

**Taking an evidence based
approach to diagnostic
imaging in the emergency
department: what the
NICS – RANZCR fellowships
have taught us**

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...the next hour.....

- **Professional behaviour change – what the evidence says**
- **The NICS RANZCR fellowships: what has been achieved and learned**
 - **Changing the approach to VTE investigation in the ED**
 - **Implementation of the Ottawa ankle rules**

Evidence Practice Gaps

- Common
- Often attributable to behaviour of professionals
 - 30 - 40% of patients get treatment not proven to be effective
 - 20 - 30% get care that is not needed

Shuster, McGlyn, Brook. Milbank Memorial Quarterly 1998
Grol. Med Care 2001

Levels at which barriers to evidence based practice can operate

- **Individual practitioner – patient**
- **Teams of practitioners**
 - medical, nursing, allied health etc)
- **Hospital / Institutional**
- **Health care delivery system as a whole**

- Provider – patient interaction is **final common pathway** of complex healthcare delivery systems
- Interventions at other levels ultimately aim to affect this secondarily by making it
 - Easier / rewarding to do the right thing
 - Harder / more expensive / illegal to do something else

What stops practitioners providing evidence based care?

- Vast amount of new information to manage
- Average primary care physician spends <1 hr per week reading medical literature
 - Single studies often contradict one another
 - Few are capable / trained in appraising the quality of what they read

- **Most healthcare systems have failed to invest in knowledge management**
 - **Access to the Cochrane Library provided free of charge by the Australian government**
 - **Addresses therapeutic interventions but not diagnosis / diagnostic imaging at present**

- “Evidence-based medicine *should* be complimented by evidence based implementation”

Grol, BMJ, 1997

- How can we know “what works” in implementation / KT
- How good is the evidence about what works?

Cochrane Effective Practice and Organisation of Care (EPOC) Group

- **EPOC produces systematic reviews of**
 - **practitioner**
 - **practice**
 - **patient**
 - **Hospital**
 - **financial**
 - **legislative interventions****aimed at changing clinical practice**
- **Based in Ottawa, Ontario**
 - **satellite at NICS in Melbourne (October 2005)**
- **43 reviews, 42 protocols, 6000+ primary research publications in EPOC library**

However.....

- **Complex or multifaceted interventions can be**
 - Hard to describe
 - Impossible to know what to attribute change to if it happens
- **Many of the primary studies pulled together for systematic reviews are methodologically flawed**
 - poor description of intervention(s) and / or setting
 - unit of analysis errors (e.g. outcomes per patient when these should have been measured per practitioner or practice group)

- **These flaws in published work can make relevance / applicability of an intervention(s) to another practice setting difficult to judge**

- **Studies that look superficially similar in design can yield radically different results for reasons that are not clear**

- **Grimshaw (2008) reported 150 systematic reviews of interventions designed to produce professional behaviour change in drug prescribing**
 - **Virtually all were effective to some degree**
 - **>5 – 10 % improvement was unusual**
 - **Variation within interventions (e.g. academic detailing, audit feedback, outreach) was greater than between interventions!**

**Canadian Agency for Drugs and Health
Technologies Rx for change database**

(<http://cadth.ca/index.php/en/compus/optimal-ther-resources/interventions/about>)

- **There is still a lot we don't understand about "what works"**
- **Context / workplace culture / buy –in are (unfortunately) probably very important**
- **More resources need to be devoted to knowledge translation (evidence implementation) research**

Why is evidence implementation research less popular than other research?

- **Competition from more traditional basic science, “straightforward” clinical research makes funding harder to secure**
- **Lack of interest of institutions / state jurisdictions / federal government in funding**

- **Avenues for publication of KT work fewer, unfamiliar to clinicians, and less prestigious?**
 - **Implementation Science**
 - **BMJ “Change Page”**
 - **Journal of the American College of Radiology (JACR)**
- **“Legitimacy” of KT as research rather than “management”**
 - **Methodology more complex (qualitative / quantitative)**
 - **Lack of availability of training / mentoring in KT research**

NICS RANZCR Fellowships – Training in KT / EI

- Inaugural fellowships commenced 2006
- Co-sponsored by
 - RANZCR and
 - National Institute of Clinical Studies (now affiliated with NHMRC) is the Australian peak organization for evidence implementation / knowledge transfer.
- NICS provides advice / resources to government / NGOs on priority evidence practice gaps, guideline development and evidence implementation
 - Trains health professionals in evidence implementation
 - Hosts EPOC satellite
- NICS RANZCR fellowships are part of the NICS Leadership Program

How does the Fellowship work?

- Fellowship applicants identify an important evidence practice gap in their field that could be closed by an implementation project
- Competitive review of project plan and interview
- **Successful candidates (<10%) receive**
 - training (through NICS masterclasses, visiting expert program, mentoring program) costing NICS 40k p.a.
 - annual stipend of up to 60k p.a. for 2.5 day investment in the project
 - support network of other fellows and NICS staff

What we had to do

- **Figure out how to do implementation in our own backyard!**
- **6 monthly project reports**
- **Presentations at NICS symposia and other suitable quality / craft group meetings**
- **Final 8,000 word monograph as well as shorter versions of main project outcomes suitable for dissemination to stakeholders**

How do you get evidence into action?

The basics of guideline implementation

- **Establish the evidence-practice gap**
- **Barrier analysis**
- **Engage the target group**
- **Choose intervention/s**
- **Measure the effect of your intervention**
- **Sustain improvements**
- **Spread**

Evidence-practice gap

- **Establish objectively that there is a gap between evidence and current clinical practice through baseline audit**
- **Data is powerful and anecdote is weak**

Barrier analysis

- **Need to identify potential barriers at the beginning**
- **Barrier = what stops your guideline being implemented successfully**

Barrier analysis

- The guideline
- The individual clinician
- The patient
- The social context
- The organisational context
- The economic and political context

**“Identifying Barriers to Evidence Uptake”
National Institute of Clinical Studies 2006**

Engage the target group

- **Involve the target group from the outset**
- **Enlist their help in “fixing it”**

Choose interventions

- **Choose intervention/s that are most likely to overcome the identified barriers**
- **Single or multiple interventions**
- **Examples include**
 - **Education**
 - **Reminders**
 - **Audit and feedback**

Measure the effect of your intervention

- **Measurement**

- What are you going to measure?
- How?
- How often?

