Practice Development & Educational Requirements in Hybrid Imaging

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Overview

• Current technology position within nuclear medicine
• Emergence of a new culture and clinical skills
• Appropriate use of Computed Tomography (CT) within modern hybrid imaging practice
• Training & audit: Defining role development in hybrid imaging
• Challenges / opportunities
• Defining the educational requirements within hybrid imaging
• Future considerations
Technological advancements

Hybrid Imaging: Transformational change

Do you currently have a SPECT/CT System in your department?

1. Yes
2. No
3. Replacement planned for next 12 months
4. Replacement planned for next 2 years
5. Replacement planned sometime in the next 5 years
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Source: BNMS Spring 2011 Meeting, Brighton
Mapping your journey
The emergence of a new workforce?

- New working practices – Inclusion of CT based imaging
- Complexity of software and "movement" of digital data? Impact on patient contact
- Greater appreciation of the potential role of nuclear medicine within the patient treatment pathway

Hybrid Imaging Practitioner
Knowledge of Nuclear Medicine
• What Pharmaceuticals to use
• How to much to inject
• Scan parameters
• Radiation protection

Knowledge of CT
• Knowledge of cross sectional anatomy
• Scan parameters
• Dose limits
• Radiation protection

Hybrid Imaging Environment
Transformational Change # 1

Queen Alexandra Hospital, Portsmouth
Department profile

- Three system department:
  - Siemens Symbia T4 SPECT/CT
  - Siemens Symbia S SPECT
  - One retained SMV DSTLXi
Training & development

• CT Training of the Radiographers
  – Only one Radiographer had any previous CT experience
  – All would need CT training
  – Training initially performed by Applications Specialists

• Agency Radiographers also provided a good resource for training
Training and level of operation

• Mixture of radiographers and technologists within the nuclear medicine department
  
  – CT Training of the technologist ?
  – Defining “appropriate training” can be difficult
  – In house practical training
  – External theoretical training
Practice development

- Protocols in SPECT/CT
  - Appropriate use of CT
  - Value of AC & one stop shop imaging approaches

- Quality control measures
  - Optimising techniques
  - Dose considerations & QC checks

- Knowledge & Skills development
  - Knowledge and understanding
  - Radiation safety considerations
Considerations for role development

• **Clinical SPECT/CT protocols:**
  – Change of patient pathway
  – Diagnostic CT examinations
  – Potential use of contrast agents

• **Training & audit:**
  – CT acquisition protocols and processing parameters
  – Exam optimisation and dose minimisation

• **Reporting:**
  – NM Physician
  – Radiologist
  – Is there potential for Nuclear Medicine Practitioner reporting in Hybrid Imaging?
Transformational Change # 2

University Hospitals Bristol
NHS Foundation Trust

Two systems:

SPECT/CT – 16 slice
SMV DSTLXi
Background / training

• Previous CT experience prior to the introduction of a SPECT/CT system
• Business case for SPECT/CT system included:
  – Ability to perform stand-alone CT
  – Ability to perform contrast enhanced CT studies
  – Support Radiotherapy with post I-131 ablation examinations
• Necessity to “map” new patient workflows within the SPECT/CT environment
• Appropriate use of CT component
• Training of staff who had not used CT before
• Knowledge and skills development essential
• Departmental links with the local Oncology centre
Practice development

- Greater need for formal training and recognised qualifications to ensure the smooth running of the new service
- Extra training has been valuable:
  - Practitioners confidence to evaluate their own work with the new technology,
  - Gain an understanding of the various factors that can be manipulated in order to optimise image quality.
  - Improved working relationship with the CT department
  - Appreciation of dose implications from Multislice CT
Example of an emerging technique: Hybrid Imaging

• Introduction of new I-131 thyroid ablation scanning:
  – Integration of extra workload on a busy SPECT/CT system
  – Opportunity to develop working practices with the radiotherapy isotope team based at the oncology centre.
  – Improved understanding of other professional roles within the patient pathway and promote the changing capabilities of nuclear medicine and SPECT/CT
  – Improved job satisfaction
Role development

• SPECT/CT for oncology patients:
  – Increased confidence of utilising SPECT/CT as part of the patient pathway
  – Improved confidence demonstrated by HIPs in terms of:
    • Acquisition parameters
    • Cross sectional anatomy
    • Reconstruction factors
    • Display and image “blending” techniques

