RSNA 2014, McCormick Place, Chicago

Everyone on Board: Creating an Opportunity for Flat Collaboration and Safe Collegiate Working in Molecular Imaging

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bettertogether

Presentation objectives

- Objective #1: Determine the key health and safety issues for a Nuclear Medicine Technologist working in a PET/MRI unit
- Objective #2: Explore how a multi-professional approach to delivering patient care may arise from working within a hybrid imaging environment
- Objective #3: What are the opportunities and challenges associated with introducing new automated software platforms within a hybrid imaging environment
- Objective #4: What could you learn, in terms of counselling skills, from your nursing colleagues, which may benefit oncology patients within a hybrid imaging environment?

Positioning: Professional Doctorate

Analyse the potential cultural changes and emerging social meanings within the nuclear medicine workforce, following the introduction of new hybrid imaging technology and the subsequent development of new professional identities and order within the health care environment

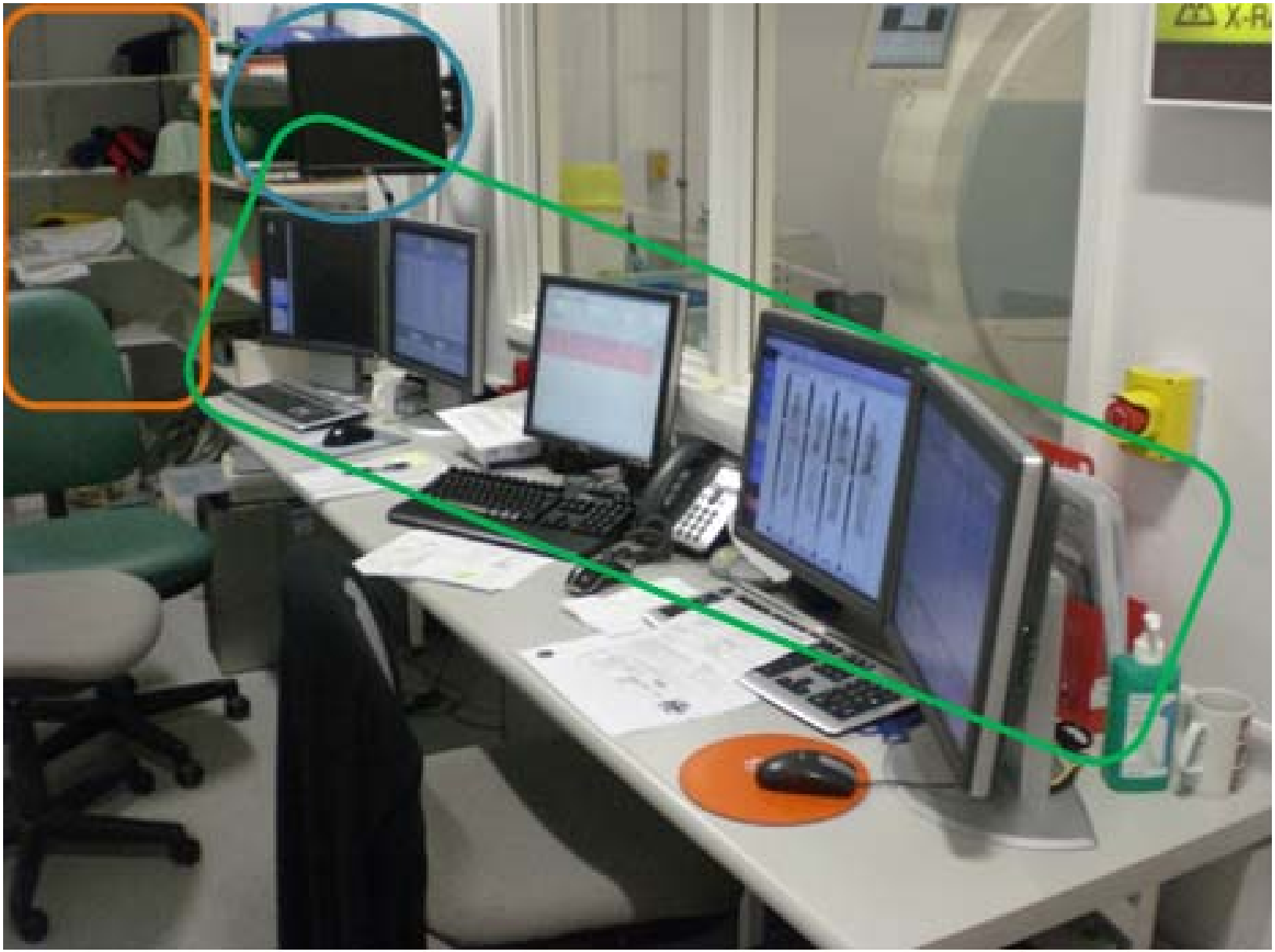
Themes identified

- Change in working practice, the environment and emerging clinical practice
- Role development / innovative practice and emerging sub-communities
- Role erosion and automation / technological determinism
- Emergence of new professional identity and intercollegiate working
- Need for new professional guidelines and training frameworks to be established
- Occupational shift and domain ownership
- Impact of technology on patients and creating a patient centric approach to hybrid imaging service delivery

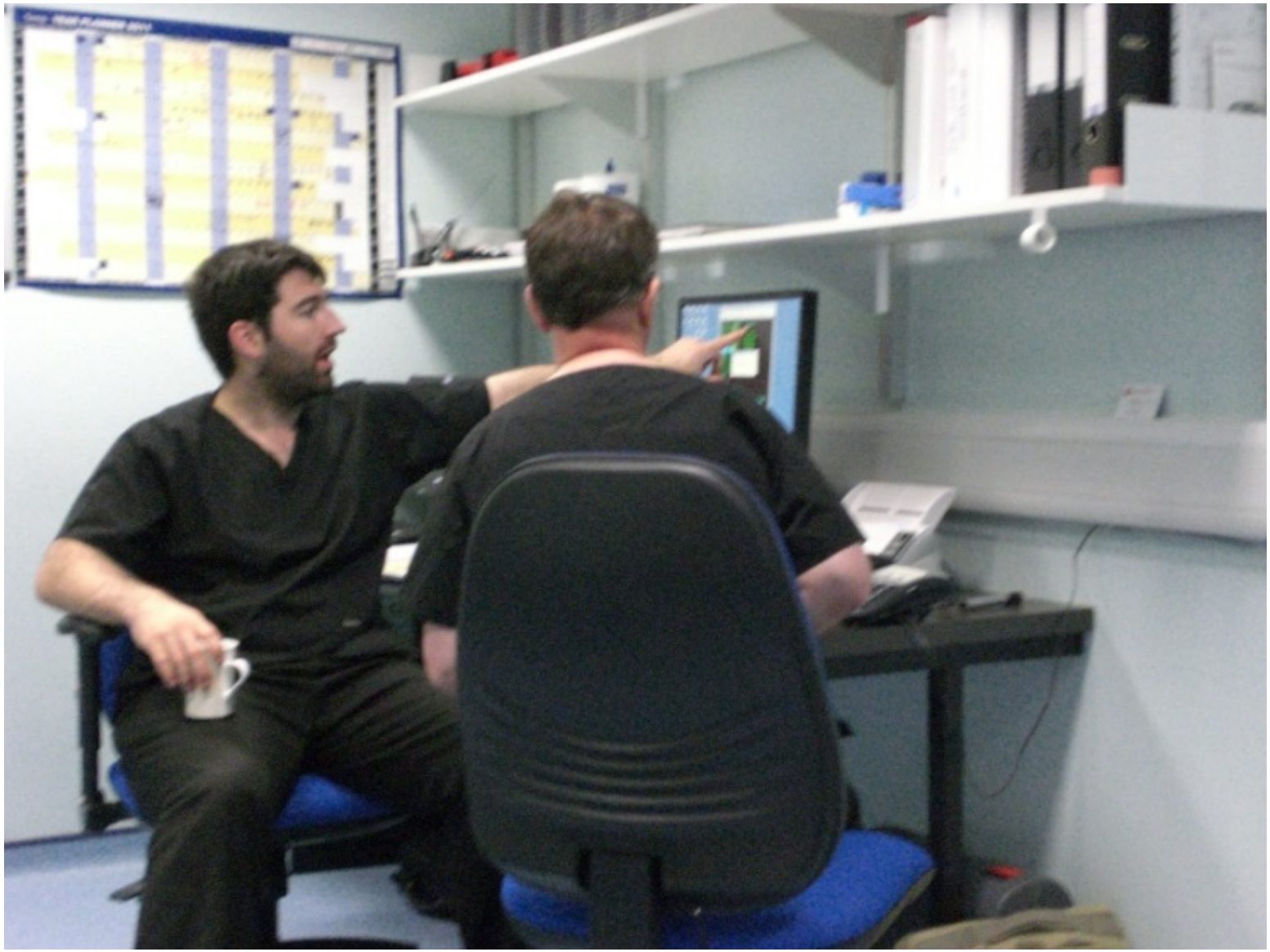
Evolution

Changing the physical environment


CARDIFF
UNIVERSITY



Creating new identities?