- **Results**

- Who are you going to tell about the results?
- What are you going to do if it is not working?
- What are you going to do with bad results?

Sustaining change

- **Develop strategies to sustain the changes beyond the life of the project**
- **Strategies include**
 - **Permanent system change**
 - **Support from stakeholders**
 - **Resources for data collection**

Spread

- **Hospital network**
- **Professional Colleges**
- **NICS network**
- **Publication**
- **Safety and Quality organisations**

**Changing the approach to
diagnosis of venous
thromboembolism in the
emergency department**

Background

- **Suspicion of venous thromboembolism (VTE),**
 - **pulmonary embolism (PE)**
 - **deep vein thrombosis of the lower limb (DVT) or**
 - **both**

is a common and important clinical problem in the emergency department

- **Case fatality rate**
 - 1/3 for inpatients
 - 1/10 for ambulatory outpatients
- **Clinical diagnosis is difficult** due to signs and symptoms being non specific
- **Treatment is 3 months of anticoagulation commenced in hospital**
 - Haemorrhagic complication rate means Dx needs confirmation, not suspicion

- **Diagnostic testing is ALWAYS needed to rule in or out this diagnosis**
- **Until recently diagnostic imaging**
 - **CTPA**
 - **Ventilation perfusion lung scanning**
 - **Lower limb ultrasound**

The Evidence

- **Systematic reviews indicate it is safe to withhold anticoagulation in patients at LOW RISK of VTE who have a negative D-dimer**
- **D dimer assay tests for fibrin degradation products in blood and if normal = no VTE**
 - **Imaging can be avoided in 1/3 unselected emergency patients if low risk tested with D dimer**

Fancher TL, White RH, Kravitz RL. BMJ 2004

Stein PD, Hull RD, Patel KC et al. Ann Intern Med 2004

The setting and the evidence practice gap

- 3 metropolitan emergency departments (one tertiary referral, 2 community hospitals) >120,000 presentations per annum
- **Baseline audit**
 - 48% (23/48) with suspected PE referred for CTPA or VQ**
 - 17% (5/30) with suspected DVT referred for US**
 - had interpretable risk assessment recorded on the request for imaging
 - D – dimer testing prior to imaging performed in
 - 71% (34/48) patients with suspected PE and**
 - 47% (14 / 30) with suspected DVT**

- The problem: **lack of pre test risk assessment and / or documentation of the result of this assessment**
- Decisions about “which test” cannot be made rationally without this information

Barriers – hearts and minds

- **How to get buy in from influential ED physicians**
- **How to ensure consistency and accuracy of risk assessment**
 - **Subjectivity**
 - **Experience level**
- **How to get medical staff to document it**
 - **MITs (radiographers), radiology postgraduate trainees as gatekeepers**

Barriers - operational

- **Data collection**
 - **What to collect?**
 - **Meaningful in terms of project aims**
 - **Collectable**
 - **Time required to do this**
 - **Access to / knowledge of ED, DI, pathology databases and Excel**
 - **Financial cost of clinical radiologist doing QI**

Enablers

- **Support of key ED physicians**
- **Support of chief MITs**
- **Support of Director of Diagnostic Imaging**
- **NICS fellowship financial support**
- **NICS training, mentoring, project plan one-on-one critique**
- **Donation of 10 hours per week research nurse time by diagnostic imaging**

Interventions

- Evidence practice gap DATA presented at “normal” ED staff meetings at three sites
 - In principle agreement that change needed
 - In principle support for standardization of risk assessment using decision tool
 - Agreement about bypassing guideline if clinical judgement dictated it
- Problem specific A4 coloured paper requests for imaging created incorporating validated decision tools for risk assessment (www.southernhealth\imaging\evidence)

Interventions II

- **Trialling of requests in one ED – 3 modifications at suggestion of ED physicians until accepted**
- **Support for MITs rejecting incomplete / incorrect requests**
- **Lollies in ED, CT, nuclear medicine, ultrasound at all three sites reminding MITs**

Interventions III

- **Audit and feedback**
 - Simple
 - Excel bar charts in colour
 - Email to key MITs, emergency physicians, radiologists with congratulations when results were good
- **Non compliant request forms collected and random phone calls to non complying doctors (right up to the end.....)**
 - “I didn’t know” (???)

www.southernhealth.org.au/imaging/radiology

Southern Health

Pulmonary Embolism Imaging Request

Billing Details
 Rehab TAC
 WC Vets
 Private Other

ED clinic No.....
 Monitored Yes / No.....
 Outpatient clinic no.....

UR: _____ DOB: _____
 Name: _____ Phone: _____
 Address: _____ M / F _____

Risk Assessment
 Q1. Age > 49 Yes No
 Q2. Heart Rate > 100 Yes No
 Systolic BP > 160 Yes No

Q3. Is there unexplained hypoxaemia? (O₂ saturation by pulse oximeter < 95% on room air and no other clinical explanation such as known asthma or COPD)
 Yes
 No

Q4. Has there been surgery with general anaesthetic in last 4 weeks?
 Yes
 No

Q5. Is there unilateral leg swelling? (3 cm difference in circumference 10 cm below tibial tuberosity)
 Yes
 No

Q6. Does patient have haemoptysis?
 Yes
 No

If Q3 - 6 are all answered No --> Low Risk --> Order D-dimer
If D-dimer positive (> 0.2 mg/L) --> Imaging

If any response to Yes --> High Risk --> Imaging Required

If patient has:
 • acute CNR and no swelling/leg pain or swelling < 10 years
 OR
 • contrast allergy
 OR
 • renal impairment
 --> FD to the requested initial test - CTPA for all other patients
 (refer alternate guidelines for pregnant patients)