• Ability to offer Skeletal SPECT/CT as a “one-stop shop” approach
Meeting the needs of the workforce

• Training and education is essential
• SPECT/CT has impacted (+) greatly on our clinical service and on the skill development of the staff involved in running the service
• Several new services are now supplied by our department as a direct consequence of the new technology at our disposal
• Major changes in our working practices
  – Incorporation of “out of hours” CT lists on SPECT/CT system
  – Extra pressures on staff to provide CT examinations in normal working hours
  – Provision of a “one-stop shop” service for oncology patients: Improved patient experience and role development
Appropriate use of CT within a hybrid imaging environment
2nd generation SPECT/CT systems

Increased capabilities

Potential for greater use within patient pathway

Greater scope for decision making

Skills

Competent practice

Training

Knowledge
Defining the use of CT in Hybrid Imaging

- Impact of hybrid imaging will be greater for SPECT/CT than PET/CT (Roach et al, 2006)
- Low dose CT can be performed to localise regional uptake areas identified on the NM scan
- Decisions need to be made with regards to the transmission (CT) dose levels used with the NM examination in SPECT/CT

What type of CT unit do you have within your SPECT/CT system?

1. Single Slice
2. Dual Slice
3. Multislice
4. Volume (Brightview)
5. N/A
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1. Single Slice
2. Dual Slice
3. Multislice
4. Volume (Brightview)
5. N/A

Source: BNMS Spring 2011 Meeting, Brighton
Training & audit

• Level of training should reflect the profile of your clinical department
• Assumptions of professional backgrounds should be treated with caution
• Training requirements should be factored into the business case for your new system
• Familiarisation with equipment & unexpected images necessary
• Audit system should be in place to monitor performance
• Regular Personal Development Reviews undertaken

Ring artefact on CT data set
What form of training have you / your staff undergone with regards to the use of CT?

1. Informal / House training
2. Formal competency based training
3. Post graduate education training
4. Other
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Source: BNMS Spring 2011 Meeting, Brighton
Compartmental model: Hybrid Imaging examinations

NHS Institute for Innovation and Improvement: Quality and Service Improvement Tools:

PDSA (Plan, Do, Study, Act)
SBAR (Situation, Background, Assessment, Recommendation)

http://www.institute.nhs.uk/option.com_quality_and_service_improvement_tools/Itemid,5815.html
Problem solving abilities

- Experiential learning approach
- Pattern recognition
  - Imaging with new isotopes
- Decision making capabilities
- Autonomous practice
- Critical evaluation of working practice

Mis-registration of SPECT and CT data sets
Knowledge of CT: Possible knowledge gaps

<table>
<thead>
<tr>
<th>Possible knowledge gaps</th>
<th>Initial Hybrid SPECT/CT systems provided AC / non-diagnostic images (localisation)</th>
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<tbody>
<tr>
<td>Knowledge of cross sectional anatomy</td>
<td>Role of hybrid SPECT/CT systems has evolved</td>
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<tr>
<td>Scan parameters</td>
<td>Possible to undertake diagnostic CT on all modern SPECT/CT systems</td>
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<td>Dose limits &amp; reduction techniques</td>
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<tr>
<td>Radiation protection considerations</td>
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<tr>
<td>Ability to detect artefacts / problem solve</td>
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Initial Hybrid SPECT/CT systems provided AC / non-diagnostic images (localisation)
Practitioner skills

- Knowledge & Understanding
- Competency based practice
- Experience & problem solving abilities

Accurate patient outcomes
Developing the evidence base: CT competencies

- HI Knowledge Exchange (HIKE) Event held at UWE, Bristol in December 2010
- Purpose of the event:
  - Evaluate current clinical practice
  - Debate departmental protocols & decision making skills relating to the optimal use of CT
  - Identify current “gaps” in knowledge / skills base
  - Identify possible future training requirements for all professional disciplines
Main outcomes from HIKE

- Variation in SPECT/CT techniques evident
- A lack of understanding of imaging / processing parameters
- Uncertainty as to optimal clinical practice
- Default protocol driven rather than evidence based practice
- Lack of formal training opportunities
- Reliance on cascade training mechanisms
- Some departments relied solely on application training
SPECT/CT referrals have increased in my department

