Radiological Technology (Radiography): Emergence of a Profession

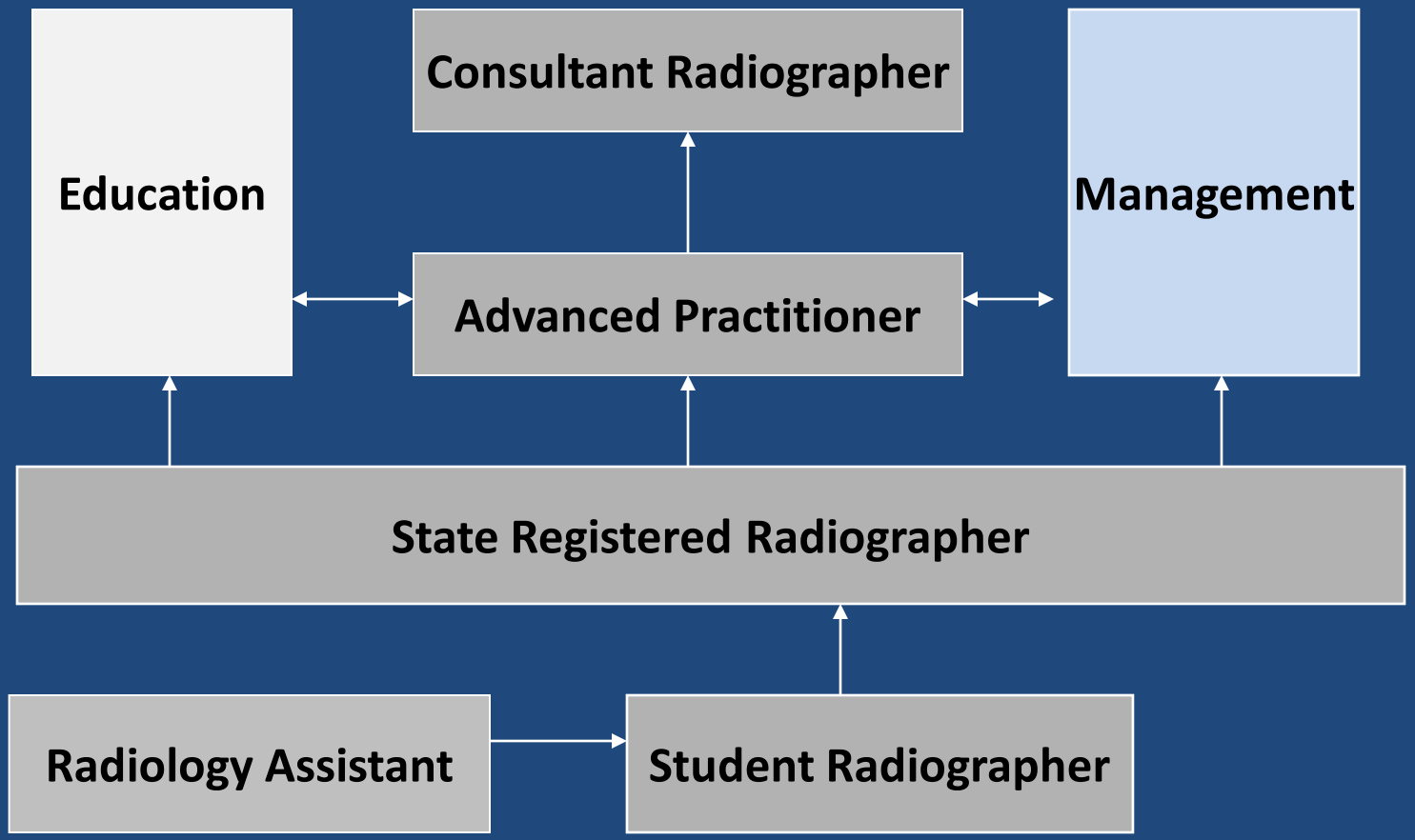
(Dr) Bev Snaith
Consultant Radiographer, Mid Yorkshire Hospitals
Honorary Research Fellow, University of Bradford
UK