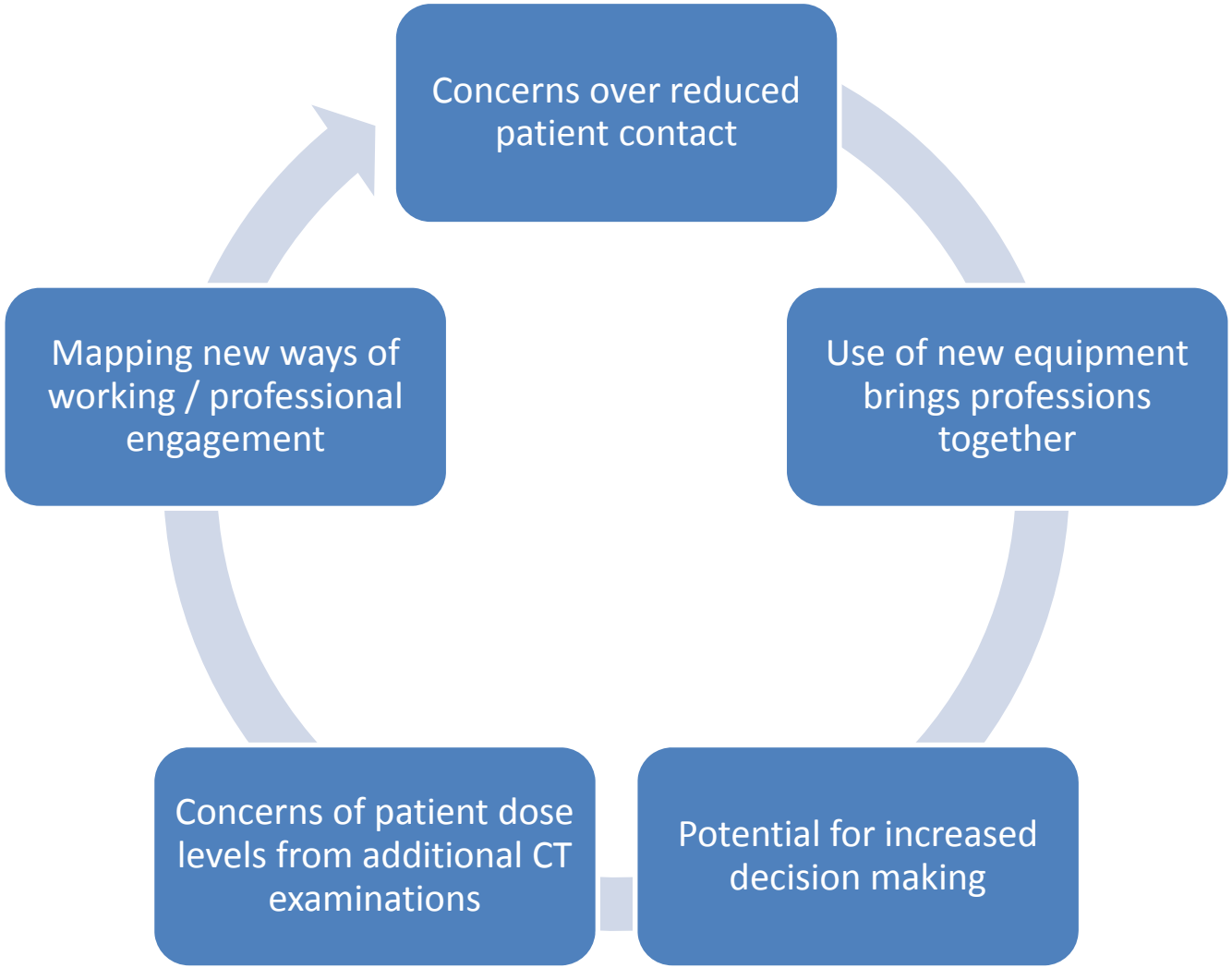
Techno-centric approach to the delivery of clinical services?

Workflows and decision making

Wynn Jones et al., (2013)

Griffiths, (2014)

Road to change: Impact of new technology

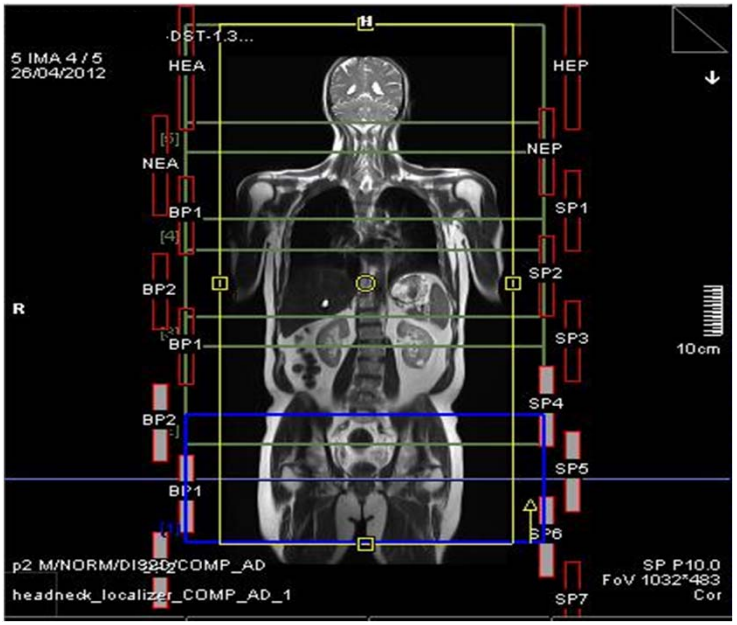


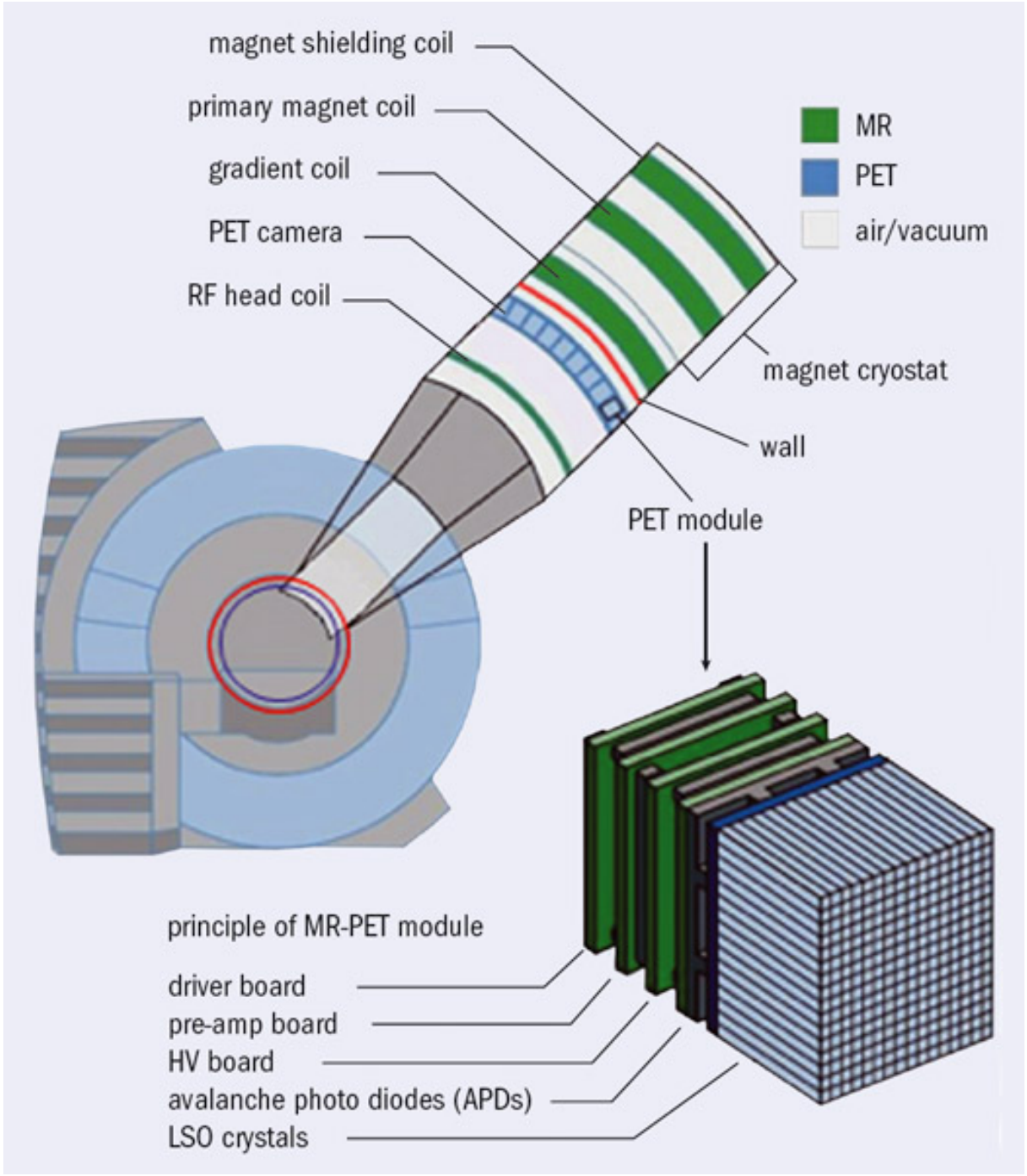
Change in working practice, the environment and emerging clinical practice

- Change to the flow of patients through the clinical department
- Rebalancing of existing professional domains / identities
- Appropriate diffusion and adoption of new hybrid technology
- Introduction of PET/MRI requires new approaches to working
- Some evidence of skill mix / team working present
- Potential for a ‘protocol driven culture’ exists