1. Strongly Agree
2. Agree
3. Neutral
4. Disagree
5. Strongly Disagree

Source: Hybrid Imaging Knowledge Exchange Event, December 2010, Bristol
Actions resulting from HIKE event

- Delegate reflections indicate clinical and professional value of formal hybrid imaging training
- Necessity to further develop professional relationships is essential for potential future clinical services
- The need to develop a CT competency framework
- Patient workflow mapping & new imaging techniques to be included in future curriculum
Development of CT competencies

- Draft CT Competencies (CTC) produced
- Reviewed by experienced HI Practitioner
- Introductory CT course held @ UWE & CTC piloted
- User’s feedback requested
- Amendments made
Draft CT Competencies

Quality Control Tests within a hybrid imaging environment

Depending on your area of clinical practice, performing specific CT quality control tests is an important aspect of daily/weekly imaging.

What is the daily CT QC in your hybrid imaging department?

The following images identify typical set ups for weekly CT-QC in PET/CT and SPECT/CT.

Water phantom set up in PET/CT

Water phantom set up in SPECT/CT

How does this compare with the weekly CT setup in your hybrid imaging department?
Future focus?

PET/CT

SPECT/CT
Emergence of new relationships, working cultures & service redesign

• Opportunity for greater presence within the established medical community
• Representation at MDT meetings: presenting findings & influencing treatment
• Research / audit active
• Service re-mapping / re-design
• Greater level of professional pride / respect
Challenges / opportunities

• Departments sharing experiences
• Willingness to work in a collaborative style
• Adding to the evidence base & undertaking funded research
• Greater presence of funded research roles within nuclear medicine
• Clear career trajectory for hybrid imaging workforce
• Unity and harmonisation within the modality
Reframing of established imaging techniques: Patient Pathway Focussed (Chowdhury and Scarsbrook, 2008)

Image reproduced with permission from University Hospitals Bristol NHS Foundation Trust

Future considerations

• Greater level of CT within Nuclear Medicine training:
  – Cross sectional anatomy
  – Clinical applications & service optimisation
  – Physical principles / Safety considerations
  – Contrast agents

• Greater movement within multi-modality imaging
  – PET/MRI
  – Training programmes specifically for the hybrid imaging workforce
  – Research opportunities
MSc/Postgraduate Diploma/Postgraduate Certificate

Nuclear Medicine

In line with current advances in Nuclear Medicine Practice, this programme is aimed at Technologists and Radiographers currently working within the clinical field, who plan to expand their existing knowledge and develop advanced clinical and professional skills in Nuclear Medicine. The aim of the programme is to provide both theoretical and practical aspects of Nuclear Medicine. The programme is designed to equip Technologists and Radiographers with the knowledge and skills required to provide high quality nuclear medicine services and to improve the delivery of healthcare. It also provides an opportunity for Technologists and Radiographers to extend and improve their knowledge and skills through the provision of continuing professional development. The programme aims to deliver an enhanced and co-ordinated approach to training and development, which will enable Technologists and Radiographers to keep up to date with the latest developments in Nuclear Medicine and to meet the needs of their clients and employers.

Module 1: Radiopharmaceuticals and Imaging Techniques
This module covers the fundamental principles of radiopharmaceuticals and imaging techniques in Nuclear Medicine. It includes the study of the physics of radiation, the properties of radionuclides, and the principles of imaging. The module also covers the preparation and administration of radiopharmaceuticals, and the evaluation of imaging studies.

Module 2: Nuclear Medicine Imaging Techniques
This module covers the principles and applications of various imaging techniques used in Nuclear Medicine. It includes the study of planar imaging, SPECT, PET, and PET-CT. The module also covers the interpretation of imaging studies and the use of imaging in diagnosis and management of diseases.

Module 3: Nuclear Medicine Therapy
This module covers the principles and applications of therapeutic radiopharmaceuticals in Nuclear Medicine. It includes the study of radionuclide therapy, brachytherapy, and immunotherapy. The module also covers the evaluation of treatment response and the management of complications.

Module 4: Nuclear Medicine and Medical Physics
This module covers the role of medical physics in Nuclear Medicine. It includes the study of the physics of radiation, the properties of radionuclides, and the principles of imaging. The module also covers the evaluation of imaging studies and the use of imaging in diagnosis and management of diseases.