**** See reverse for management pathway following imaging ****

Examination Requested CTPA VQ
Clinical Details

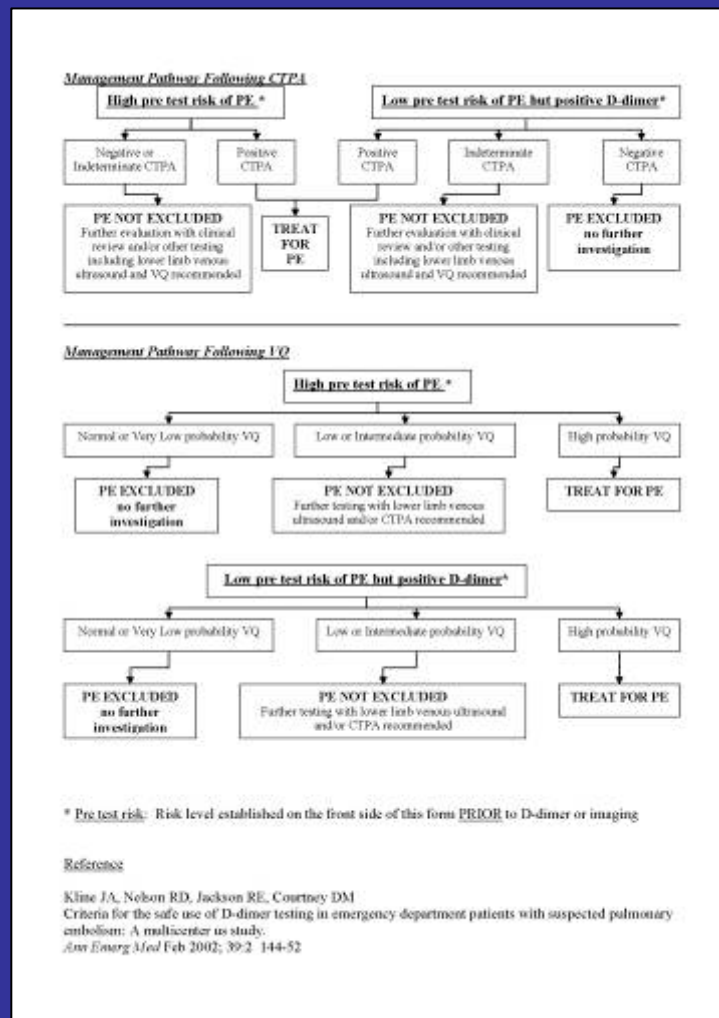
Serial Creatinine **D-dimer**

Contrast Allergy Yes/No **Pregnant** Yes/No **Meds/Ins** Yes/No

Signature..... **Name**..... **Page**..... **Date**.....

Diagnostic Imaging Monash Medical Centre 594-2200 Fax 594-6687
 Dandenong Hospital 955-8175 Fax 955-8654
 Casey Hospital 8768-1245 Fax 8768-1966

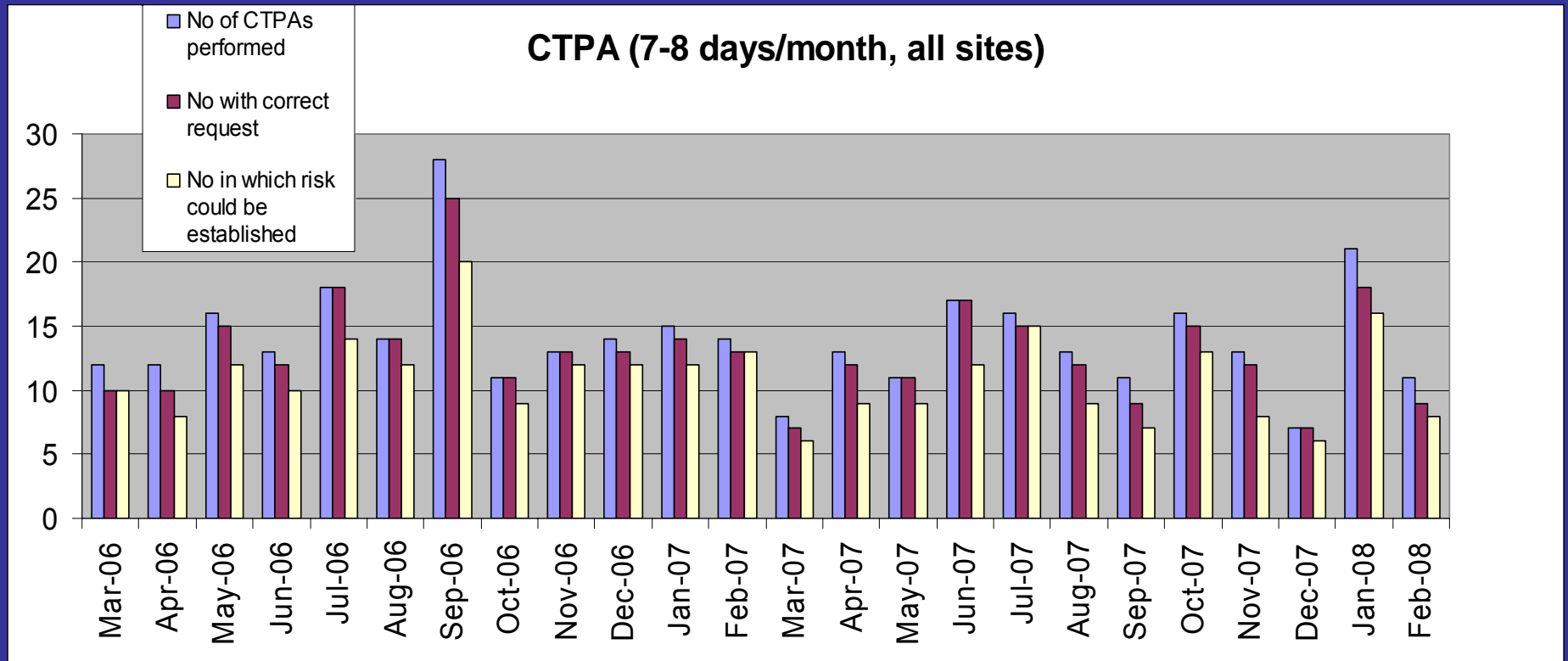
Version 5 - 28.2.2006
 Authored By: ED Imaging, Dandenong, Dandenong, Diagnostic Imaging, Dandenong, Dandenong