Introduction

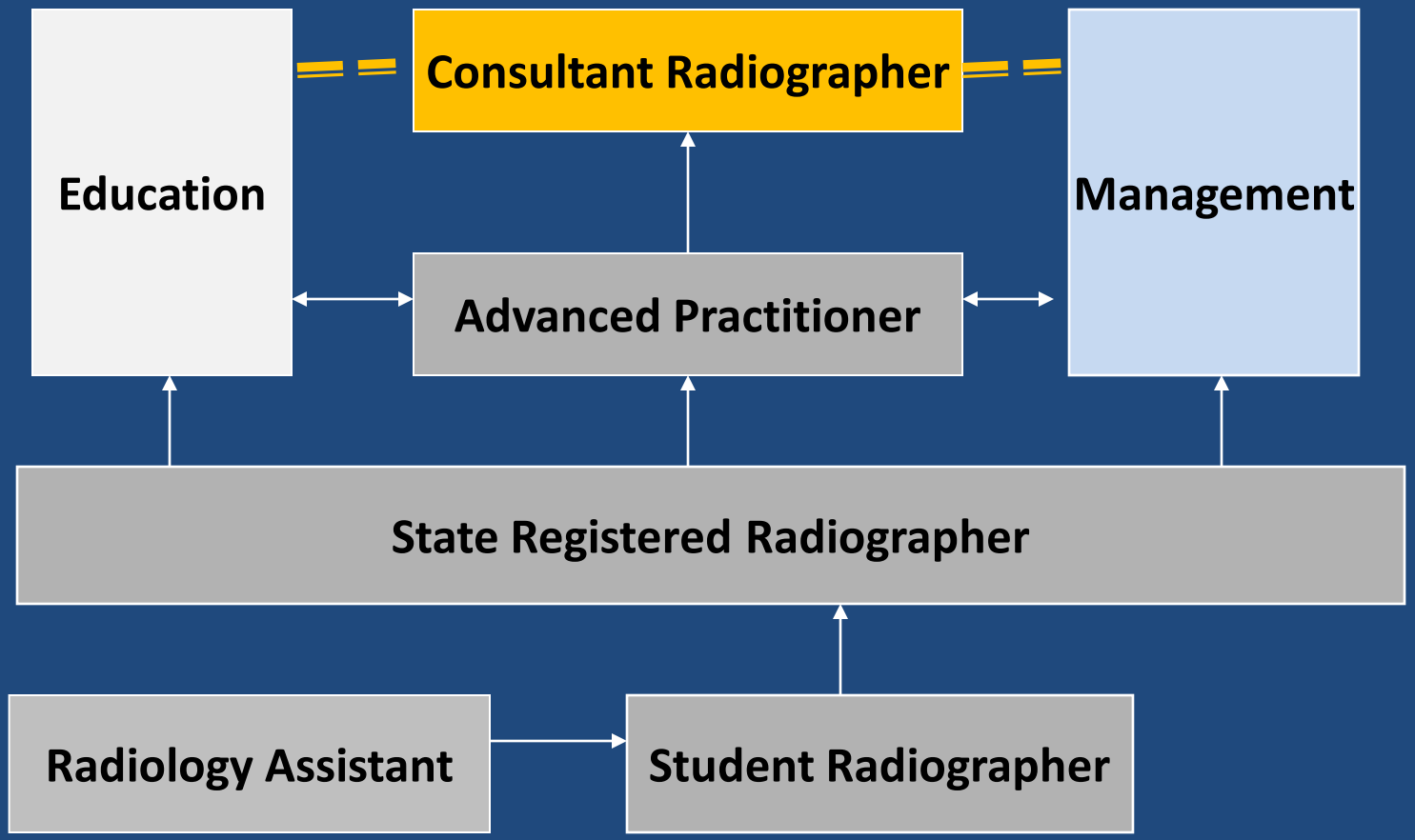
- Gratitude
- Hospital visits
- Welcome

- Radiologic Technology/Radiography - apology
- Personal introduction
- Programme

UK Radiography career progression



UK Radiography career progression

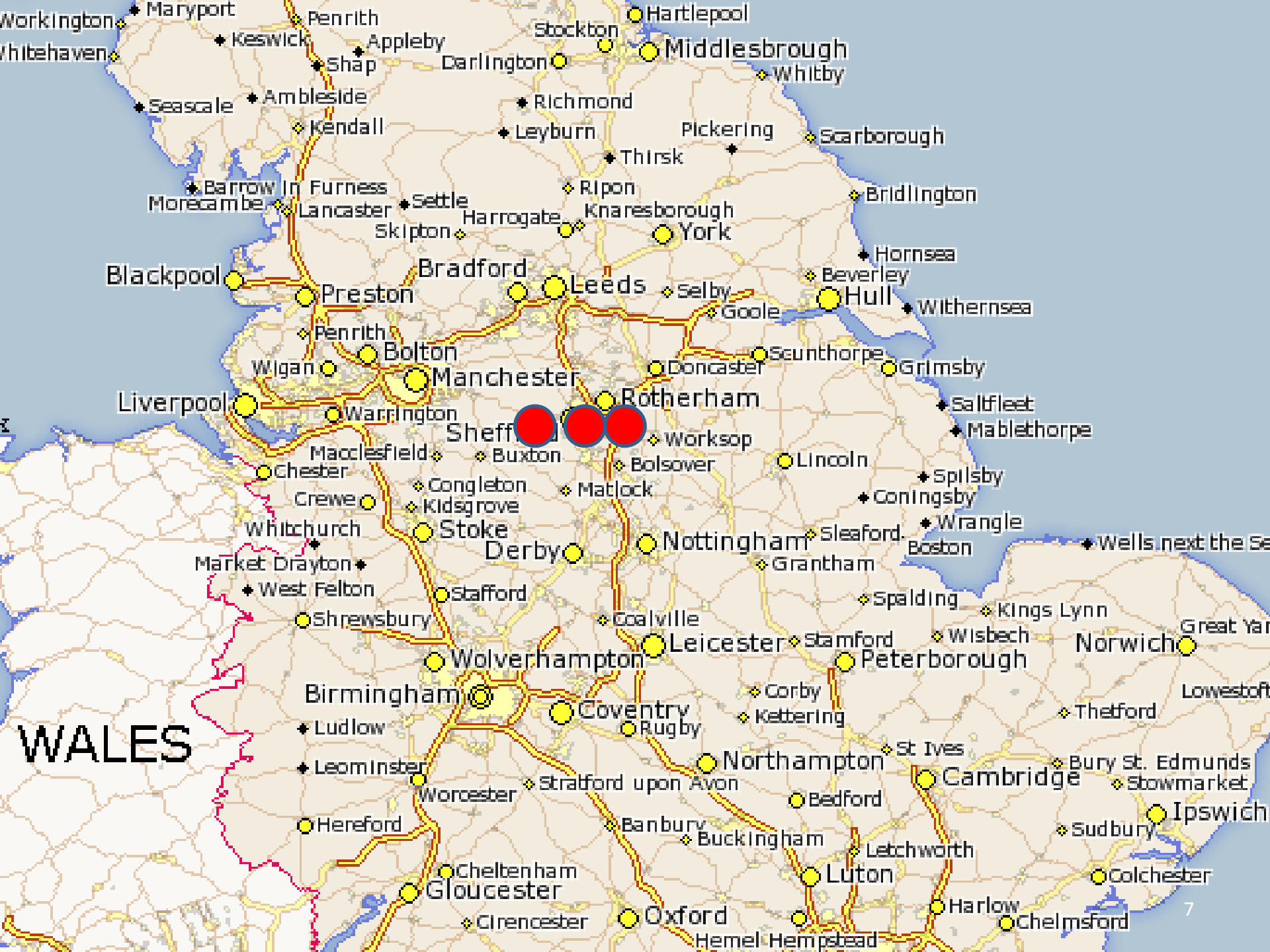


Personal introduction

- Consultant Radiographer
  - Emergency care (Radiography and Ultrasound)
- Mid Yorkshire Hospitals