Module 5: Nuclear Medicine in Clinical Practice
This module covers the role of Nuclear Medicine in clinical practice. It includes the study of the role of Nuclear Medicine in the management of various diseases, and the integration of Nuclear Medicine in the interdisciplinary team. The module also covers the use of Nuclear Medicine in research and education.

Course Details

Duration: 1 year
Module: 20 credits
Mode of Delivery: Part-time

Hybrid Imaging in Nuclear Medicine Module

This 20 credit Masters level module is delivered via a blended learning approach, encompassing a range of methods used in Nuclear Medicine education. The module is aimed at nuclear medicine practitioners working within a hybrid imaging environment, or a department about to undergo hardware changes in the near future. The module may also be suitable for diagnostic radiographers and radiographers working in UK hospitals who are developing their clinical roles.

Course Dates

Available from October 2011

Venue

Glenside Campus, Bristol, or via distance learning

Contact details

For further information and to apply, please contact: Mark Griffiths
Director of Clinical Education
University of the West of England, Bristol
Glenside Campus, Bristol
Tel: +44 (0) 117 32 88400
Email: mark.griffiths@uwe.ac.uk

Further information on this exciting opportunity to further develop your knowledge and professional skills can be obtained by contacting Mark Griffiths, e-mail mark.griffiths@uwe.ac.uk, telephone +44 (0) 117 32 88400.
Reporting Skills and Service Enhancement in Nuclear Medicine

This 20 credit Masters Level module is aimed predominantly at Nuclear Medicine Practitioners who have a desire to develop their image interpretation skills, or in line with current clinical advancements, have the opportunity to engage with aspects of service development.

This distance-based module which promotes investigational and enquiry based strategies is fully interactive and encourages the student to consider their own practice in relation to the developing field of Nuclear Medicine. The use of interactive workbooks and educational ‘e-resources’ is further supplemented by discussion boards aimed at providing the student with a forum to question and develop their ideas.

The syllabus covers the ethical and legislative aspects of reporting and provides guidance on topics such as information governance, data protection and the technical reporting of core clinical assessments. These features are further supported by the testament accounts of Nuclear Medicine Practitioners who have been instrumental in the development of reporting services and who are fully aware of the current issues associated with service re-design and workforce development.

This module would suit a Nuclear Medicine Practitioner who is working towards an enhanced level of practice and who wishes to further develop their theoretical and clinical knowledge base. Importantly, module content is flexible and can be tailored to meet the needs of your department.

Enrolment Details
This program has a ‘rolling’ start date; admission for students will vary to cater to meet the needs of your department. Weekend delivery is usually also available.

Contact Details
For further information and cost, please contact
Gary Dawson
Radiation and Life Sciences
University of the West of England
Bristol Gloucester Street
Blackberry Hill, Totterdown
Bristol BS8 2DT
E-mail: GaryJ.Dawson@uwe.ac.uk
Telephone: +44 (0) 117 32 80000

Essential Aspects of CT within Hybrid Imaging (SPECT/CT)

The course is aimed at:
Nuclear Medicine Technologists and Radiographers either currently working in a SPECT/CT environment, or who will be in the near future, post equipment installation.

Course Aim:
Gain an appreciation of the current position of CT technology within modern SPECT/CT equipment.

- Provide an understanding of optimal CT working practices within a SPECT/CT environment, including basic quality control tests.
- Evaluate the range of CT imaging parameters within a SPECT/CT environment and justification for relevant clinical applications.
- Explore the potential of CT imaging artefacts within a SPECT/CT environment.
- Appreciate the potential imaging processing pitfalls associated with SPECT/CT imaging.
- Gain an understanding of the rationale for the use of CT within Nuclear Medicine environments, including recent referral realisation.
- Explore the emerging role of the Practitioner within a SPECT/CT environment and safe working practices.
- Understand the future potential value of CT in the diagnosis, planning and treatment of Oncology patients.
- Provide a basic cross-sectional CT overview of the chest, abdomen and pelvis, with correlation to typical SPECT radionuclide tracers (new studies).

Date: Tuesday 17th January 2012
Cost £1144 including lunch & refreshments.

Venue:
Glenside Campus, Bristol

Further details
To book places please contact
Emily Haythorn at the CPD Team
E-mail: emily.hayborn@uwe.ac.uk
Telephone: +44 (0)117 32 81181
http://cpdnow.uea.ac.uk/programme.aspx