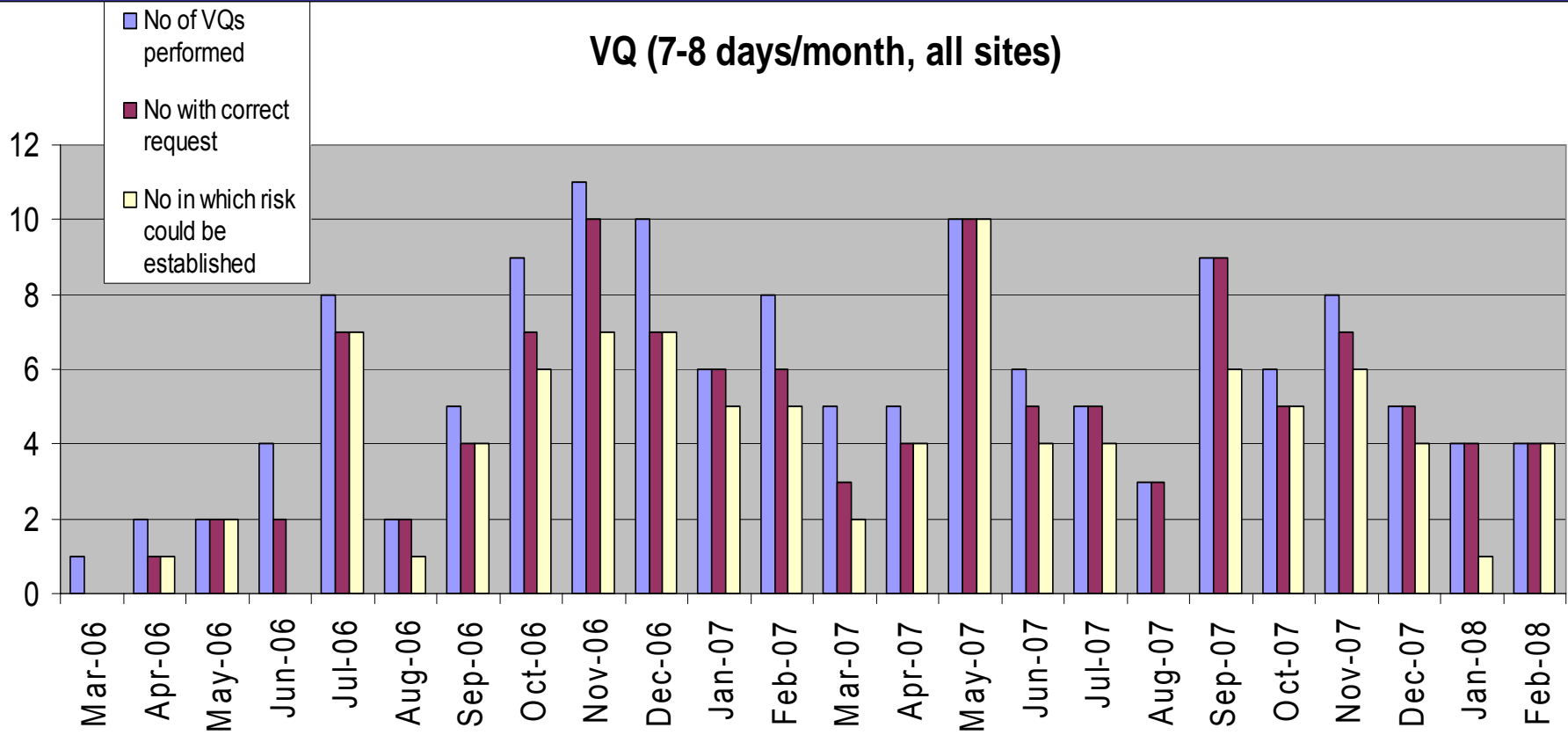
Data Collection – random audit 4 days per month for 2 years

1. Outcomes relating to practitioner behaviour (risk assessment + low risk / D dimer pathway)
 - correct form
 - risk assessment interpretable
 - D dimer before imaging if at low risk
2. Outcomes relating to patients
 - proportion of “at risk” ED patients receiving imaging for VTE
 - proportion of tests with positive result

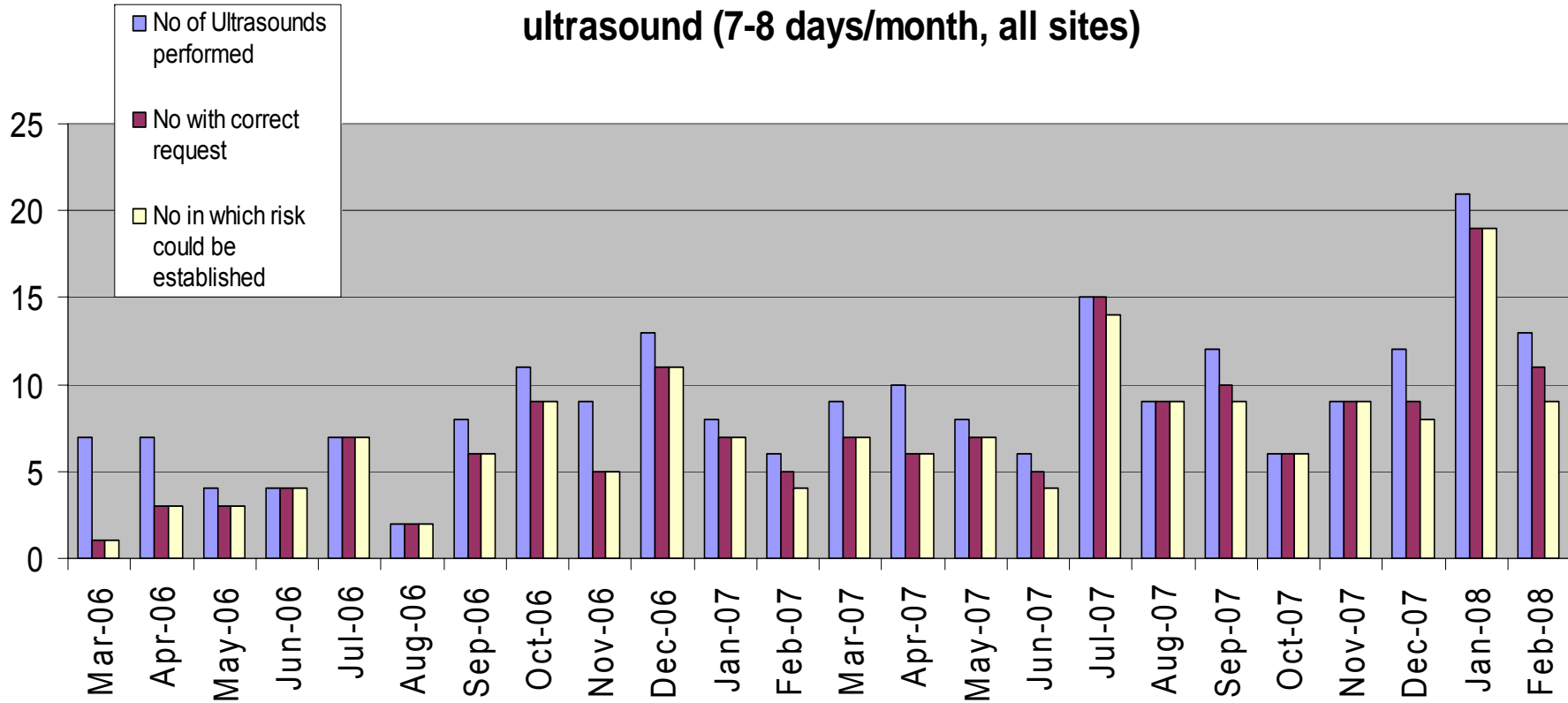
Results – Compliance with risk assessment