Mid Yorkshire Hospitals

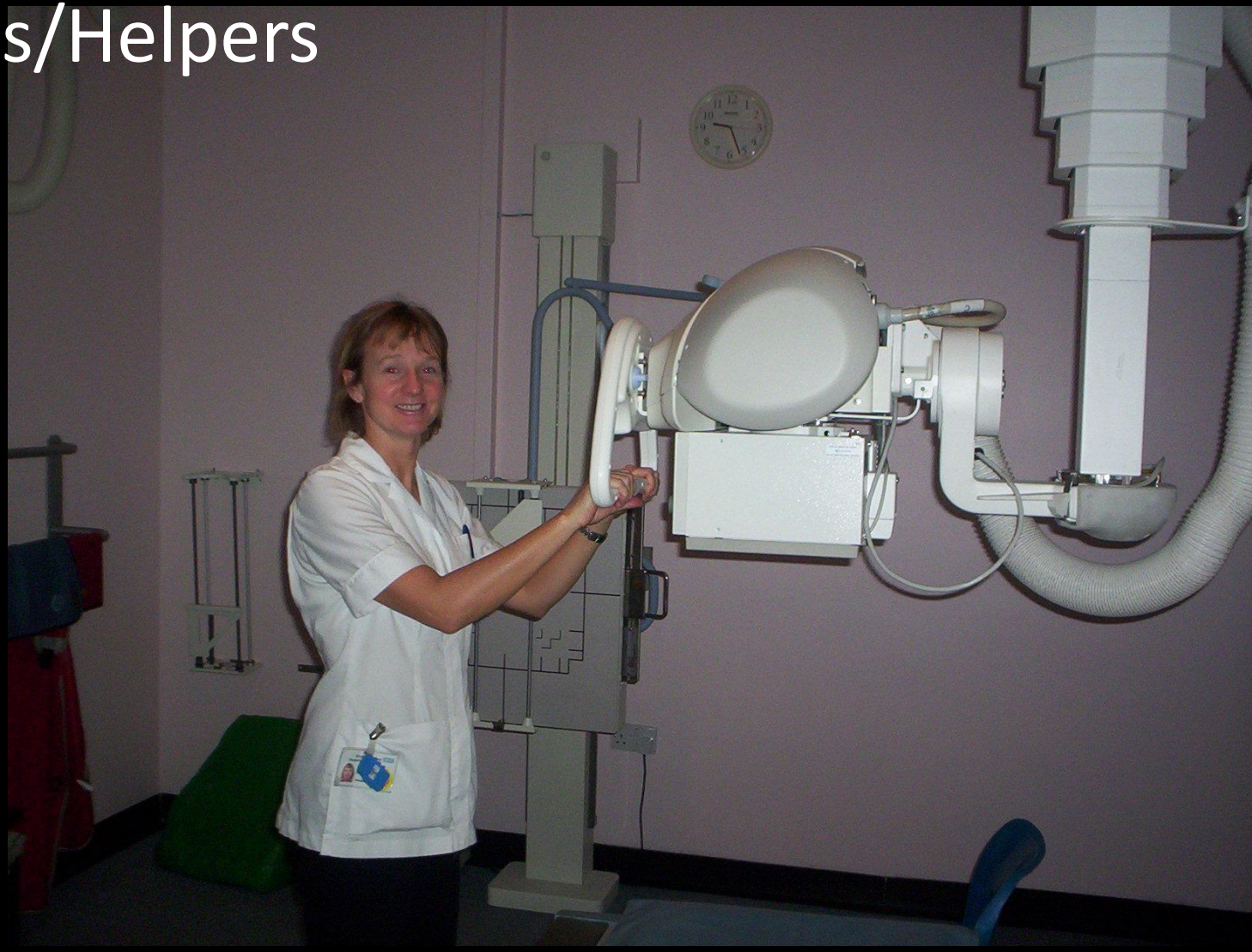
- 3 hospital sites (30km)
- Tertiary burns and spinal injuries services
- 2011 - 2 new PFI hospitals
- 180,000 X-rays per year
- 36,000 CT
- 28WTE cons radiologists


