RESEARCH IN MEDICAL IMAGING – Radiographer's Perspective

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Research is creating new knowledge.
- Neil Armstrong

Objectives of the presentation

- To present the importance of research in medical imaging
- To highlight the nature and areas of research for radiographers and the general medical imaging fraternity
- To present some of the research done elsewhere in the areas of research identified.

If we knew what it was we were doing, it would not be called research, would it? - Einstein

What is research in Medical Imaging?

- A scientific undertaking to gain ***knowledge and understanding*** of aspects related to medical imaging, through the ***analysis*** of collected information derived from ***data collection*** methods, and ***communicating*** the understanding to others.
- Communicating the understanding can cause a change or reinforce current knowledge.

"Imagination is more important than knowledge." - Einstein

The importance of research in medical imaging

- To built up practice based on research done locally, for the local practice
- To reduce overdependence on research findings done elsewhere
  - Appreciate the uniqueness of the Malaysian population
- Fulfilling The concept of Evidence Based Practice (Evidence Based Radiography)

"Anyone who has never made a mistake has never tried anything new." - Einstein

- Appreciate that no two patients are alike: hence to individually tailor each patient to the examination.
- long term, enormous benefits to patient and client groups and to the health service as a whole
- To become a CEO : A means for professional advancement
- A means for self actualisation (Maslow's Heirarchy of Needs)

Be less curious about people and more curious about ideas. – Marie Curie

- Different types of examinations
- Different types of patients
- Different types of imaging modalities
- Optimisation studies to optimise examination based on given conditions and modalities ; leading to individual tailoring of examinations

I was taught that the way of progress was neither swift nor easy. – Marie Curie

Research mindedness in Radiography Profession
V. Challen, S. Kaminskit and P. Harris
***Radiography* 1996 2 , 139-151**

- Professional development and advancing the profession are reasons individuals should be involved in research
- Deterrents towards research:
  - Time
  - Resources
  - lack of knowledge
  - motivation

In the fields of observation chance favors only the prepared mind.
- Louis Pasteur

Million dollar question.

What is needed to initiate research in Medical Imaging?

- *Personal*
- *Administrative*

Personal

- Realise the importance / relevance of research – professional obligation, do something good for the public, (the person who might benefit from your research could be your next of kin)
- Observe, contemplate, question, challenge
- Read articles: replicate / duplicate research done elsewhere- see how they can fit for local use?

Imagination will often carry us to worlds that never were. But without it we go nowhere. – *Carl Sagan*

- Develop interest in specific areas
- Attend courses on how to start doing research.
- Discuss / work with someone else :
    - expand the interest
    - working together towards a common cause
    - availability of grants,

Somewhere, something incredible is waiting to be known.
- Carl Sagan

Administrative

- A supportive environment for research, breaking away from traditional role of service orientated
- Identify barriers towards research at the workplace
- A Tranformational Leadership change that values research: A CEO approach
    - opportunities for staff
    - opportunities for the organisation

Why observe, contemplate, question, challenge?

- Optimise the intellectual capabilty that Allah has bestowed upon us.
- More than 200 times Allah challenges us to observe, contemplate, question, challenge.

If I have a thousand ideas and only one turns out to be good, I am satisfied. – Alfred Nobel

What to Observe, contemplate, question, challenge?

- Clinical Practice
- Service development and evaluation
- Radiation protection
- Optimisation of technology
- Health Technology Innovation and Assessment : Hybrid technology
- Local standards
- Development of new imaging protocols: MRI, CT
- Tailored protocols
- Education

Anyone who stops learning is old, whether at twenty or eighty. Anyone who keeps learning stays young. The greatest thing in life is to keep your mind young.- Henry Ford

Clinical practice

- Patient satisfaction: *"Measuring mammography patient satisfaction"* **(Radiologic Technology, 2004** 75 **(6) 425-433)**

- Practice: *"The awareness and implementation of infection control procedures among radiographers"* **(The Radiographer, 2002,** 49 **(2) 61-65)**

Coming together is a beginning; keeping together is progress; working together is success. – Henry Ford

Service development and evaluation

- "Predictors of patient education by bone densitometry technologists" **(Radiologic Technology; 2005; 76 (5) 354-364)**

- "Personal and professional development: a survey of radiographers employed in South West Region" **(Radiography, 2001,** 7 **43-53)**

Failure is simply the opportunity to begin again, this time more intelligently.- Henry Ford

Radiation protection

- A practical demonstration of improved technique factors in paediatric fluoroscopy. Fenner JW, Morrison GD, Kerry J, West N. Br J Radiol. 2002 Jul;75(895):596-602
- Added copper filtration in digital paediatric double-contrast colon examinations: effects on radiation dose and image quality. Hansson B, Finnbogason T, Schuwert P, Persliden J. Eur Radiol. 1997;7(7):1117-22.
- “Evidence based practice: an experimental study to determine how different working practice affects eye radiation dose during cardiac catheterization” (Radiography, 2001, 7 21-30)

Optimisation of technology

- Investigation of optimum X-ray beam tube voltage and filtration for chest radiography with a computed radiography system. Moore CS, Beavis AW, Saunderson JR. *Br J Radiol*. 2008 Oct;81(970):771-7. Epub 2008 Jul 28.