Considerations for working in PET/MRI

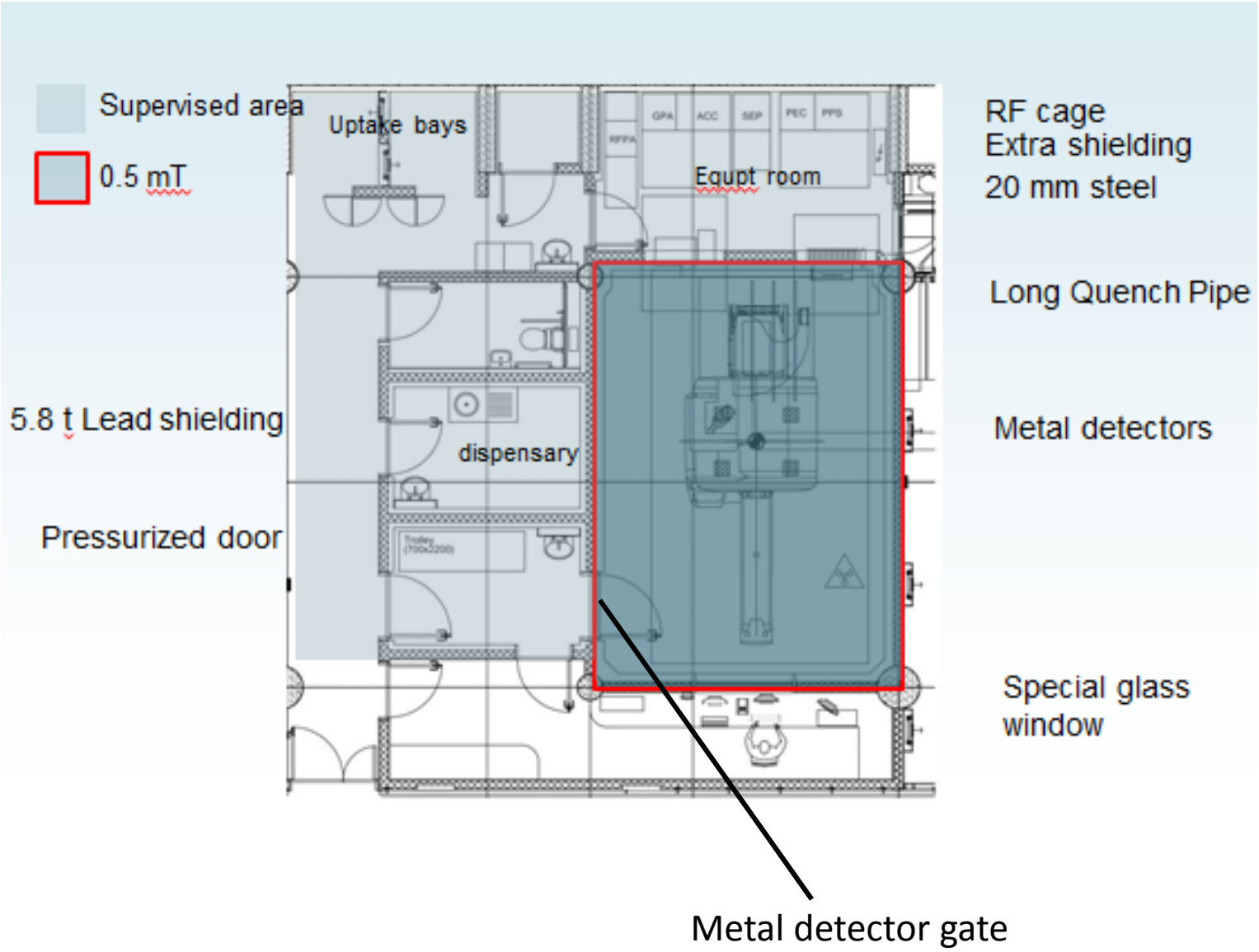
- Working within a strong magnetic field (3T)
- Minimising exposure to ionising radiation during MR set up
- Working in teams to rotate examination / processing duties
- Increased psychological support required by patients during examinations




magnet shielding coil
primary magnet coil
gradient coil
PET camera
RF head coil
MR
PET
air/vacuum
magnet cryostat
wall
PET module
principle of MR-PET module
driver board
pre-amp board
HV board
avalanche photo diodes (APDs)
LSO crystals

PET/MRI working considerations

PET/MRI – Design principles



Potential safety issues in PET/MRI

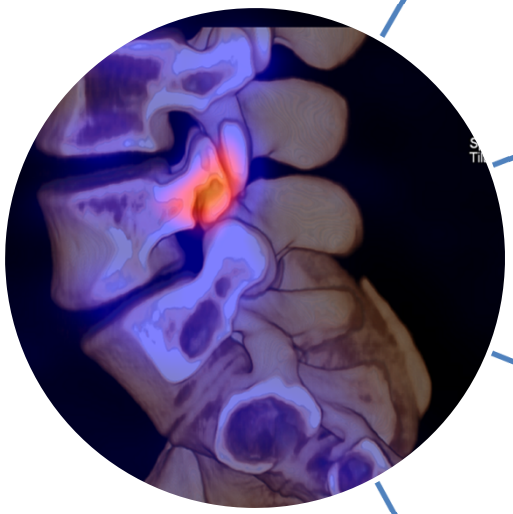
- Metallic objects becoming missiles
- Patients / Staff with Pacemakers
- Specific patients / staff who have undergone surgery:
  - Clips / valves
  - Spinal work
- Patients / staff with dentures, coloured contact lenses, history of tattoos etc
- History of kidney problems (contrast agent)
- Glaucoma (muscle relaxant)

Emergence of new professional identity and intercollegiate working:

- Some evidence of flat collaboration occurring
- New culture emerging
- Professional pride established
- New opportunities for preceptorship and mentorship
- Autonomous practice (e.g. dedicated CT / MR patient worklists)
- Practitioner driven protocols

Flat collaboration

'There has been the development of problem solving abilities during the installation and in-house training of the SPECT/CT equipment within the Department. Working as a team, rather than individuals.'

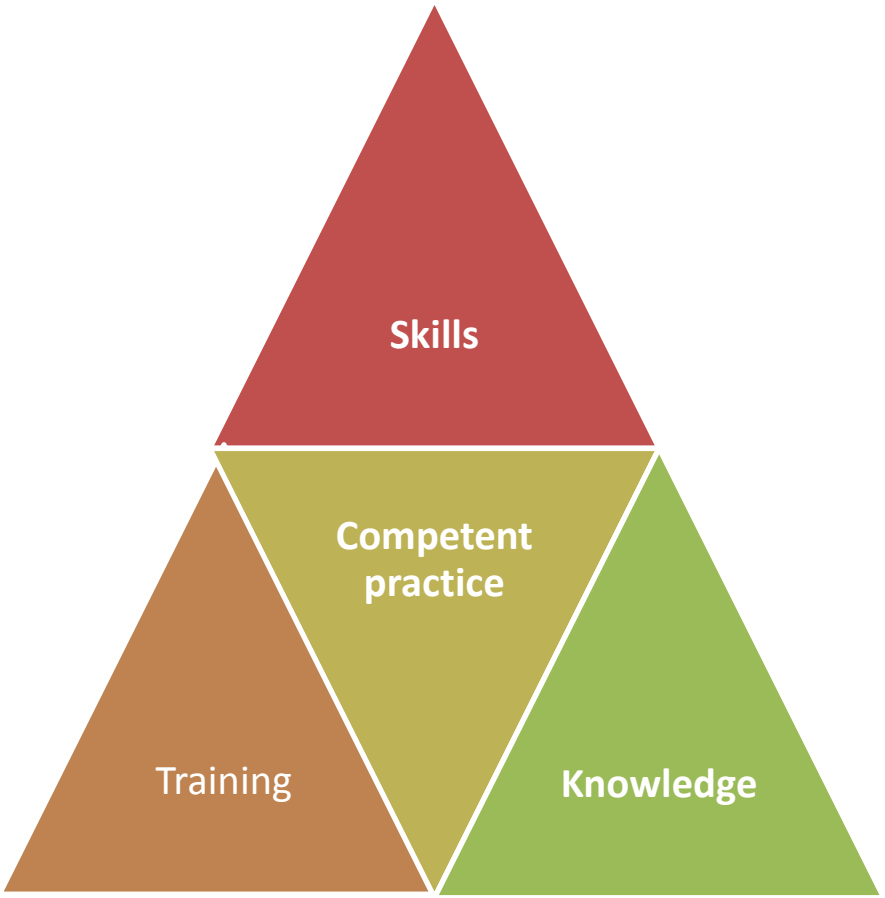


Clear professional identity

Increased capabilities

Increased involvement within patient pathway

Greater scope for decision making

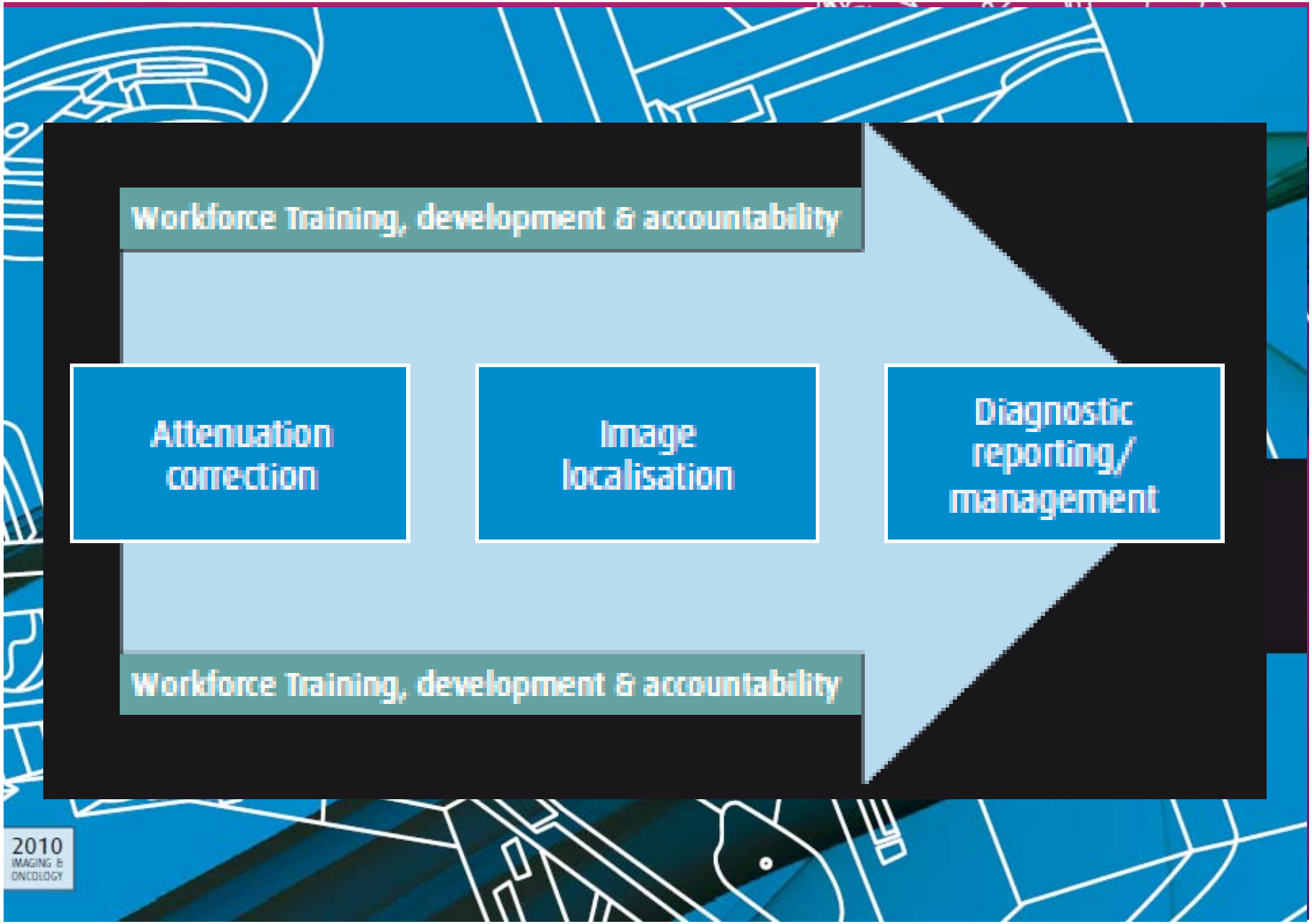


Gibbs and Griffiths, (2013)

Emerging culture

'Introducing hybrid imaging technology has brought challenges in that there's a steep learning curve for us, we've sort of drifted along, we've done nuclear medicine for a long time and all of a sudden there's this new thing to learn.'