VQ (7-8 days/month, all sites)



ultrasound (7-8 days/month, all sites)



Results II – Compliance with low risk diagnostic pathway

Of

- 94% of 102 patients who had VQ
- 97% of 258 patients who had CTPA
- 98% of 123 patients who had US

Were either ***high risk*** or ***low risk + positive D dimer*** consistent with guideline

Results III – Effect on Patients

1. Proportion of patients with particular ICD 10 codes who were imaged

-chosen based on discharge codes of patients imaged during baseline period

2. Proportion of patients with positive imaging results on CTPA, US, VQ

These are surrogate markers of appropriate selection of patients for imaging

Proportion of patients with chosen ICD 10 codes who were imaged

| YEAR | NUMBER IMAGED | PROPORTION |
|-----------------|---------------|------------------------|
| 2005 (baseline) | 24 / 376 | 6.4, 95% CI (4.2–9.2) |
| 2006 | 26 / 378 | 6.9, 95% CI (4.6–9.8) |
| 2007 | 48 / 540 | 8.9, 95% CI (6.7–11.5) |

Proportion of patients who had positive imaging

| | YEAR 1 | YEAR 2 |
|--------------|----------------|-----------------------------|
| CTPA | 14.3% (17/119) | 10.9% (13/119) |
| VQ | 5.7% (2/35) | 7.2% (4/55) |
| ALL PE TESTS | 12.3% (19/154) | 9.8% (17/174) (p = 0.46) |
| US | 13.7% (7/51) | 21.1% (19/90) (p=0.28) |

Conclusion

- **It is possible for radiologists to control inappropriate testing but requires support and active participation of clinicians whose behaviour you seek to change**

- **Resourcing for**
 - data collection
 - clinician time to do QI
 - aides memoire
 - acceptance that implementation is never “over”

are important to sustainability

Generalisability

- Public hospitals have advantage of no financial incentive for extra testing on ED patients – would this work in private sector?
- “Culture” is important – without receptivity to change and good working relationship professional behaviour change is hard

Improving the uptake of imaging guidelines in the Emergency Department

Overview of talk

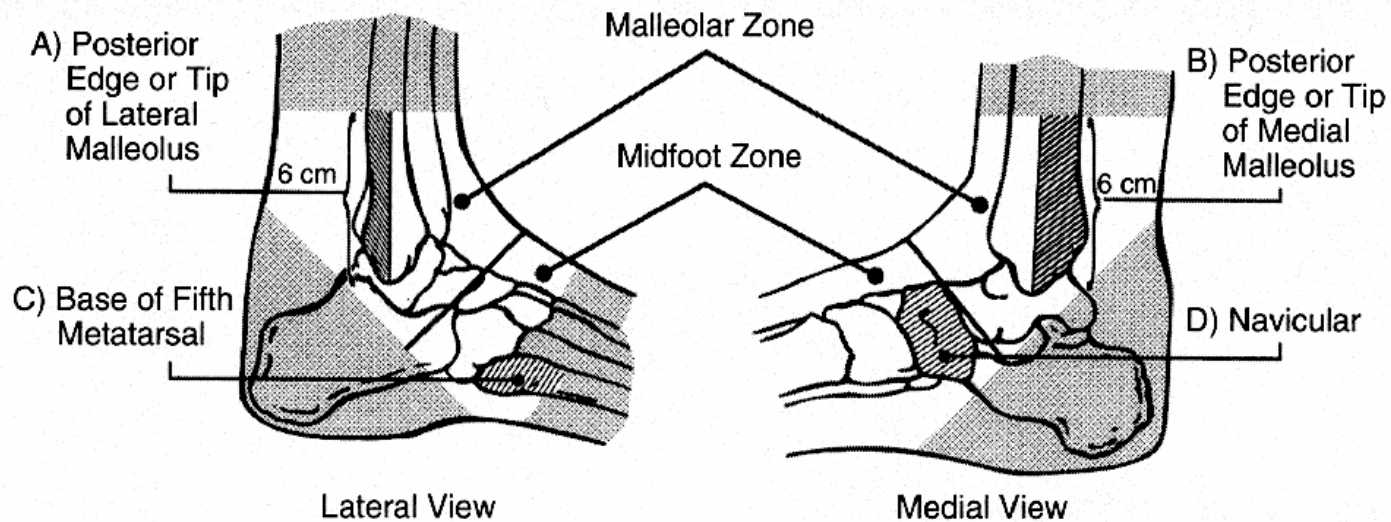
- What is the project about?
 - The problem
 - The interventions
 - The results
- What did I learn?
 - Data
 - Evidence implementation

Background

- Ankle injuries common
- Xrays ordered for most patients
- Typically 85% of xrays are normal
- The Ottawa Ankle Rules can reduce the number of xrays without missing fractures

**Stiell IG et al. Implementation of
the Ottawa Ankle Rules**

JAMA 1994; 27: 827-832



An ankle radiographic series is only required if there is any pain in malleolar zone and any of these findings:

1. bone tenderness at A
or
2. bone tenderness at B
or
3. inability to bear weight both immediately and in emergency department

A foot radiographic series is only required if there is any pain in midfoot zone and any of these findings:

1. bone tenderness at C
or
2. bone tenderness at D
or
3. inability to bear weight both immediately and in emergency department

Aim

- To improve the uptake of the Ottawa Ankle Rules for patients presenting with acute blunt ankle trauma to the Emergency Department

Evidence

- Systematic review
 - Sensitivity 97.6%, false negative rate 2%
 - The OAR is highly accurate at excluding ankle and mid-foot fractures
 - Can reduce the number of unnecessary xrays by 30-40%

Bachmann LM, et al. Accuracy of Ottawa ankle rules to exclude fractures of the ankle and mid-foot: systematic review.