- Effect of X-ray tube parameters, iodine concentration, and patient size on image quality in pulmonary computed tomography angiography: a chest-phantom-study.

  Szucs-Farkas Z, Verdun FR, von Allmen G, Mini RL, Vock P. *Invest Radiol*. 2008 Jun;43(6):374-81.

- MOORE CS, SAUNDERSON JR, and BEAVIS AW
  Investigating the exposure class of a computed radiography system for optimisation of physical image quality for chest radiography
  Br. J. Radiol., September 1, 2009; 82(981): 705 - 710.

If you think you can do a thing or think you can't do a thing, you're right. – Henry Ford

Innovation

- Vassileva J; A phantom for dose-image quality optimization in chest radiography
  British Journal of Radiology 75 (2002),837-842 © 2002 The British Institute of Radiology

- Local Innovation: Use of Lead shielding in Lateral Pelvimetry.

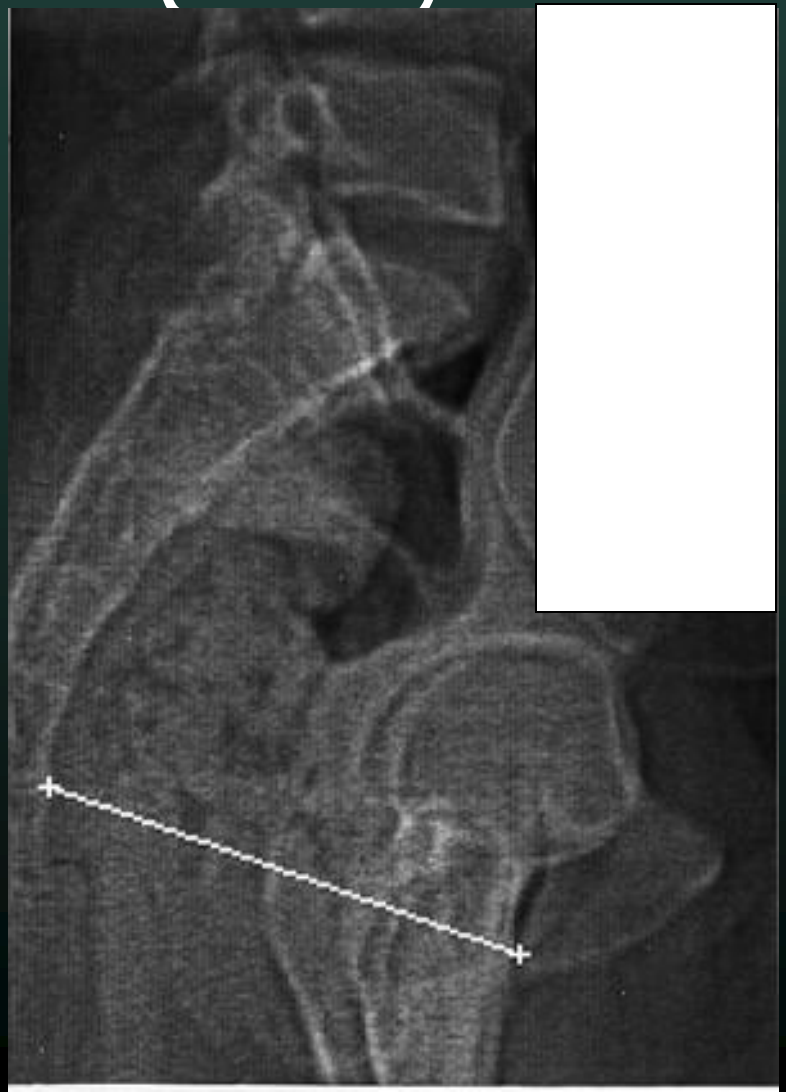
Thinking is the hardest work there is, which is probably the reason why so few engage in it. – Henry Ford