'I think it's increased the scope of the nuclear medicine technologists, the practitioner, the radiographer or whatever, because then they are more multi skilled. They can do nuclear medicine and they can do CT and those skills are transferable, the nuclear medicine practitioner could do a CT list as long as they're educated properly enough and confident enough.'


Workforce Training, development & accountability
Attenuation correction
Image localisation
Diagnostic reporting/ management
Workforce Training, development & accountability
2010
IMAGING & ONCOLOGY

A Need for new professional guidelines and training frameworks to be established

- Lack of formal training and educational guidelines
- Limited professional networks in existence
- Distinct lack of career support mechanisms in hybrid imaging
- Concerns over the mapping of new aspects of service redesign and role development opportunities
- Limited support from equipment manufacturers post installation of new kit

Role development / innovative practice and emerging sub-communities

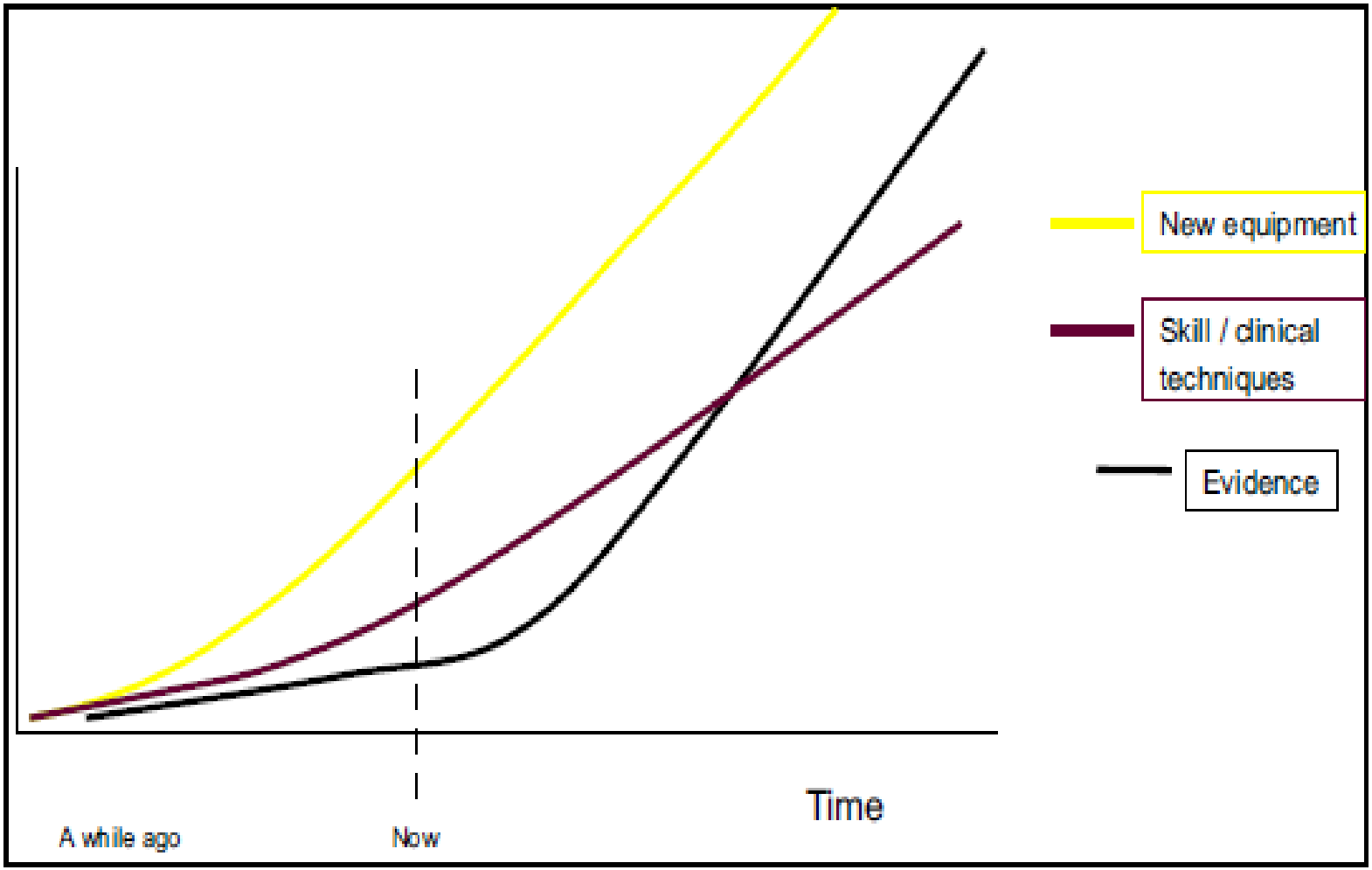
- Evidence of role development exists
- Need to reflect on the introduction of the new hybrid imaging technology
- Emergence of new patient pathways
- Creation of sub-communities – early adopters / cultural lag
- Lack of collaboration at times

Cultural lag: Impact on service provision

Ogburn (1966) refers to the term '*cultural lag'* as a means of defining a period of maladjustment within society following the introduction of new systems / machinery etc, which may in turn lead to anxiety, confusion and the inefficient deployment of resources

Any delay in developing the appropriate knowledge and skills may impact on the efficient use of established resources within the healthcare environment (Kings Fund, 2012)

Cultural Lag



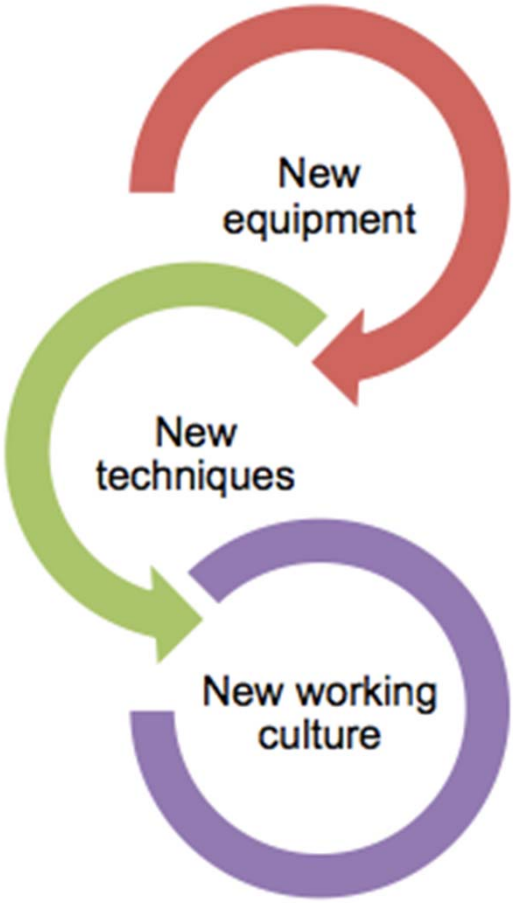
Projected lag in the development of new skills / techniques following the introduction of new technology (Hogg, 2012)

Making the best use of new technology

INVENTION
The originating idea for a new service or product, or a new way of providing a service