Workington
Maryport
Penrith
Hartlepool
Whitehaven
Keswick
Appleby
Stockton
Middlesbrough
Shap
Darlington
Whitby
Seascale
Ambleside
Richmond
Kendall
Leyburn
Pickering
Scarborough
Thirsk
Barrow In Furness
Ripon
Bridlington
Morecambe
Lancaster
Settle
Harrogate
Knaresborough
Skipton
York
Hornsea
Blackpool
Bradford
Beverley
Preston
Leeds
Selby
Hull
Goole
Withernsea
Penrith
Bolton
Scunthorpe
Wigan
Doncaster
Grimsby
Manchester
Liverpool
Rotherham
Saltfleet
Warrington
Mablethorpe
Worksop
Macclesfield
Buxton
Bolsover
Lincoln
Chester
Spilsby
Congleton
Matlock
Crewe
Kidsgrove
Coningsby
Whitchurch
Stoke
Wrangle
Sleaford
Nottingham
Boston
Wells next the Se
Derby
Market Drayton
Grantham
West Felton
Stafford
Spalding
Kings Lynn
Shrewsbury
Coalville
Great Yar
Leicester
Stamford
Wisbech
Norwich
Wolverhampton
Peterborough
Birmingham
Corby
Lowestoft
Coventry
Kettering
Thetford
Ludlow
Rugby
WALES
St Ives
Northampton
Bury St. Edmunds
Leominster
Cambridge
Stowmarket
Worcester
Stratford upon Avon
Bedford
Ipswich
Hereford
Banbury
Sudbury
Buckingham
Letchworth
Cheltenham
Luton
Colchester
Gloucester
Harlow
Oxford
Cirencester
Chelmsford
Hemel Hempstead

Radiology main hospital

- 1 MRI
- 2 CT
- 2 Fluoroscopy
- 2 Interventional
- 9 X-ray rooms
- 9 Ultrasound rooms

Assistants/Helpers



Radiographers

Personal introduction

- Consultant Radiographer
  - Emergency care (Radiography and Ultrasound)
- Mid Yorkshire Hospitals

- Diploma 1987
- Masters degree 1999
- PhD 2013

Programme

- Explore the term ‘professional’
- Revisit the basics to understand future needs
- Identify future aspirations
- Take personal stock

Programme in detail

- Profession/evidence base
- Image acquisition and technique
- Image optimisation
- Governance /multidisciplinary working

Radiography – the profession

What is a profession?

Recognised Traits

- Specialised knowledge which can be acquired only thorough higher education;
- Representation via a professional organisation;
- A distinctive code of professional conduct;
- Autonomy;
- Altruism.

Sim & Radloff 2009

Radiography

An inventory

- Knowledge through higher education;
- Professional organisation;
- Code of professional conduct;
- Autonomy;
- Altruism.

Do you have these?
If not, is there a plan?

Higher education

Radiography education varies internationally

UK

- Degree
- Postgraduate (CT, MRI, US, NMR, Mammo, etc)
- Masters
- Doctorate

Sri Lanka

- Diploma/Degree
- Diploma in CT, etc

Professional Organisation

SOCIETY OF RADIOLOGICAL TECHNOLOGISTS _ SRI LANKA. Founded 1975
Affiliated to International Society of Radiographers and Radiological Technologists

Society of Radiological Technologists - Sri Lanka

Radiological Technology-
ever upgrading profession

Home | AACRT 2013 | Membership | more...

Membership

The membership of the Society of Radiological Technologists Sri lanka (SRTSL) is open for all Sri lankan Radiographers who have the diploma in Diagnostic radiography or Therapeutic radiography from the Sri Lanka School of Radiography or an

Live Members List

The membership list is arranged in the alphabetical order of the name with initials of the member.

Click here to see the list.

To get the password to open the file please use

Code of Professional Conduct

- Defines the role
- Defines scope
- Identifies limitations of practice

- Protects the individual
- Protects the profession
- Protects the PATIENT

Autonomy

- Does not mean working alone
- Does not mean being in charge
- Distinct knowledge base
- Self-esteem
- Commitment to improvement
  - Self
  - Profession

Altruism

- Definition:

  Altruism or selflessness is the principle or practice of concern for the welfare of others

What is a Radiographer?

- Professional
- Technician
- Technical expert

- Can you be all 3?

To answer:

- Explore what the role is and how our skills/knowledge base has changed
- Particular focus on technological aspects
- Illustrations from clinical practice

- Ponder the future

Role influences

Technological

- Computerisation
- Automation
- Modality
- Mobility
- Digital
- Virtual environments

Professional

- Multidisciplinary
- Hierarchy
- (Sub-)Specialisation
- Education
- Regulation
- Boundaries

UK History

- 3yr Diploma College of Radiographers (<1990)
  - 50% taught component - technological base
    - Physics, Photography, Equipment
  - X-ray & fluoroscopy

- 3 or 4yr Degree
  - 25-50% taught component
    - modules year 1 & 2 & 3
  - X-ray (inc. CR&DR), Fluoro, CT, MR, NM, US, etc.

The difference

Professional practice

- Communication
- Inter-professional working
- Policy
- Culture
- Evidence based practice (knowledge base)
- Pathology
- Image interpretation
- Decision making

Post degree

- Preceptorship – first post
  - Development time
  - Supervision
  - Support

- Varies internationally
  - Australia – PDY (formal)
  - UK – Preceptorship (informal)

Postgraduate

- Ultrasound (PgD)
  - 25% science and technology
- CT (PgC)
  - 33% technology
- MRI (PgC)
  - 33% technology
- Conventional radiography
  - ?

Radiography

- 8 years of change
  - CR
  - PACS
  - DDR
  - Wireless

- Have we become better radiographers?
- Has the knowledge (evidence) base evolved?

So back to a key point

Knowledge base of radiography

- Developed through medical practitioners and scientists
- Has new technology changed it?
- Have radiographers challenged it?
- How is it growing?

- Where are the current and future gaps?
- How are we planning to fill them?