BMJ. 2003 Feb 22; 326 (7386): 417

The setting : RAH



The setting : NHS



Baseline audit

| | RAH (%) | NHS (%) |
|------------------|------------|------------|
| Ankle xrays | 95 | 91 |
| OAR on requests | 41 | 34 |
| OAR in casenotes | 56 | 55 |

The problem

- Clinicians may not use the OAR
- Clinicians may use the OAR, but there may be variability in the way it is used

Barriers....



Barriers

- Individual clinician
- Social context
- Organisational context

Barriers – the clinician

- Knowledge of/about the OAR
- Lack of confidence in clinical examination
- Lack of knowledge of which xray to order
- Sense of professional autonomy

Barriers – social context

- Ankles are not “sexy”
- “The patient expects an xray”
- “Better to xray otherwise they’ll be back”

Barriers – organisational context

- Rotating and shift work staff
- No negative consequences of ordering unnecessary imaging
- RAH
 - small volume of ankle patients
 - nurses order many xrays at triage
 - most ankle patients seen by inexperienced staff
 - lack of consultant availability to drive change
- NHS
 - short “introductory” phase
 - seen as a project rather than permanent change in process

Enablers

- Support
 - Hospital Executives
 - Directors of the Emergency Departments
 - Director of Medical Imaging
 - Private radiology contractor
 - Key ED doctors
 - Radiographers
 - Nursing staff
- NICS-RANZCR Fellowship
 - Financial support
 - NICS training and mentoring

Overcoming barriers...

BERLIN WALL TUMBLES

'Beginning of the End' for Communism

Germany Re-united

The Berlin Wall was smashed on the stroke of midnight last night when communist forces in East Germany gave up.

The 1100-ft-long wall, the only remnant of the 1961 barrier between East and West Germany, was demolished after a day of peaceful protests and on the same day as the East German leader Erger Gorbachev.

When the sun came through in daylight, the walls of East Berlin had been reduced to the vast sea of rubble and the city was a scene of chaos. The West German army was seen patrolling the streets.

Thousands of people gathered in the city centre and many were seen to be celebrating. The East German army was seen to be withdrawing from the city.

The Berlin Wall was built in August 1961, when the Soviet Union and East Germany agreed to build a wall to separate the city from West Berlin.



Celebrating East Berliners as they breach the Berlin Wall

Breaching the Wall

Thousands of people gathered in the city centre and many were seen to be celebrating. The East German army was seen to be withdrawing from the city.

The Berlin Wall was built in August 1961, when the Soviet Union and East Germany agreed to build a wall to separate the city from West Berlin.

After Gorbachev and Weisbach what about a general election?



After Gorbachev and Weisbach what about a general election?

The article discusses the political implications of the fall of the Berlin Wall and the potential for a general election in the UK.

OTHER NEWS

Mr. Thatcher: From Downing Street

Mr. Thatcher is expected to announce a general election in the next few weeks.

Interventions

- Designed to try and overcome barriers
- Planned
- Multifaceted

Interventions (1)

- **Education**

- Teaching the OAR
- Improving examination skills in a hands-on tutorial
- How to use new request form
- Verbal or written “prescription” for patient
- Multiple occasions, people and methods

- **New request form**

- Evidence at “point of care”
- Looks very different to usual request
- Contains OAR as a decision tree
- Designed with ED staff
- Iterative process – now version 3

Ankle Injury X-Ray Request Form

INSTRUCTIONS FOR USE:

- This form **REPLACES** the usual form for acute ankle trauma.
- Age - 18 years.
- Initial injury occurred < 10 days ago.
- One to three views (e.g. not a full length ankle).
- Check the relevant sub-points and tick the YES/NO boxes.
- Complete "X-Ray Requested" section.

Click on Ankle Sub-Point (OAR)

ANKLE INJURY

Under primary step (Y/N) if there is more than one

YES/NO

YES/NO

Check 1 to select the appropriate ADD a third view

YES/NO

ADD NEW REQUEST

FOOT INJURY

Tick one of the sub-points

YES/NO

YES/NO

Check 1 to select the appropriate ADD a third view

YES/NO

ADD NEW REQUEST

DATE _____ **TIME** _____

CLINICAL DETAILS

Chief Complaint _____

Presenting Problem _____

Onset _____

Site _____

Character _____

Duration _____

Associated Symptoms _____

History of Present Illness _____

Previous and Past _____

Investigations _____

Diagnosis _____

Management _____

Prognosis _____

Other Details _____

X-Ray Requested

AP/PA _____

Medial/Oblique _____

Lateral _____

Plantar _____

Medial Malleolus _____

Lateral Malleolus _____

Distal Tibia/Fibula _____

Distal Radius/Ulna _____

Distal Humerus _____

Distal Femur _____

Distal Pelvis _____

Distal Femur _____

Distal Tibia/Fibula _____

Distal Radius/Ulna _____

Distal Humerus _____

Distal Femur _____

Distal Pelvis _____

Signature _____

DATE/TIME _____

CLASSIFICATION please check
EMERGENCY / ROUTINE / NA / N/A

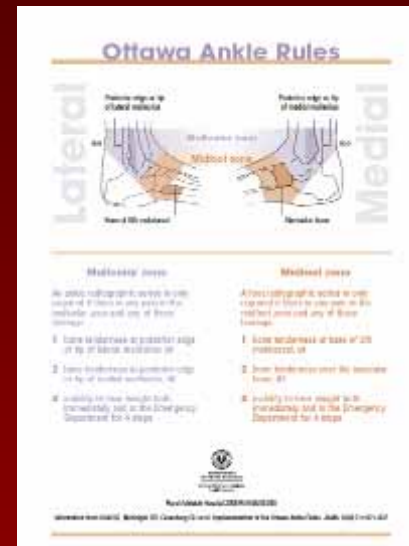
ANKLE INJURY X-RAY REQUEST FORM

8.4.2

Interventions (2)