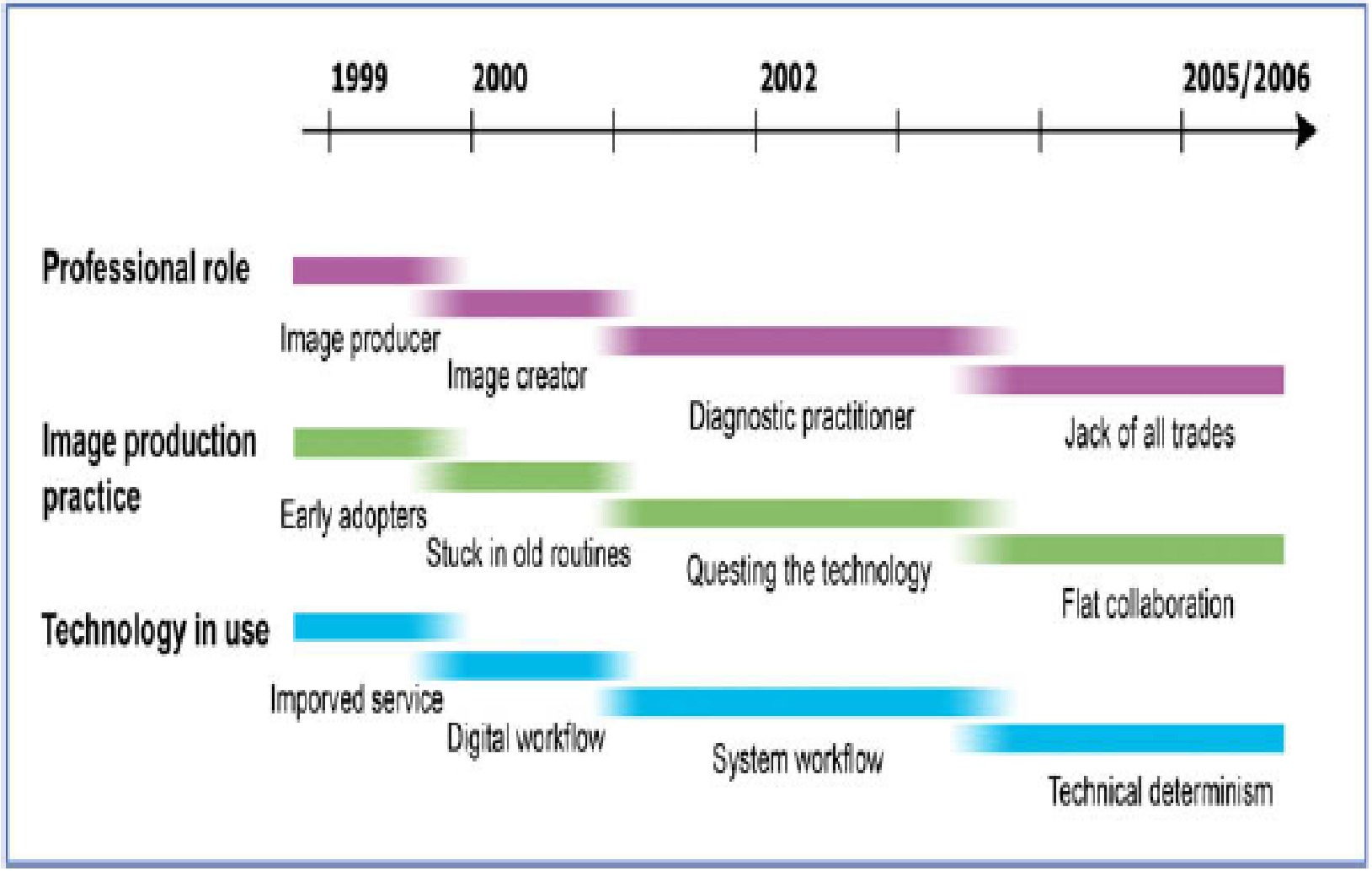
ADOPTION
Putting the new idea, product or service into practice, including prototyping, piloting, testing and evaluating its safety and effectiveness

DIFFUSION
The systematic uptake of the idea, service or product into widespread use across the whole service.

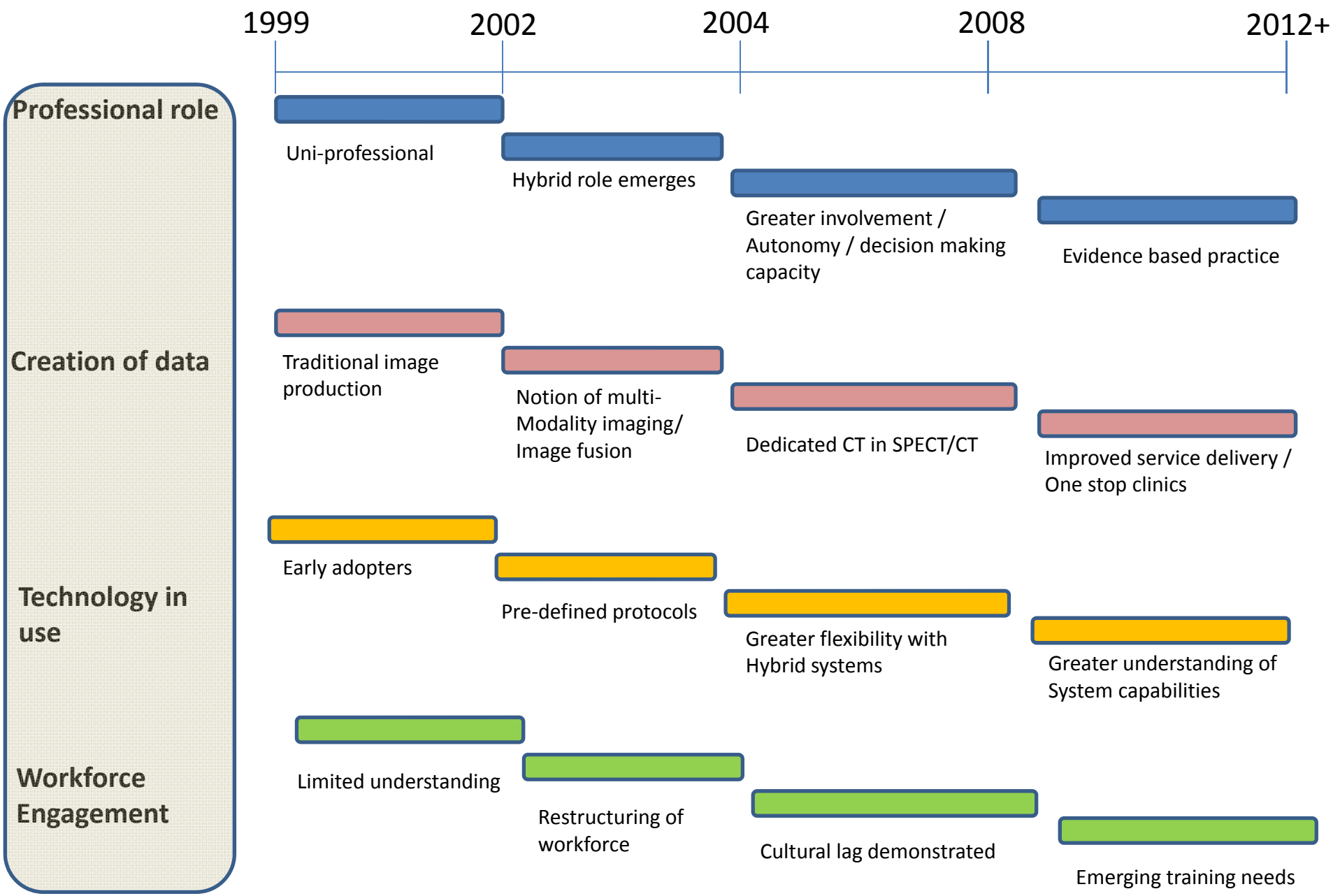


Griffiths *et al*, (2014)

Impact of technology: Radiography



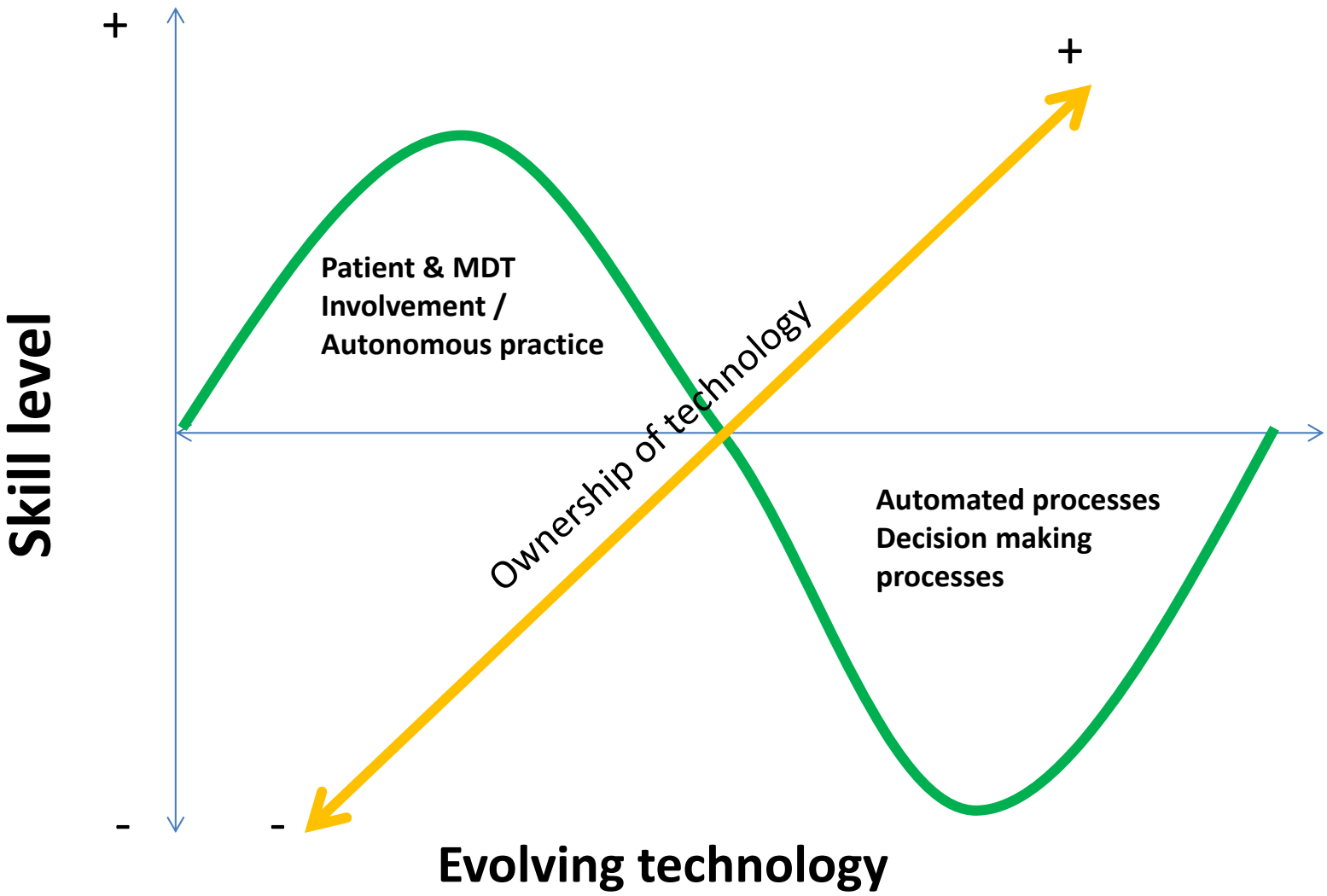
Consequences of PACS on radiographers' professional role, image production practice and technology in use (Fridell et al., 2009)


1999
2002
2004
2008
2012+
Professional role
Uni-professional
Hybrid role emerges
Greater involvement / Autonomy / decision making capacity
Evidence based practice
Creation of data
Traditional image production
Notion of multi-Modality imaging/ Image fusion
Dedicated CT in SPECT/CT
Improved service delivery / One stop clinics
Technology in use
Early adopters
Pre-defined protocols
Greater flexibility with Hybrid systems
Greater understanding of System capabilities
Workforce Engagement
Limited understanding
Restructuring of workforce
Cultural lag demonstrated
Emerging training needs

Occupational shift and domain ownership

- Traditional roles being eroded
- Impact of the digital push / pull culture in the clinical environment
- Tensions around domain ownership by sub-communities within the clinical environment
- Pressures being placed on workforce to manage the processing and data mapping
- Opportunities for service redesign

Professional '*ripple*' and reorder



Practitioner blog entry: Breaking the ceiling

18th Nov: Success!! Have got the IR(ME)R authorization criteria signed off by all five ARSAC licence holders for Senior Technologists to authorise hybrid imaging, and been added to the trust IRMER protocols as a group to perform CT and as practitioners to authorise SPECT/CT.