Radiography knowledge base

- Evidence based practice
  - Image acquisition
  - Techniques
  - Dose management
  - Image optimisation
  - Technological development
  - Patient pathways
  - Treatments and outcomes

Knowledge base

- Provides justification for clinical decisions
  - Diagnostic efficacy
  - Treatment decisions
  - Patient care
- Defines best practice
- Establishes the international standards

Image optimisation – the challenge of CR and DR

Definitions

- PACS
- Film screen
- Computed Radiography (CR)
- Digital Radiography (DR)

2004

2006

PACS

- **P**icture **A**rchive and **C**ommunication **S**ystem

- Wired (or wireless) connection of modalities
- Allows remote review of images away from the room/scanner
- Saves all patient records
- Radiology Information System (RIS) is the index
- No lost images
- Transfer of images between departments/hospitals/countries

CR vs film

- CR without PACS is slower (wait for image ... wait for printing)
- CR technology more expensive
- CR allows you to connect to PACS
- PACS means no film – saves money
- CR has a higher spatial resolution than film
- Image manipulation can improve diagnostic value
- CR is more sensitive than film, lower radiation doses
- CR (cassette based) is more like film radiography and transition easier for staff

- RISK – radiation dose creep as equipment can ‘fix’ overexposure

DR vs CR

- DR is more efficient and significantly faster than CR
- Allows a higher throughput of examinations
- DR is more sensitive than CR, lower radiation dose
- DR has higher spatial resolution than CR
- DR has a wider dynamic range than CR
- DR technology is still considerably more expensive than equivalent CR technology
- DR with fixed detectors is perceived as ‘limiting’ for patient positioning
- DR more reliant on accurate technique

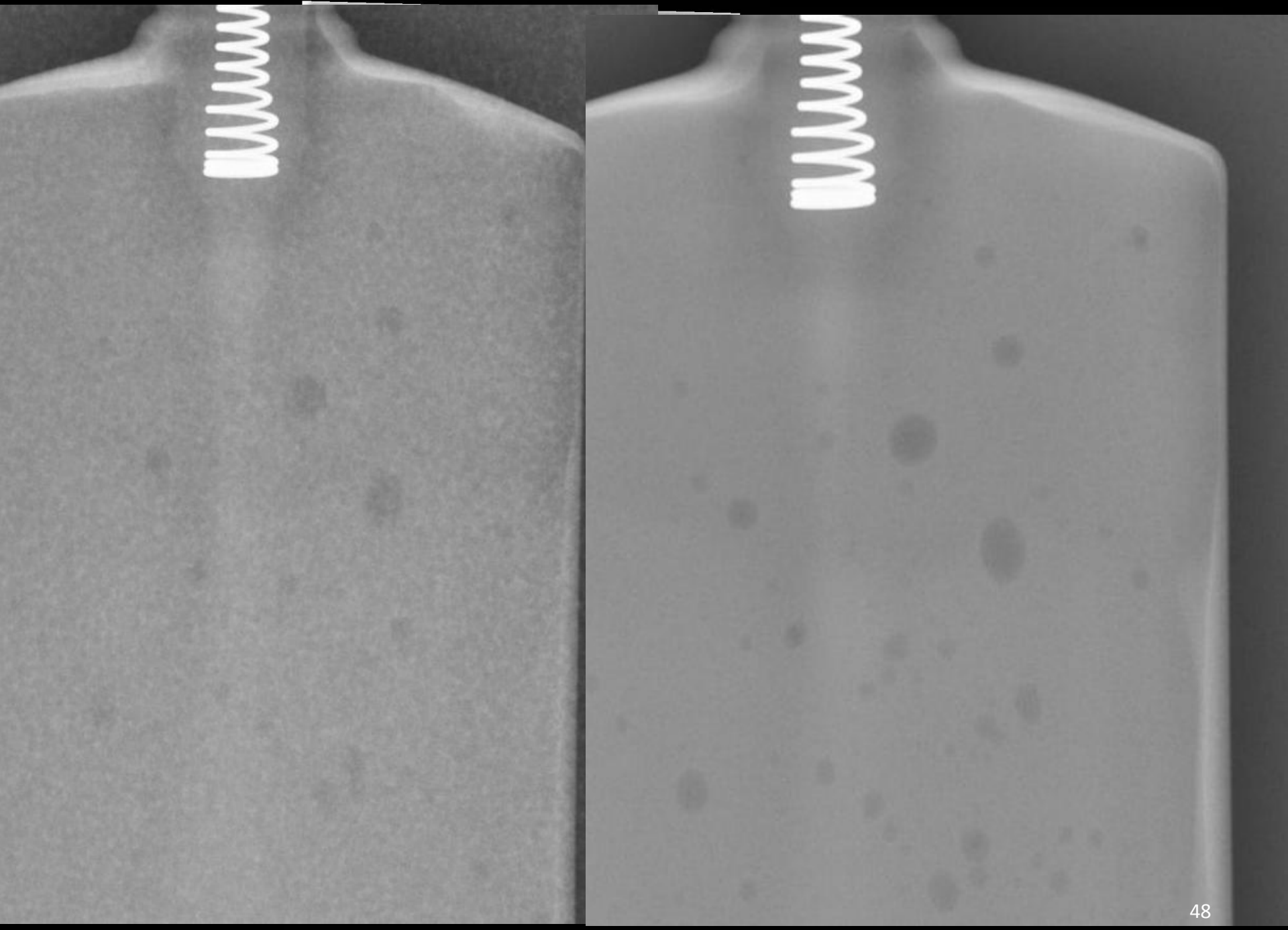
Radiographers role

- Equipment evaluation
  - Have insight into differing areas of equipment (ease of use, image production, image review)
- Technique appraisal
- Training
- Quality Assurance (QA)

Quality Assurance

- Initial acceptance of images when equipment installed
  - Choice of post-processing parameters for examinations
  - Exposure factors
  - Film / CR / DR comparisons
  - Consensus opinions (include radiologists)
- Ongoing assessment of image quality
- Defined feedback mechanisms
  - Poor & exceptional quality

But sometimes QA is looking beyond the radiographer



Technique Appraisal

- Knowledge of anatomy, especially functional
- Re-visiting traditional techniques
- Assessing techniques currently in use
- Feedback and explanation to staff