- **Reminders**

- Posters
- Paper guidelines
- Lanyard cards
- ED intranet
- ED newsletter



- **Audit and feedback**

- Use existing meetings

- **Radiographer as “gate keepers”**

- Not at NHS (private radiology contractor)

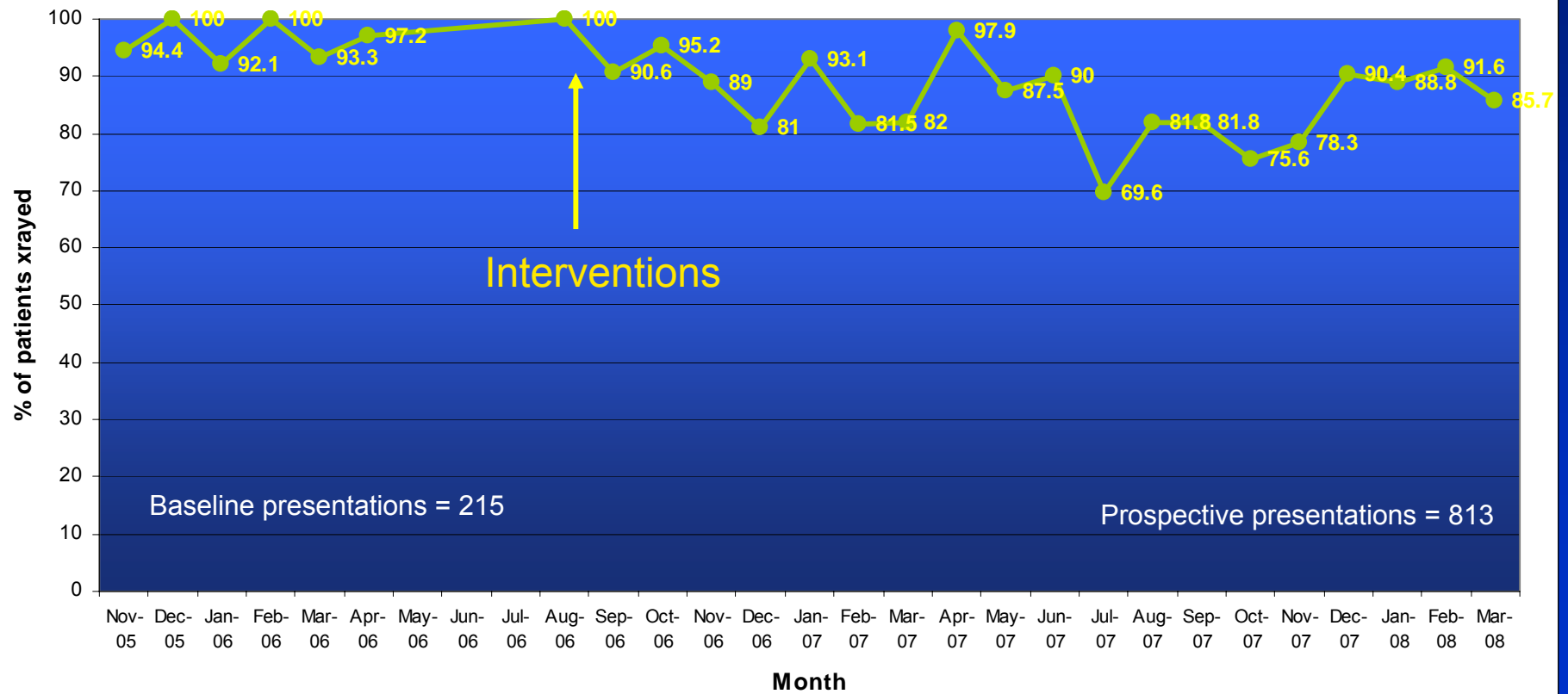
Data collection

- Xray ?
- Fracture?
- Documentation
- New request form
- Clinician
- Difference in practice change between clinician groups?