Interview quote: Ownership & identity

'We have always previously provided the information and evidence for other professions to then go on and own the techniques and technology. This is now beginning to change, with both clinical scientists and practitioners developing the evidence base for themselves and their respective professions'

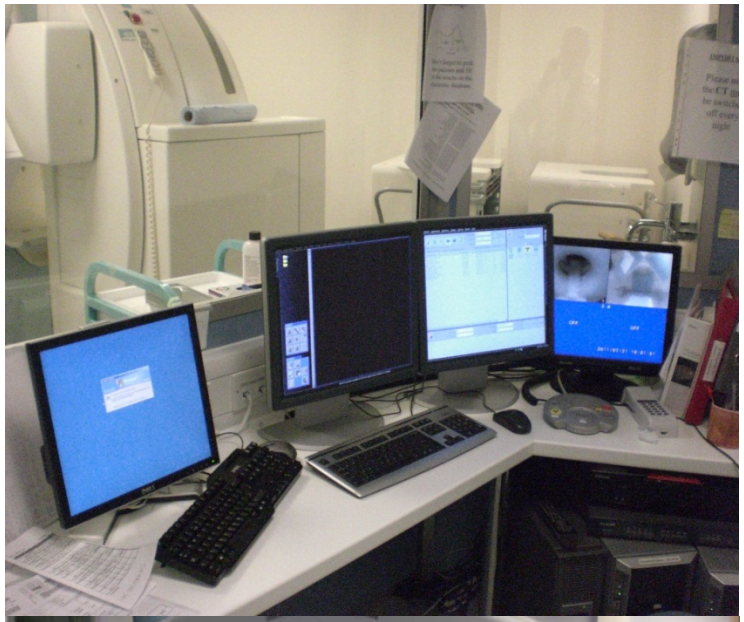
'Competency based approach, improving the overall autonomous nature of the Nuclear Medicine Practitioner. However this can also lead to an apprehensive workforce, if they are unfamiliar with the protocols and setup of the department'

Role erosion and automation / technological determinism

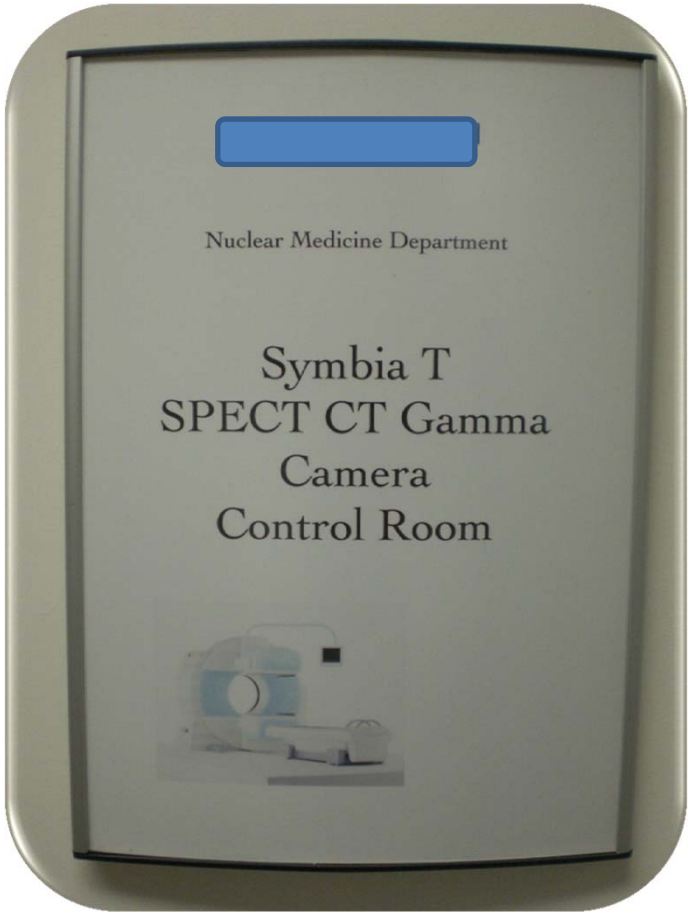
- Deskilling of the NM workforce observed
- Professional erosion / social impact of new hybrid technology
- Technological determinism reported
- Tribal instincts present in some instances, preventing flat collaboration opportunities

Reliance on technology?

- Pre-set protocols / workflows
- Start / Pause / Finish approach to working practice
- Push / pull of patient data
- Hidden identities of workforce



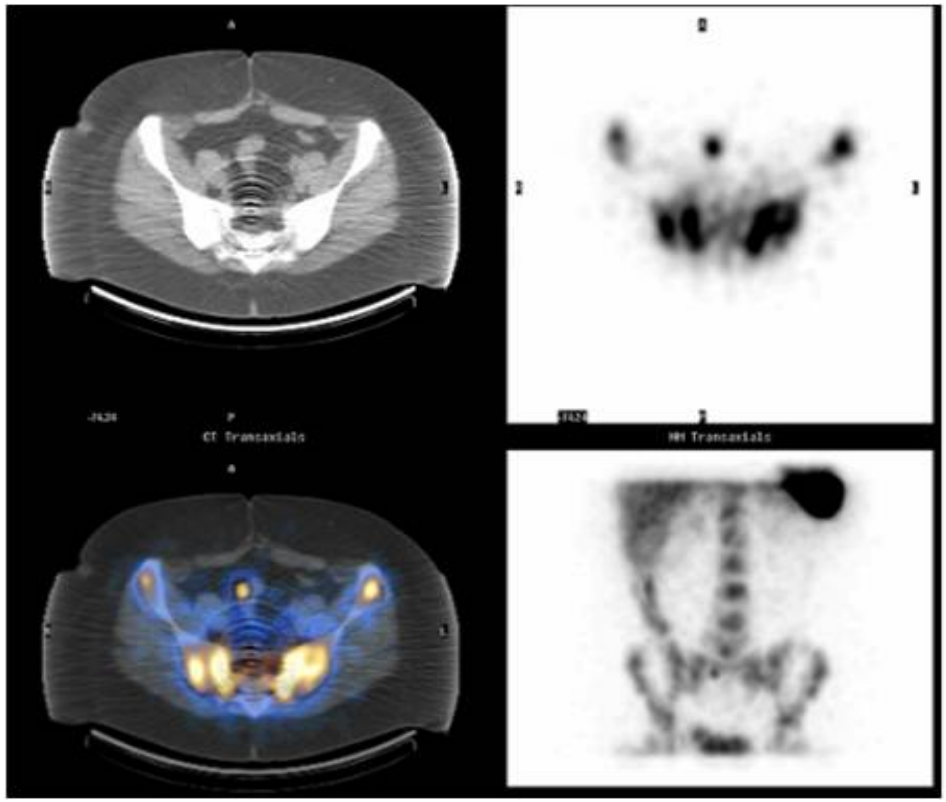
Environmental considerations



- Noise within the clinical imaging room (air conditioning for CT unit)
- Physical barrier introduced
- Emergence of additional workstations
- New language and imaging protocols
  - "*Draw up the juice*"
  - "*How many clicks*?"
  - "*Pend, suspend, activate, archive*"
- New radiation monitoring requirements