Training

- Reporting sessions
- Identifying need for training
- Standardisation of technique & protocols
- Training of radiographers
- Adaptation of equipment to technique and vice-versa

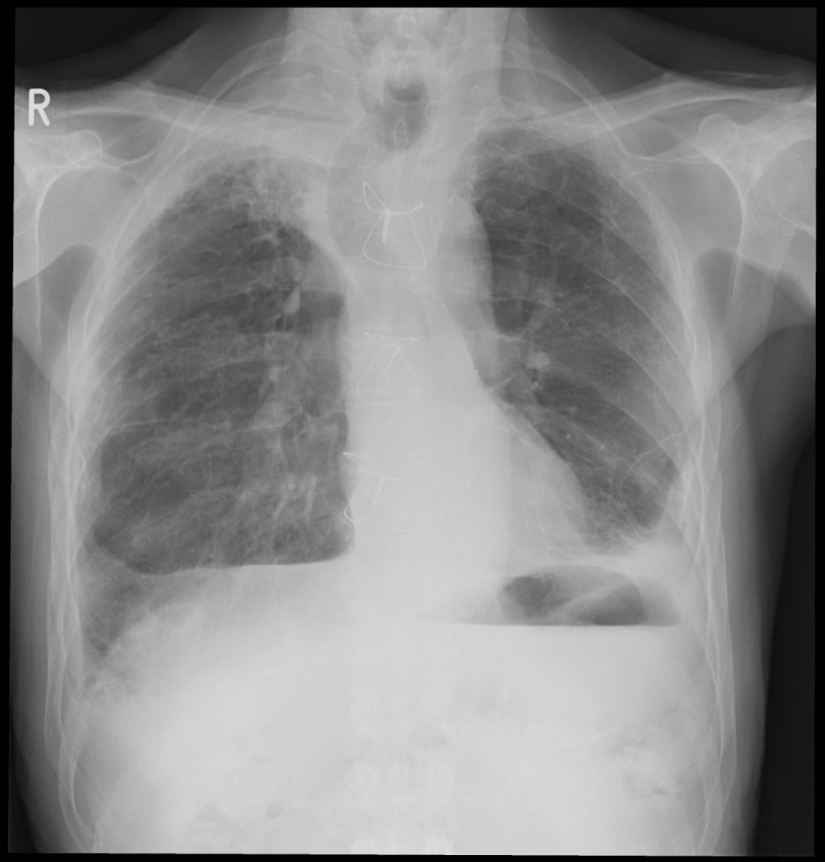
Changes with CR or DR

- Opportunity of new technology
- Match technique to workflow
- Improve quality by reviewing technique

Case Study - Chest

- Initial installation & choice of exposure factors
- Phantom studies used to compare exposure factors recommended by manufacturers
- Choice of techniques – high kV
  - Now possible without a dedicated chest room due to ease of use of removing grid and additional tube filtration

DR



CR

DR

CR

Case Study - Chest

- Comparison of DR & CR radiographs (including mobile radiography) between departments and sites
- Standardisation wherever possible, otherwise optimisation
- Workflow and direction of patient categories
- Work ongoing to improve techniques / exposures / pathways

Case Study - Foot

- Initial reviews of foot radiographs showed suboptimal image quality.
- Review of post-processing settings made slight improvements
- Review of exposure factors using phantoms
- Technique review – correct projections with collimation produced high quality images


NO GRID
NO ANGLE
62/2


62/2
10 DEGREE ANGLED UP

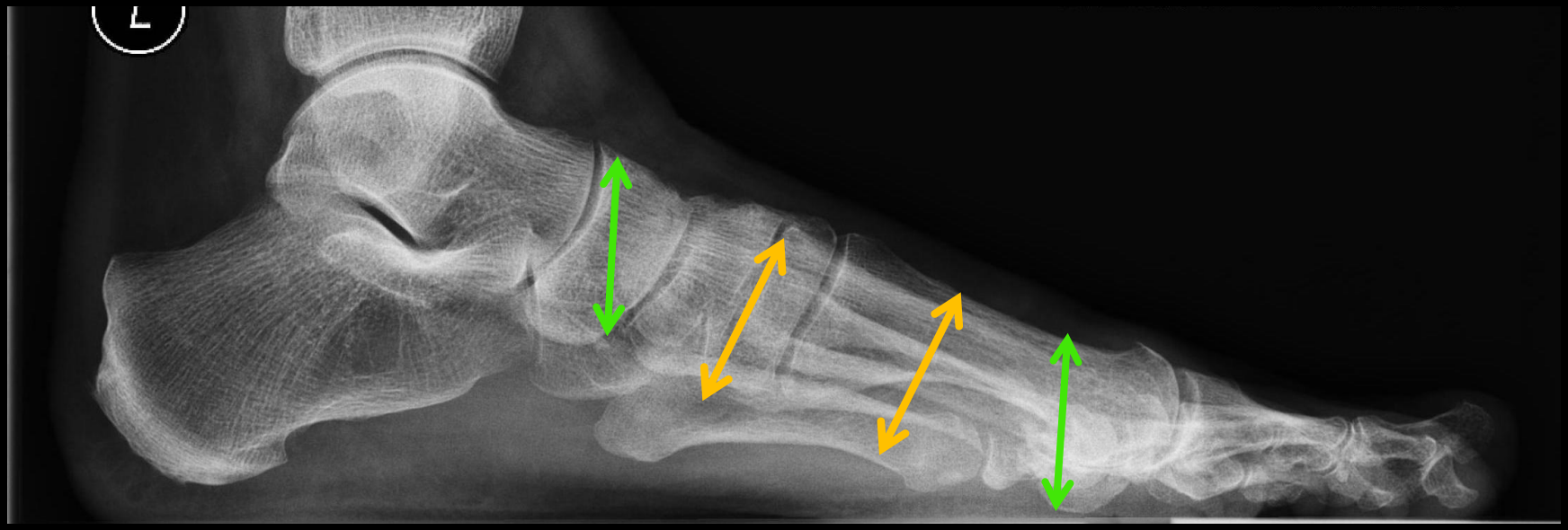
RIGHT

Application of angle

0^0

15^0

Density and anatomy



Re-affirm technique

Case Study - Knee

- Image quality poor due to positioning
- AP joint spaces not well visualised
- Reject rate for lateral knees increased dramatically
- Review showed changes in workflow