Innovation: Development of positioning aids

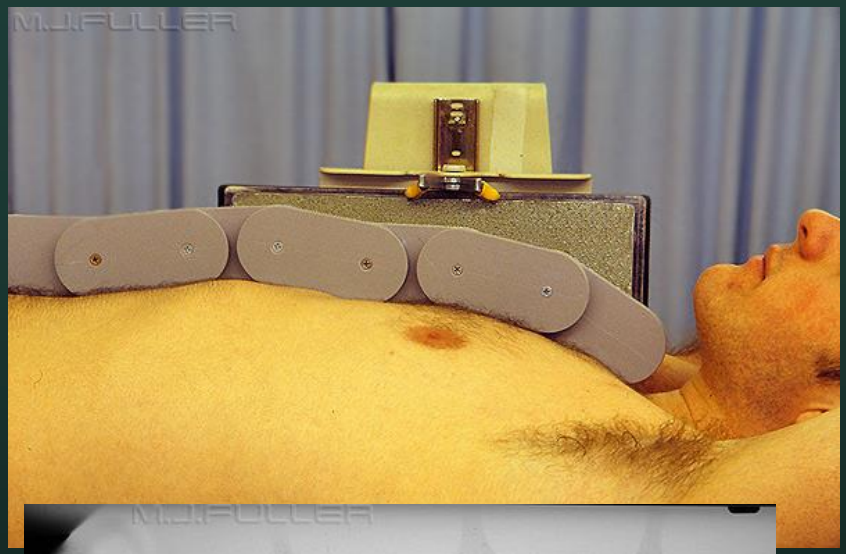
- **Head Clamps for Skull Radiography**

http://wikiradiography.com/page/Head+Clamps+for+Skull+Radiography

Local Innovation : Mr. Bon Ka Kiong- won the PM Quality Award



Using the Lead Snake to Reduce Scatter Radiation - Fuller MJ



http://www.wikiradiography.com/page/Using+the+Lead+Snake+to+Reduce+Scatter+Radiation

Health technology assessment

- Andriole KP: Productivity and Cost Assessment of Computed Radiography, Digital Radiography, and Screen-Film for Outpatient Chest Examinations *Journal of Digital Imaging,* Vol 15, No 3 (September) 2002: pp 161-169

- Reiner BI, Siegel EL, Carrino, JA et al SCAR Radiologic Technologist Survey: Analysis of the Impact of Digital Technologies on Productivity *Journal of Digital Imaging* Vol 15, No 3 (September) 2002: pp 132-140

- Gisella Gennaro and Cosimo di Maggio: Dose comparison between screen/film and full-field digital mammography *European Radiology* May 2006

Local standards

- Johnston DA and Brennan PC :Reference dose levels for patients undergoing common diagnostic X-ray examinations in Irish hospitals
  Br. J. Radiol. 2000 73: 396-402.

- Optimising the Hybrid technology in the local setting. (Film-screen and Digital technology)
- Tailoring examinations to the different x-ray equipment: Example: Diagnostic Imaging Department at HOSHAS
- Dose reference levels of the various equipment in the department.

Development of new imaging protocols

- Pfannenberg C, Aschoff P, Brechtel K et al : Value of contrast-enhanced multiphase CT in combined PET/CT protocols for oncological imaging *Br. J. Radiol.* 2007 80: 437-445.

- To visualise certain lesions
- To individually tailor imaging protocols to patient characteristics.

CT Scanning

- Mayo JR: Radiation Dose Issues in Longitudinal Studies Involving Computed Tomography *The Proceedings of the American Thoracic Society* 5:934-939 (2008)

- Li J, Udayasankar UK, Toth TL, Seamans J, Small WC, Kalra MK. Automatic patient centering for MDCT: effect on radiation dose. *AJR Am J Roentgenol* 2007;188:547–552.

Education

- Chapman NA, Oultram SC: Enhancing the RT student clinical experience: Newcastle Mater Hospital Radiation Oncology Department
  Radiography, *Volume 13, Issue 2*, May 2007, Pages 159-163

- Price R, Hopwood N, Pearc V: Auditing the clinical placement experience
  Radiography**,** *Volume 6, Issue 3*, *August 2000*, *Pages 151-159*

- Reeves S: Planning and implementing a collaborative clinical placement for medical, nursing and allied health students: A qualitative study ***Medical Teacher***, Volume 30, Issue 7 2008 , pages 699 - 704

Summary

- Appreciate the intellectual capacity that has been bestowed and use it to benefit mankind.
- Radiographers should realise the importance of research in the context of their professional obligation towards providing the best medical imaging service to the public.
- Submit that there are vast areas of research that can be undertaken.

Food for thought

How will future mankind benefit from our presence today?

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- Marilyn Baird, Engendering a research culture within the radiography profession. Powerpoint Presentation