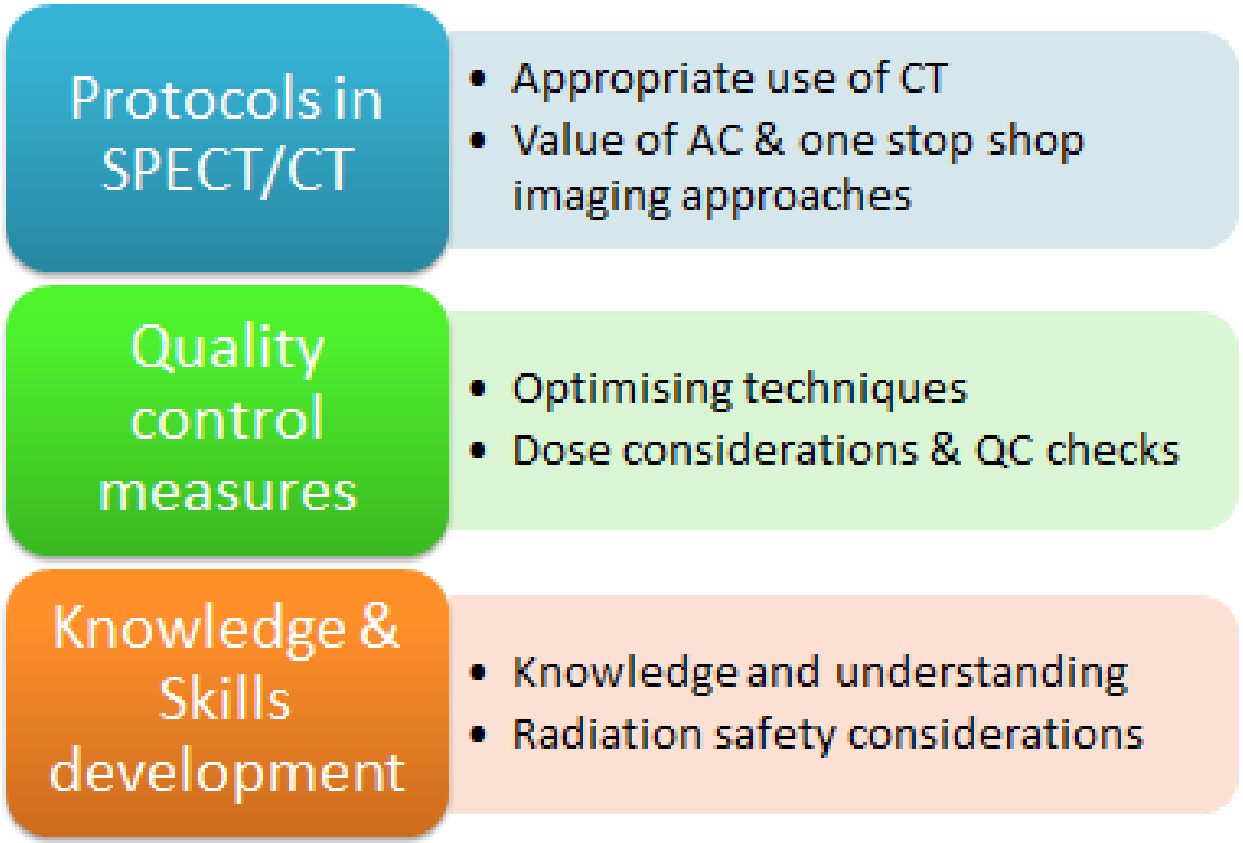
Training & audit

- 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

Example competencies

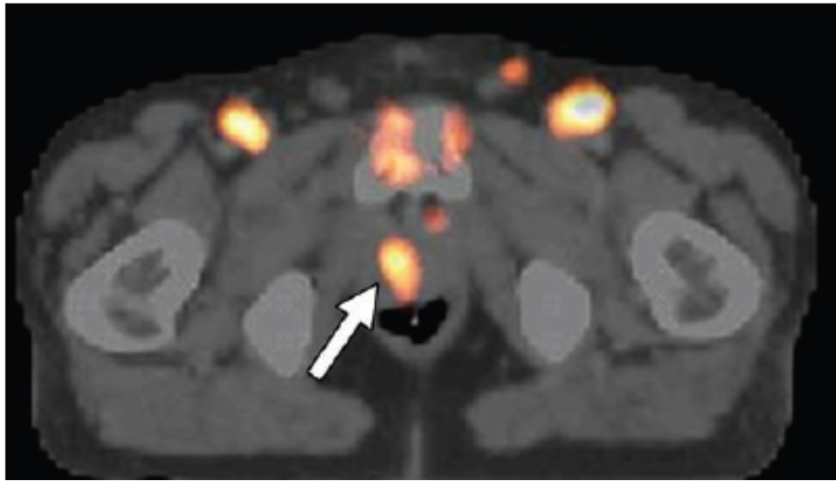


Interview quote: Role development

Interviewer: ‘Have the changes from the introduction of hybrid technology evolved your approach to work differently?’

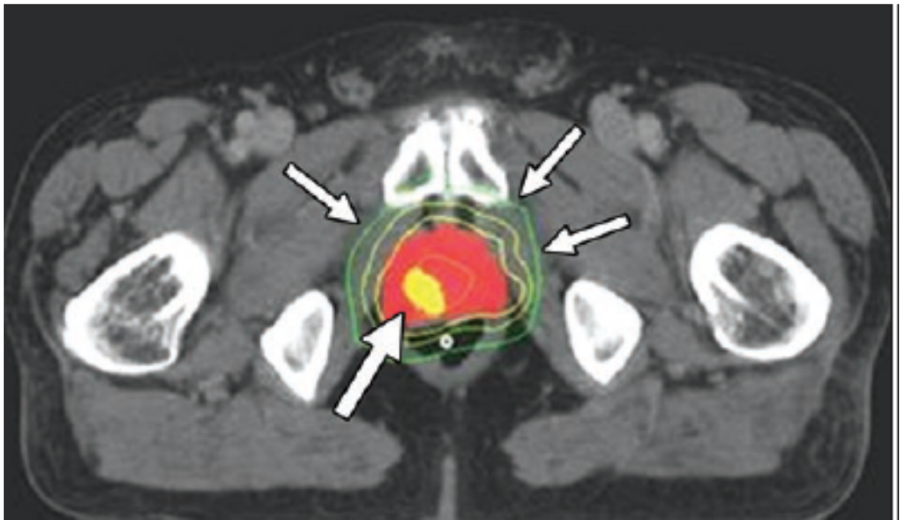
Participant: ‘Definitely, it’s made everyone's, before there was a hierarchy within the department but now with this new technology that’s come in, everyone’s on a even footing to start with because we’re all introduced to it at exactly the same time and it’s the people who are more enthusiastic, who want to do more, who read more about their way to study more, finding themselves going further forward’

Collaboration: Everyone on board



By contouring dose profile, site of highest tumour concentration can receive boosted dose, while dose is reduced to surrounding tissues.

IMRT CT based SPECT/CT data showing tumour in relation to 82-, 75.6-, 70- and 60-Gy isodose lines.

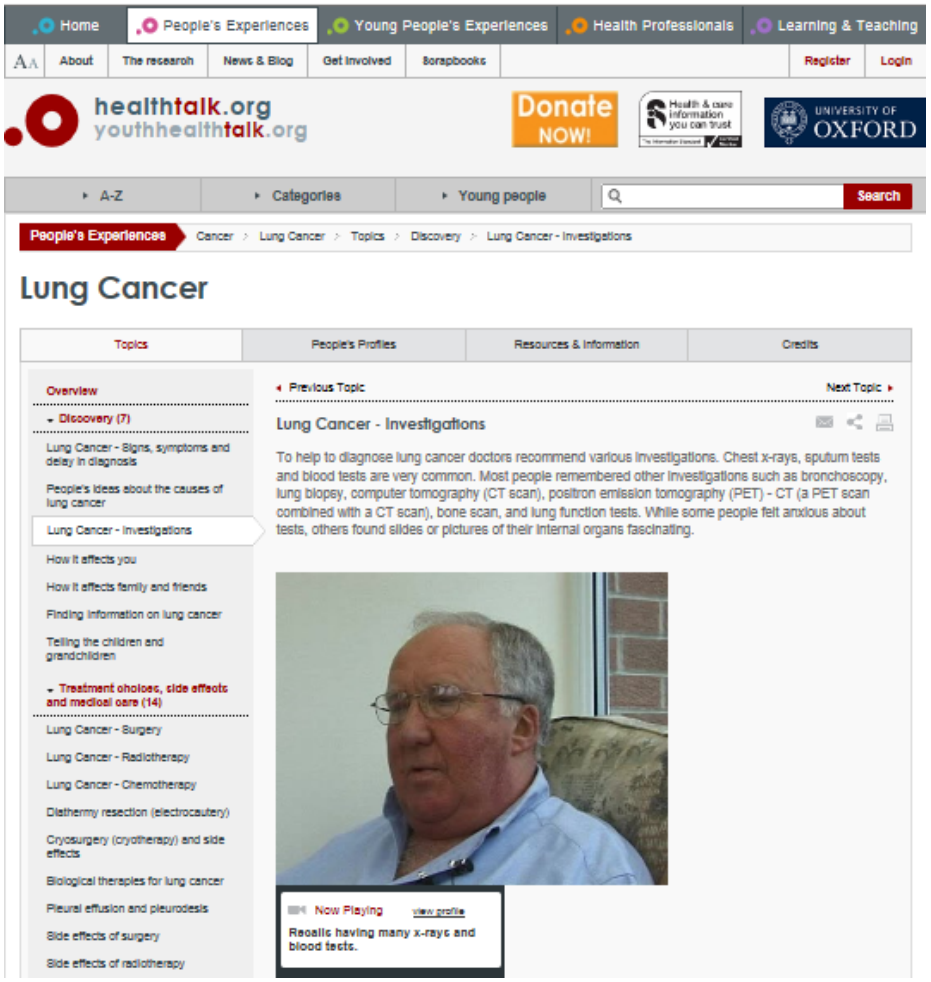


Impact of technology on patients and creating a patient centric approach to hybrid imaging service delivery

- Balancing the training needs of the Technologist / Practitioner with the needs of the patient (i.e. patient centric approach)
- Physical barriers now present between practitioner and patient
- Sense of isolation for the patient and the Technologist /Practitioner
- Shared learning with nursing colleagues

Supporting each other

- Patient experiences
- Psychological support
- The Kubler-Ross grief cycle
- Training / education
- Schwartz rounds



Point of Care foundation Healthtalk.org

Interview quote: Isolation

'Patients sometimes become intimidated by the hybrid equipment, by the shear size in the machines and you've got your claustrophobic patients, they don't really enjoy the situation but most of them are ok'

HYBRID IMAGING IN NUCLEAR MEDICINE: CREATING A PATIENT-CENTRIC APPROACH TO SERVICE DELIVERY

MARC GRIFFTHS, GARY DAWSON

Staffing a modern, hybrid imaging environment requires a skilled and competent workforce, who should have the opportunity to further develop their working practice and clinical service provision.

TECHNOLOGICAL POSITIONING

Health professionals across the world now work within an environment of flux and uncertainty, which inevitably presents new challenges for the workforce, in terms of developing new skills and knowledge[1]. This, when coupled with the need to provide high quality care, which enhances the individual patient experience[2], has resulted in a revolutionary change to the traditional role of the health professional[3]. The introduction of any new hybrid imaging system may require appropriate staff training, considerations for service redesign and patient workflow dynamics, as part of the change process.

Collectively, the term "hybrid imaging" relates to the physical fusion of more than one diagnostic imaging tool to provide anatomical and functional information in one environment. The emergence of the hybrid imaging workforce has arisen from the developing specialist area of clinical nuclear medicine over the last decade, mainly due to the introduction of new imaging hardware and developments within current patient treatment pathways[4,5]. The ability to perform a hybrid imaging examination within a single physical environment provides clinicians with physiological and anatomical information, which may form part of the patient's initial diagnosis or evaluate their on-going response to treatments such as radiotherapy and / or chemotherapy[6,7,8]. The integration of new technology requires the modern healthcare professional to adopt a greater 'evidence based' ethos, which is innovative, promotes quality patient care, and encourages 'smart' working practices that help deliver productivity savings[9,10].