- Lateral knee radiograph now being performed erect
- Revisit texts for help
- Consideration of patient positioning & technique?

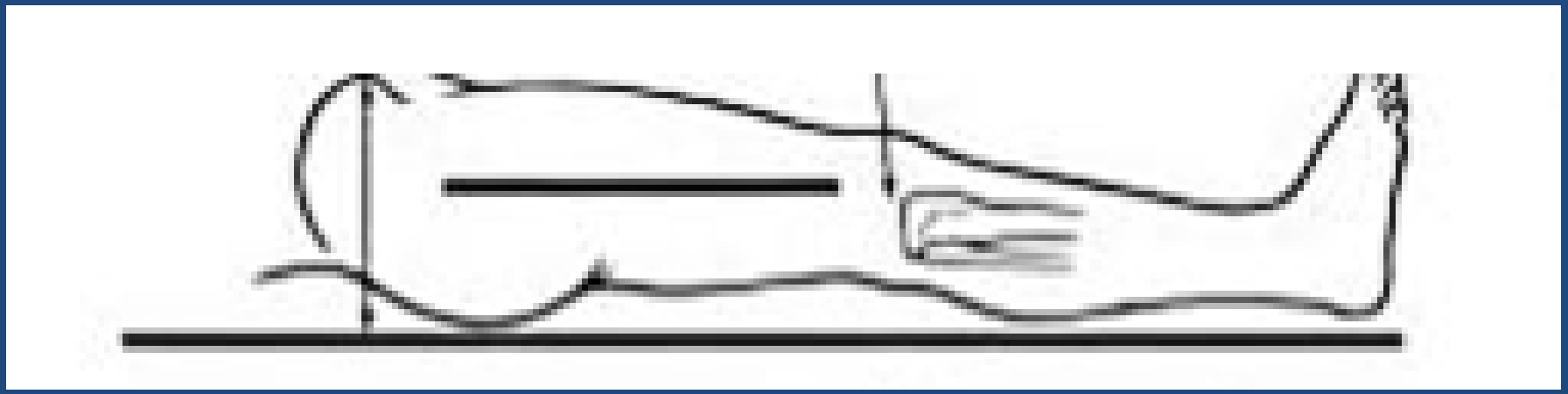

L

Kellgren and Lawrence Radiographic Criteria for Assessment of OA*

Radiographic grade	0	I	II	III	IV
Classification	Normal	Doubtful	Mild	Moderate	Severe
Description	No features of OA	Minute osteophyte; doubtful significance	Definite osteophyte; normal joint space	Moderate joint-space reduction	Joint space greatly reduced; subchondral sclerosis

*Radiography does not reliably correlate with symptoms.

Cooper C et al. In: Brandt KD, Doherty M, Lohmander LS, eds. Osteoarthritis. Oxford, NY: Oxford University Press; 1998:237-249.

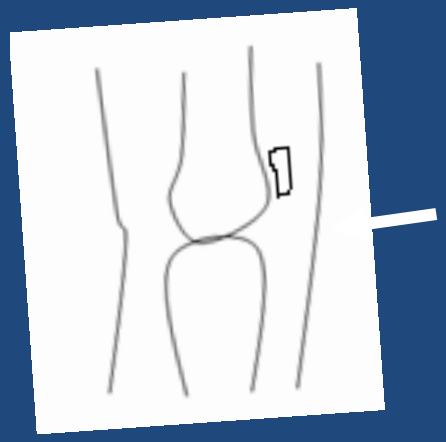


ASIS to table

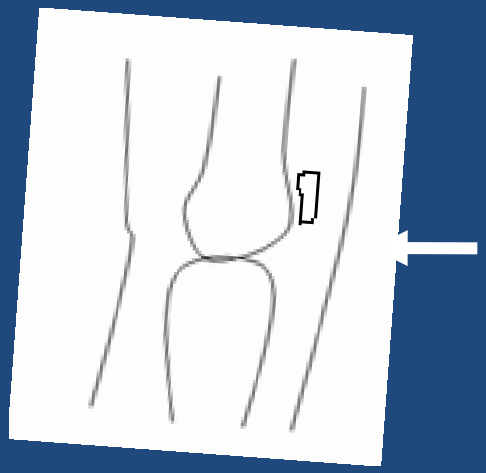
- <18cm – 5^0 down
- >24cm – 5^0 up

McQuillen-Martensen K (2006)

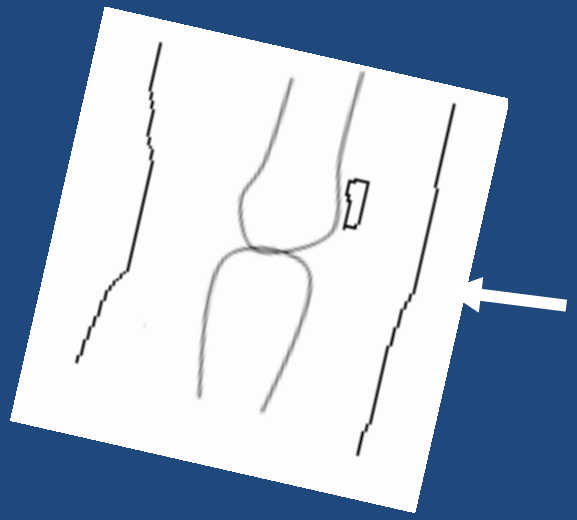
- Tibial plateau naturally angles posteriorly 5^0 – with changes in body habitus the leg position varies. The larger the leg the more anterior the hip is angled.



