# Research involvement makes better radiologists

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# Outline

1. Discuss why Research is important
2. To learn how EBR, CER, and HTA contribute to imaging decisions
3. Understand why involvement in Research makes better Radiologists
4. PhD Opportunities

# Research Rational

- **Good clinical practice requires a strong evidence base**
- **Explosion of new medical imaging technologies, together with clinicians recognition of the value of these, has resulted in rapid adoption.**
- **Radiology needs a strong evidence based strategy to ensure sensible guidance is given particularly with expensive new technologies to establish how best to use these in clinical practice.**

# Rational

- **The UK has a nationally funded healthcare system which is designed to deliver equitable care for the population free at the point of delivery.**

- **The challenge for the UK has been to ensure the highest quality service by delivering the most appropriate technology and care for patients in a timely manner.**

**Precision Medicine = Right test, Right patient, Right time**

# Guidelines

- **Royal College of Radiologists - iRefer: Making Best Use of Clinical Radiology[1]**
- **NICE Guidelines[2]**
- **Scottish Intercollegiate Guidelines[3]**

1. http://www.rcr.ac.uk/content.aspx?pageID=995
2. http://www.nice.org.uk/guidance
3. http://www.sign.ac.uk/

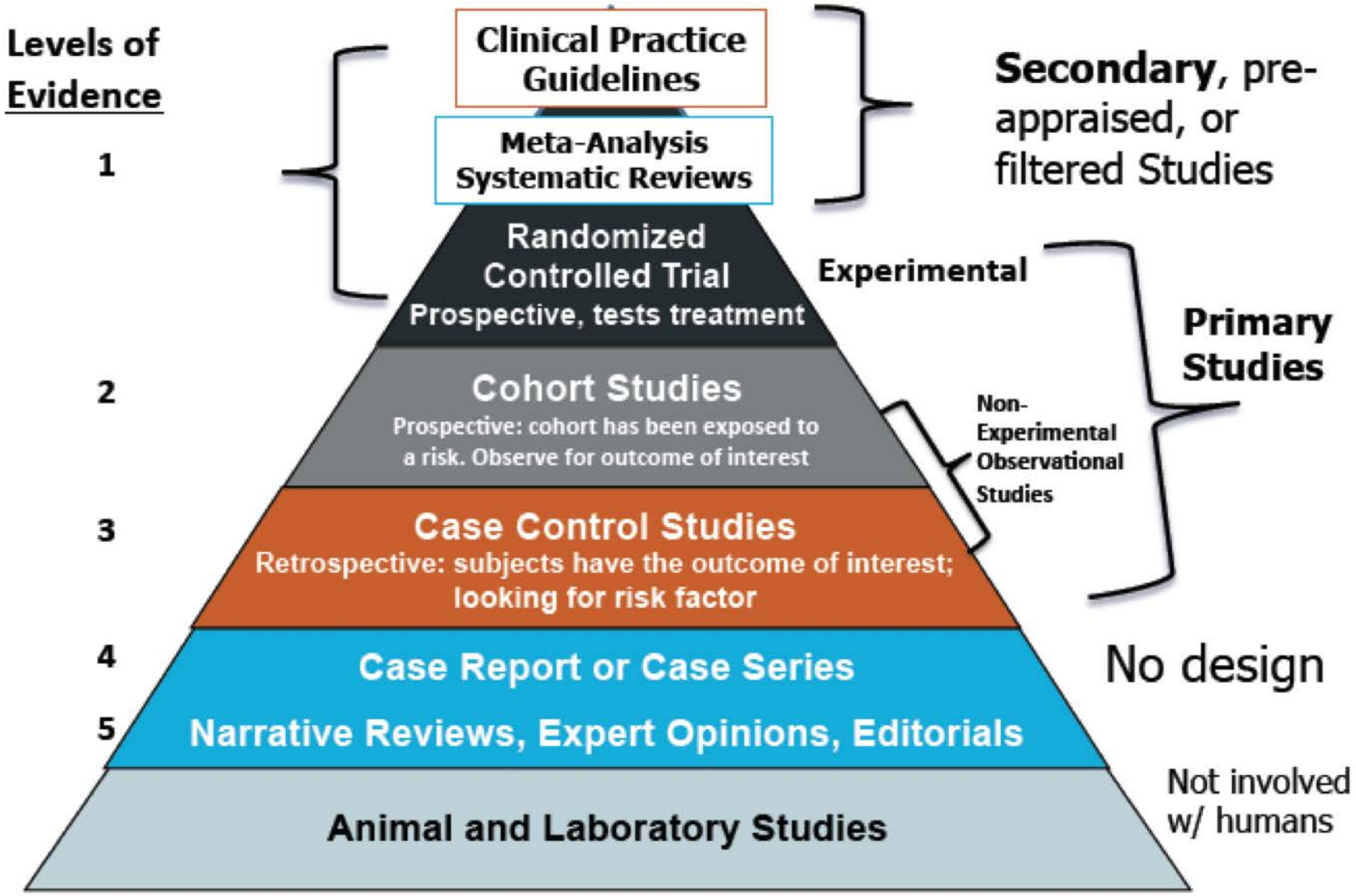
# Gathering and sifting the evidence

- **Relative lack of published data in Radiology**
- **Few randomised controlled trials demonstrating benefit (very dependent on the clinician acting on the radiology result)**
- **More observational studies, time series cohorts, registry data**
- **Lots of collections of cases**
- **Thousands of case reports**

# Framework to assess new techniques

- **Technical assessment**
- **Technical impact**
- **Diagnostic accuracy**
- **Diagnostic impact – evidence of patient benefit**
- **Societal impact – benefit and costs to society**

Friberg and Thornbury

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# Health Technology Assessment

- **Important to assess new technologies in a formal way**