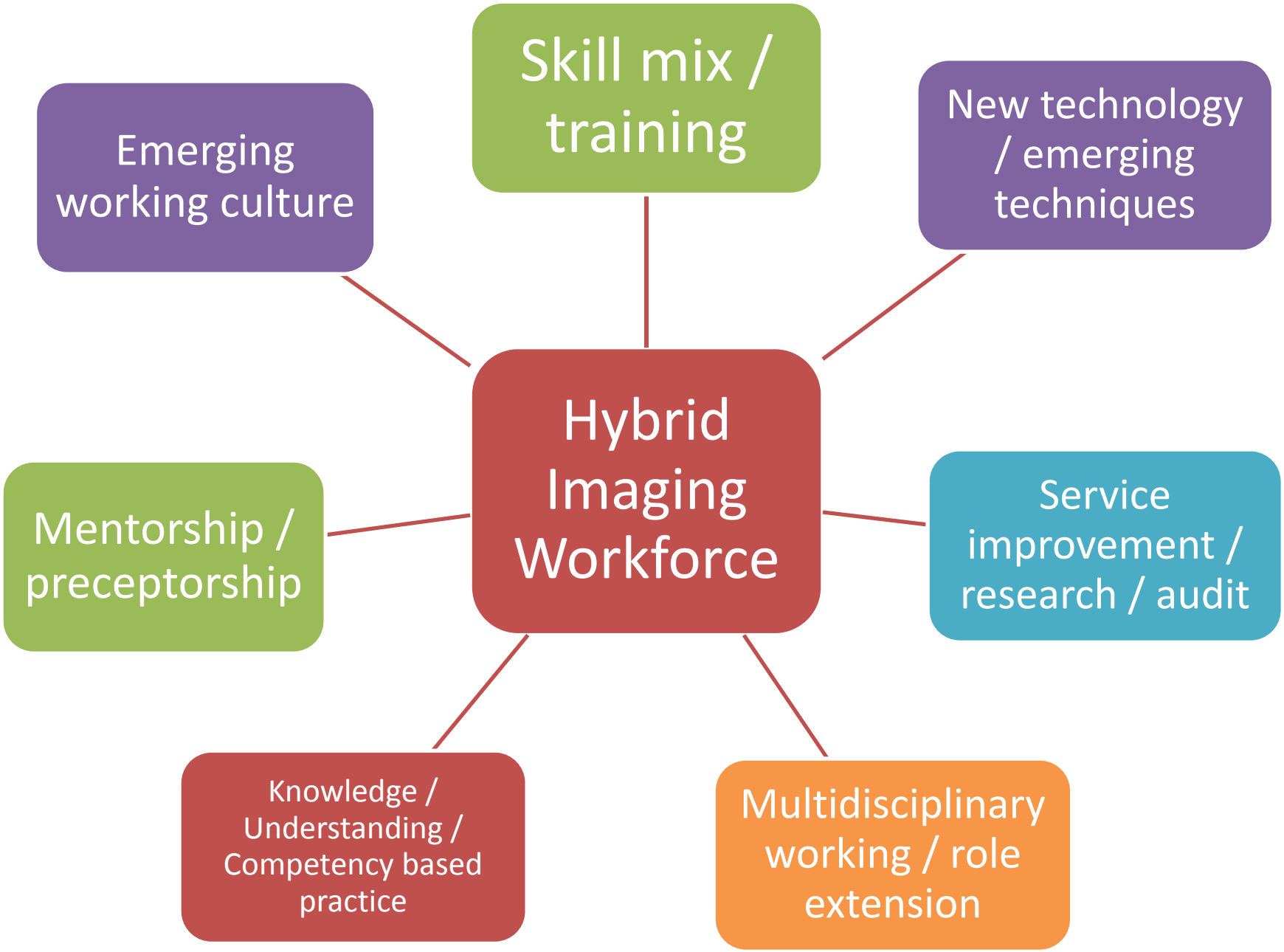
Optimisation of SPECT/CT acquisition parameters is essential to current clinical practice, in order to minimise the patient dose from the CT element of the examination and to ensure that an appropriate level of anatomical information, which is both justified and adds clinical value to the imaging procedure, is acquired. There is a necessity for clear clinical protocols and appropriate use of CT within a hybrid imaging environment, especially where the patient may have recently undergone a diagnostic quality CT examination. Such activities would appear to warrant the development of clear clinical guidelines / protocols, which can help support the healthcare professional as to the appropriate use of CT within the hybrid imaging environment in order to ensure that patient safety can be maintained at all times.

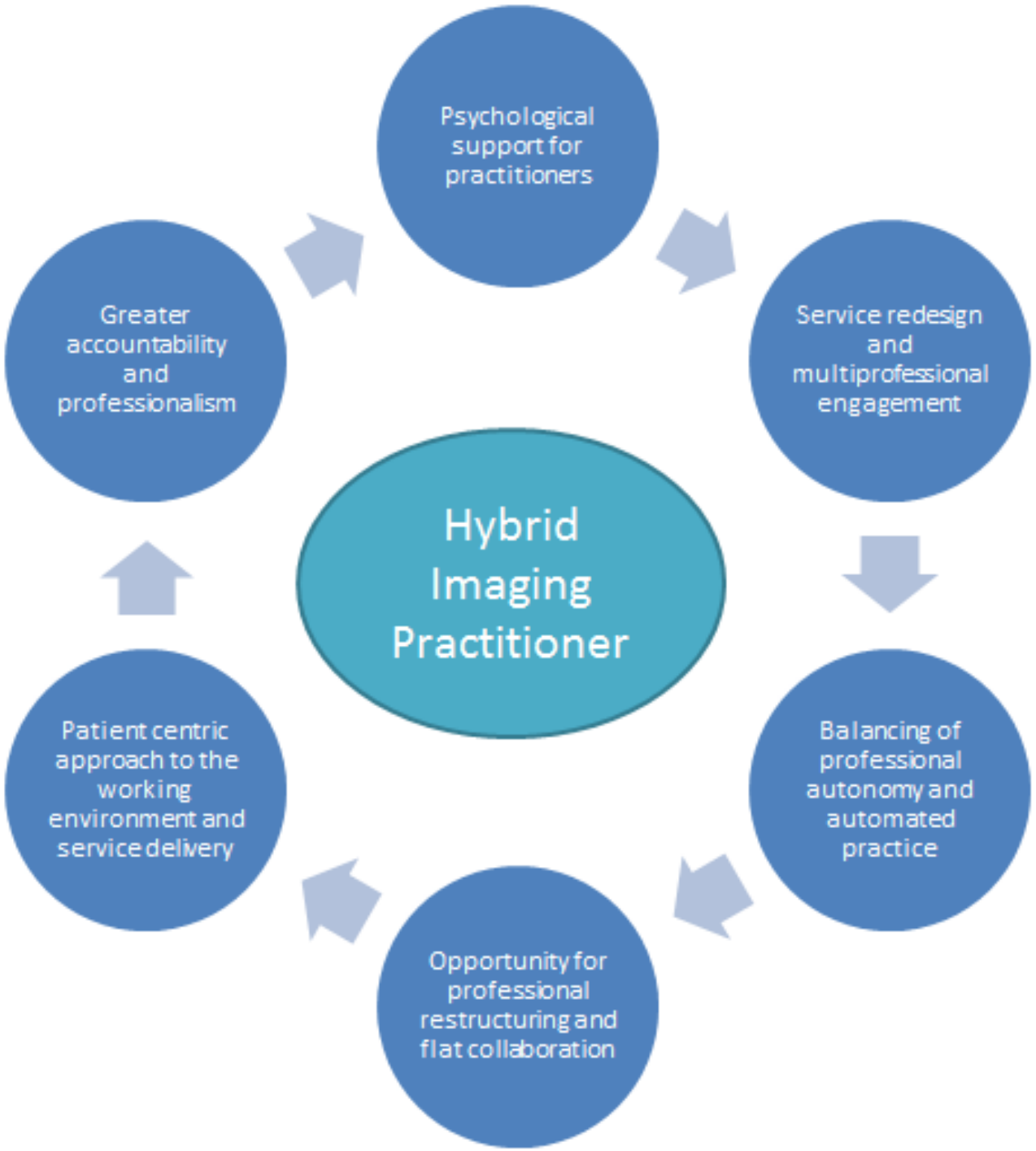
The growing use of CT within the hybrid imaging environment has placed additional pressures on nuclear medicine practitioners, particularly nuclear medicine technologists, who make up a large percentage of the workforce, as previous or recent training and experience with CT may not have been undertaken. Balancing the needs of effective service delivery, workforce development and holistic patient-centric care requires careful planning and collaboration with a range of healthcare professionals. Introducing new hardware and software technology requires appropriate social frameworks, which may include ensuring the role of the practitioner is clearly defined in order that the emerging relationship with the patient is maintained. There is a potential danger of 'patient objectification' during high technology examinations[11,12], such as hybrid imaging and the subsequent dehumanisation process that may occur. Creating an environment where workforce flexibility is present, in terms of understanding the position of new technology within the patients' journey and a greater understanding of the need to reshape the delivery of such clinical services, is paramount to the ongoing development of hybrid imaging within the modern healthcare domain.

CHANGES IN WORKING PRACTICE AS A RESULT OF INTRODUCING HYBRID IMAGING TECHNOLOGY

Introducing new hybrid imaging technology may result in an increase in examination

Imaging and Oncology, 2014, College of Radiographers


Skill mix / training
Emerging working culture
New technology / emerging techniques
Hybrid Imaging Workforce
Mentorship / preceptorship
Service improvement / research / audit
Knowledge / Understanding / Competency based practice
Multidisciplinary working / role extension


Hybrid Imaging Practitioner
Psychological support for practitioners
Service redesign and multiprofessional engagement
Balancing of professional autonomy and automated practice
Opportunity for professional restructuring and flat collaboration
Patient centric approach to the working environment and service delivery
Greater accountability and professionalism

Acknowledgments

- PET/MRI staff within at University College London
- Marguerite du Preez
- Nuclear Medicine Community
- College of Radiographers (CoRIPS Grant)

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