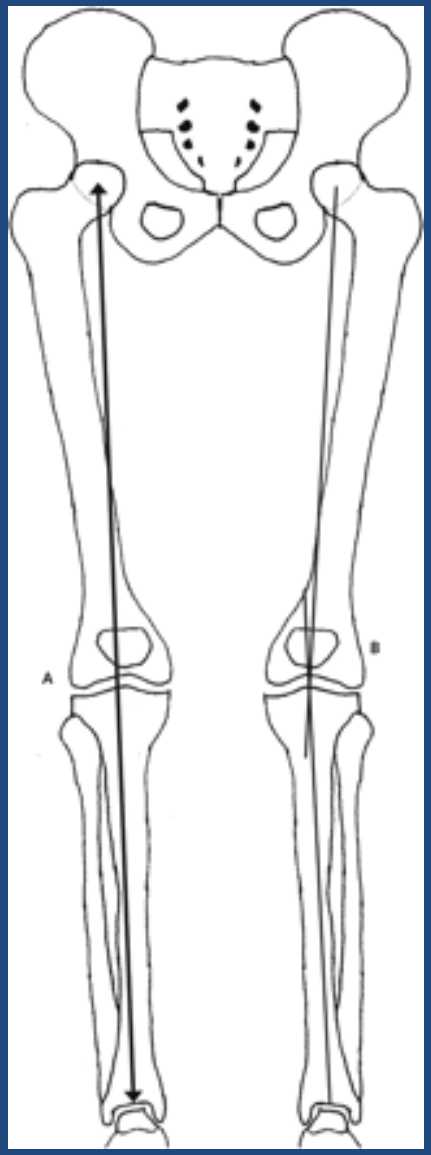
SLIM

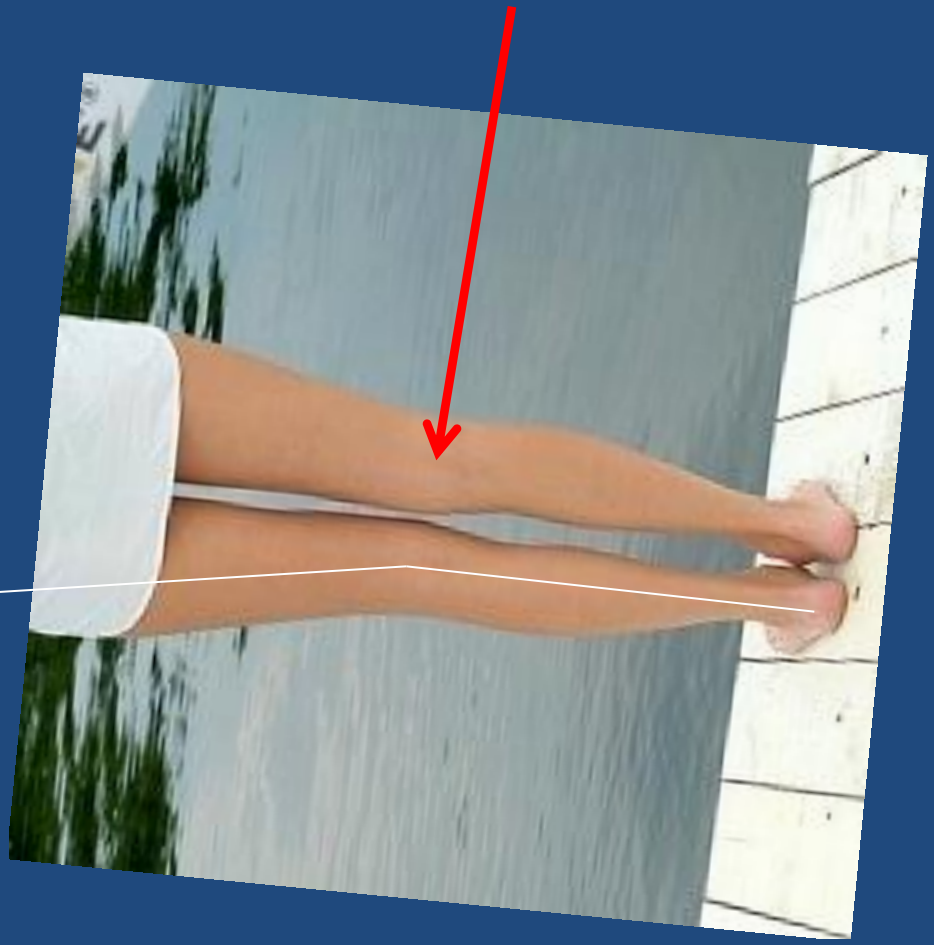


MEDIUM



V. LARGE


A
B




R
WEIGHT BEARING

One more thing

- Anatomical markers
  - All UK sites report less markers visible at time of exposure film > CR > DR
  - Issues with type, collimation, reprocessing
  - Clinical governance and risk

  - Need robust plan and audit

Summary

- Embrace changes that new technology offer
- Contribute and feedback to practice change
- Develop a ‘new evidence base’

- DR is not the new CR; CR not the new ‘film’
  - Requires a review of practice
  - Less forgiving of poor radiography