- **But when is the most appropriate time point to do this?**
  - **Before adoption into clinical practice**
  - **Time from prototype to commercial system is variable**
  - **Need stable system to do trial**

- **Important to assess diagnostic accuracy, diagnostic confidence in the test and impact on patient care and measure the benefit to the patient.**

# Scottish Back Trial

- **What is the cost and benefit to patients of undertaking an MRI or CT examination early compared to waiting?**
- **800 patients with LBP randomised to early MRI or normal care**
- **Measured diagnostic confidence in the MR report and the change in management after the MR, and impact on the patient using a health questionnaire**
- **Demonstrated that those with early MR felt slightly better but no change in outcome at 6mths or 2 years**

Gilbert FJ et al 2004

# MARIBS Trial

- **Single centre studies demonstrating increased sensitivity of MRI to detect breast cancer compared to mammography**
- **HTA advertised for trial to compare MRI with mammography**
- **1997-2005**
- **Women at high risk of breast cancer recruited to have annual MRI & mammography**
- **Huge effort to produce the best technical MR examinations in multiple centres across the UK with three manufacturers**
- **MRI 77% v Mammography 40%**

Leach M et al Lancet 2005

# Evidence for MRI screening in Familial Risk

| Author/ Country | Cancers (DCIS)/ Women | Mean Age | Mammography | | Ultrasound | | MRI | | CBE | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sensitivity | Specificity | Sensitivity | Specificity | Sensitivity | Specificity | Sensitivity | Specificity |
| Warner et al 2004 Canada | 22(6)/ 236 | 47 | 36% | 100% | 33% | 96% | 77% | 95% | 9% | 99% |
| Kriege et al 2004 Netherlands | 50(6)/ 1909 | 40 | 40% | 95% | - | - | 71% | 90% | 17.8% | 98% |
| Leach et al 2005 UK | 35 (6)/ 649 | 40 | 40% | 93% | - | - | 77% | 81% | - | - |
| Kuhl et al 2005 Germany | 43(9)/ 529 | 42 | 33% | 97% | 40% | 91% | 91% | 97% | 5% | 100% |
| Hagen et al 2007 Norway | 25(3)/ 491 | 41 | 50% | - | - | - | 86% | - | - | - |
| Sardanelli et al 2007 Italy | 14(4)/ 278 | 46 | 59% | - | 65% | - | 94% | - | 50% | - |

