more nursing support as the ad hoc system of relying on a radiographer to be available is not sustainable in the long term – especially if this is rolled out to other procedures.
- Improvements to the pain experience for TIPPS procedures. Fentanyl is currently given in doses for this procedure however its effectiveness is questionable and the desired effect does not currently appear to be routinely achieved.

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E: Leadership

Monthly diary management meeting and cross cover provision

St George's Healthcare NHS Trust

Summary

As a Major Trauma Centre, it is essential that an IR consultant is available at all times in the hospital during normal working hours to deal with emergencies and that if a consultant is away for their list, the team should know who to approach to discuss or perform emergency interventions. A weekly diary is set up and discussed months in advance, to ensure all absences are covered and ensuring that it is clear which consultant should be approached.

Context and background

IR Staff rarely but occasionally planned to be away at the same time as there was no forum to discuss who should attend key meetings. On becoming a Major Trauma Centre, it was clear that a formal arrangement was required to ensure that at least one IR consultant would be available in the hospital at all times during normal working hours and to ensure that there was a fair system in place to help people attend a variety of meetings. In addition, radiographic and junior staff would not necessarily know who was available if those consultants were doing diagnostic lists elsewhere in the hospital, leading to confusion and time wasting. Also, patients would be booked for interventional procedures even when the consultant covering a list had to cover two rooms or a list in another part of the hospital, leading to stress.

How was the change made?

1. Instituted a monthly diary meeting on the first Tuesday of each month attended by all IR consultants. The bookings diary for each interventional room and the consultants' leave diary were also brought to this meeting. A weekly template to reflect consultants' absences was created and a system of named consultants providing either full cover (in which case elective procedures can be booked) or cross cover (when elective procedures are cancelled but the named consultant can be contacted for emergencies that may arise) was created. At the time of diary setting, the lists are cancelled if appropriate. This is done up to three months in advance but refreshed each month.
2. This timetable is available in the IR suite so that all staff know who should be contacted in case of emergency.
3. All IR consultants have these timetable sent to them electronically for checking and know that they are individually responsible for ensuring their list is covered if they are away.

What resources/ investment were needed?

None other than consultants time for 30-40 minutes once a month.

Results

Overall impact

There is always a named IR consultant attached to each IR session in normal working hours so it is clear who needs to be contacted for emergencies and urgent cases.

Lists are cancelled if nobody is able to offer full cover for a room, so that trainees are not left unsupervised and patients' treatments are not postponed or cancelled unnecessarily.

How was the change measured?

Review of weekly timetables since this was started shows ALL sessions covered by a named consultant.

How has good practice been sustained?

All IR consultants participate in the process and are supportive and attend the monthly meetings. They accept responsibility for ensuring their list is covered if they are away and in the rare situation of nobody being available, that they cannot take leave.

Lessons learnt

Regular monthly meetings at the same time of the month, means that everyone knows when the diary meetings are held.

Shared responsibility for ensuring cover is arranged for all sessions but individual responsibility for ensuring own list covered or leave cancelled. All timetables distributed to all IR consultants each month.

Future plans

To continue to ensure IR cover always available. This system has been rolled out to other specialist areas of radiology e.g. paediatric radiology.

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