# MRI Screening into Practice

- NICE considered the evidence in 2004 and published recommendation to adopt this technology
- Formal review of the evidence; cost/benefit assessment; impact of the recommendation

- NHSBSP finally delivered the service in 2010

NICE Family History guidance CG41 2004

# Randomised Controlled Trials

**Excellent evidence but some limitations**

- **results only relate to the cohort that was studied**
- **any variation of the test may invalidate the result**
- **often require large number of patients**
- **can take a long time to recruit and follow-up**
- **often need surrogate outcome measures**
- **therefore can be very expensive**

# NLST – RCT

- **53,454 asymptomatic high risk smokers randomised to low dose CT or CXR**
- **20% relative reduction in mortality from lung cancer with three rounds of CT**

- Specifically, the new AAFP recommendation states: "The AAFP concludes that the evidence is insufficient to recommend for or against screening for lung cancer with low-dose computed tomography (LDCT) in persons at high risk for lung cancer based on age and smoking history."

- The USPSTF, on the other hand, "recommends annual screening for lung cancer with low-dose computed tomography (LDCT) in adults aged 55 to 80 years who have a 30 pack-year smoking history and currently smoke or have quit within the past 15 years."

NLST research team NEJM 2011;365:395-409

# Why the discrepancy?

- 3 European studies where the results not as convincing
- Meta-analysis did not show such a great effect as the RCT
- Concern over the number of additional workups and incidental findings
- More evidence required – as it is such a costly intervention

# Systematic reviews

- **Formal methodological way to assess literature – well published www.**
- **Strict guidelines on how to do this which can be time consuming**
- **Useful technique to summarise results from similar studies to give a more accurate view of the evidence**
- **May reveal gaps in the literature**
- **Always helpful to do this prior to undertaking a large study – a prerequisite for UK NIHR HTA funding**

# Intra individual Patient Data Analysis

- **Useful technique to pull information together from different studies that may not have had sufficient power/numbers of patients to answer the question definitely**

- **Houssami N et al used this technique to inform the controversy about whether or not to offer women with breast cancer pre-operative MRI to assess disease extent**

# IPD Meta-analysis of preoperative MRI & Breast cancer recurrence

- **Survival analysis undertaken to investigate time to recurrence and estimate hazard ratio of MRI versus no MRI for local recurrence and distant recurrence**
- **Four eligible studies of 3,169 patients**
- **8 yr LR free survival showed no difference between those who had an MR and those who no pre operative MR**
- **Possibly too short a follow up; one of the studies was the UK COMICE trial with 1600 patients**

Houssami N et al JCO 2013

# Radiological Evidence of Benefit?

- **Hard to get data to demonstrate that a radiological test has benefit except where the test is interventional**

  **- ablation of uterine fibroids**

  **- coiling of aneurysms**

  **- AAA stenting**

  **- angioplasty**
- **Registry information is invaluable and used by IR radiologists for many procedures.**

- **Stroke thrombectomy trial**

# Why does Research involvement makes better radiologists?

# Advantage of involvement in research

- Better understanding of research techniques
- Better understanding of many articles in journals
- Appreciate the evidence on which daily practice is based

# Critical Thinking skills

- Ability to sift through key pieces if information required to differentiate “good research” from “bad”
- Gain skills to interpret research results and avoid being gullible to over claims!
- Ability to synthesise information

***Transferrable skills***

# Research skills

- Ability to undertake comprehensive literature searching
- Ability to create a database
- Skills to analyze data
- Develop scientific writing skills

***Transferrable skills***

# PhD Opportunities

# How can Radiologists help?

- **Please support multicentre trials to allow collection of good data**
- **Please support the RCR in the gathering of evidence for the guidelines**
- **Please join trainee research network!**