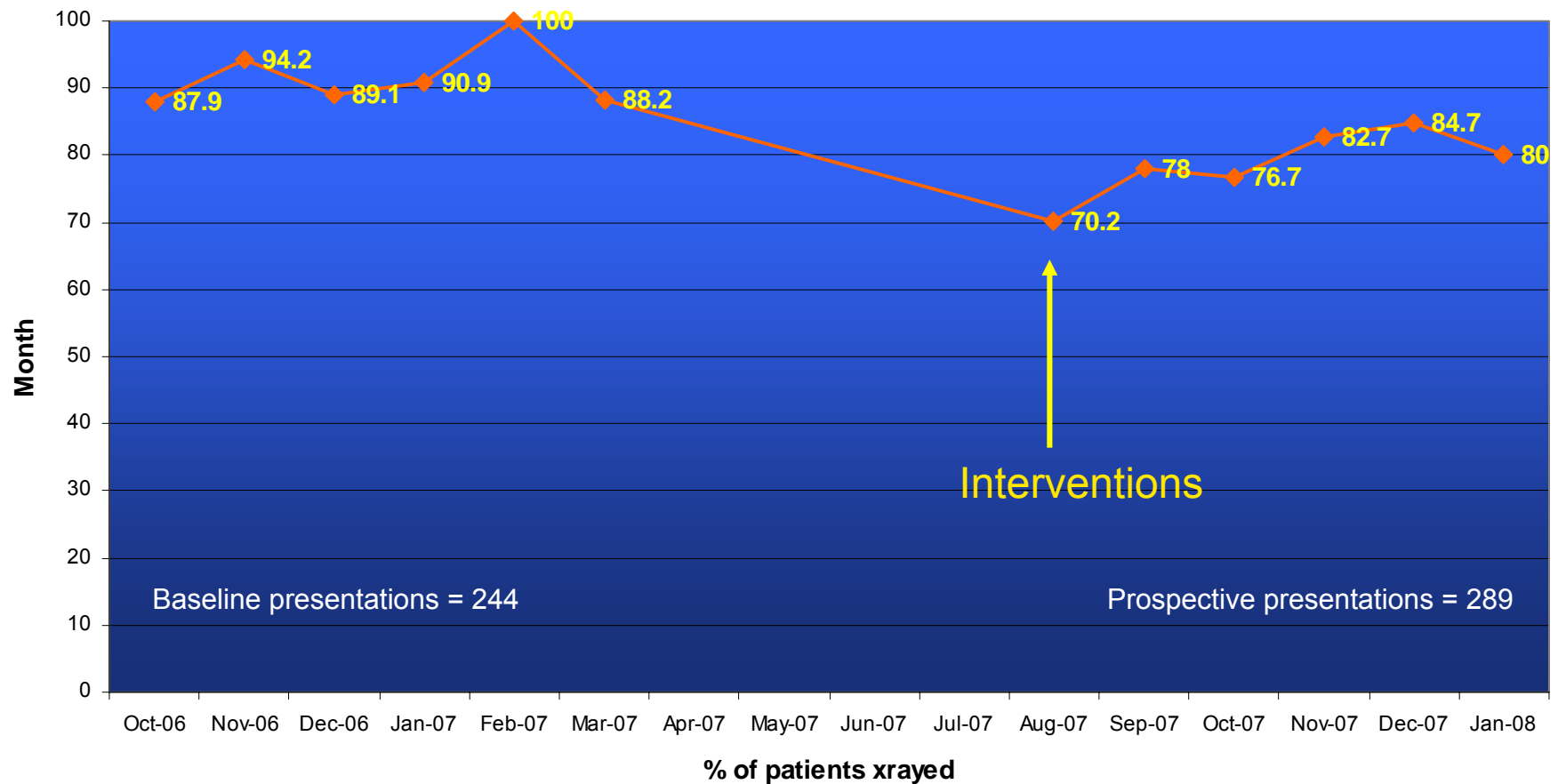
Results

| | RAH (%) | NHS (%) |
|-----------------------|------------|------------|
| ↓ ankle xrays | ↓ 8.6 | ↓ 12.5 |
| ↑ fracture rate | ↑ 6.5 | ↑ 12.2 |
| ↑ OAR request | ↑ 42.2 | ↑ 31.2 |
| use of new request | 88 | 41 |

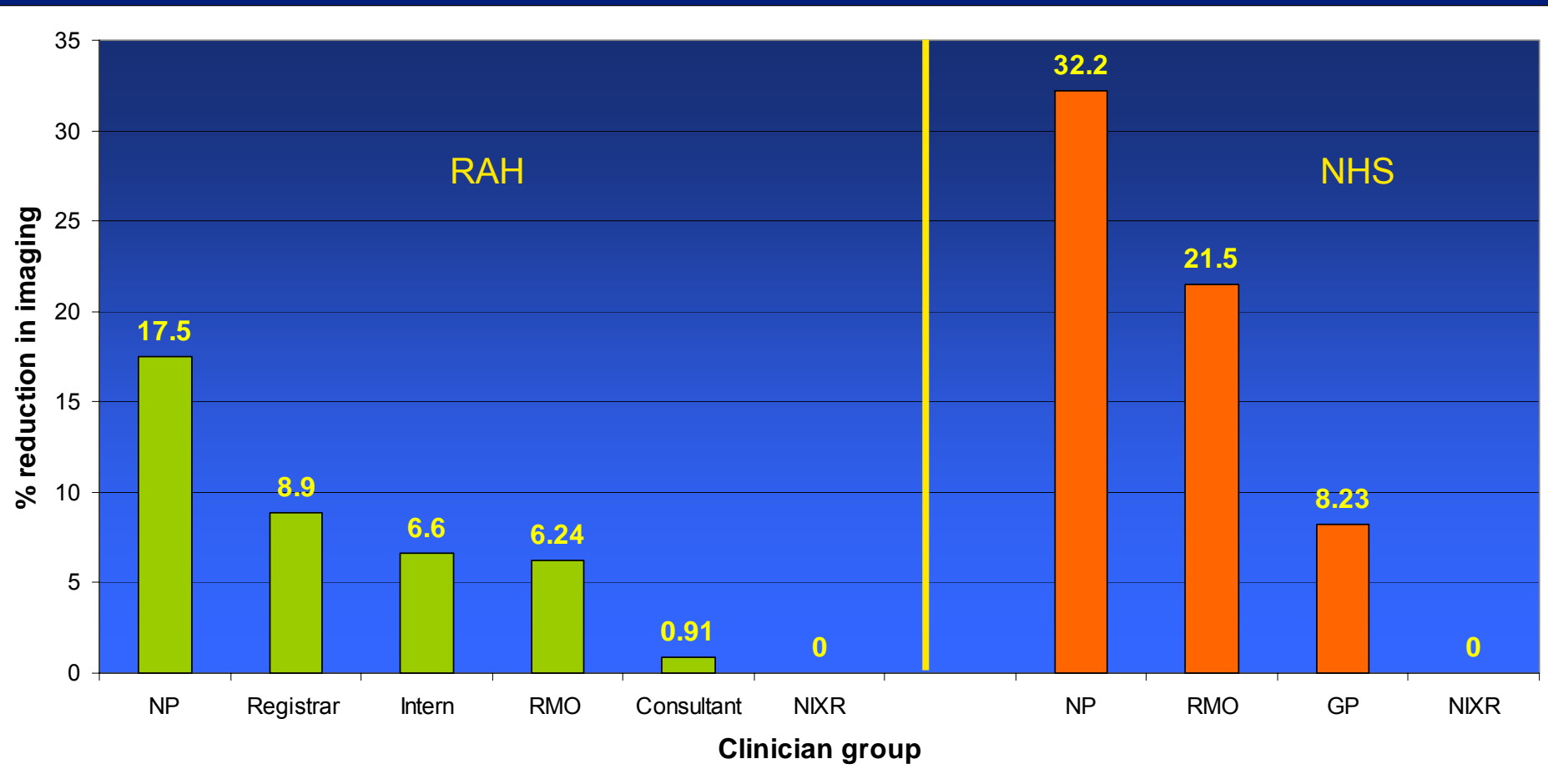
↓ xrays : RAH



↓ xrays : NHS



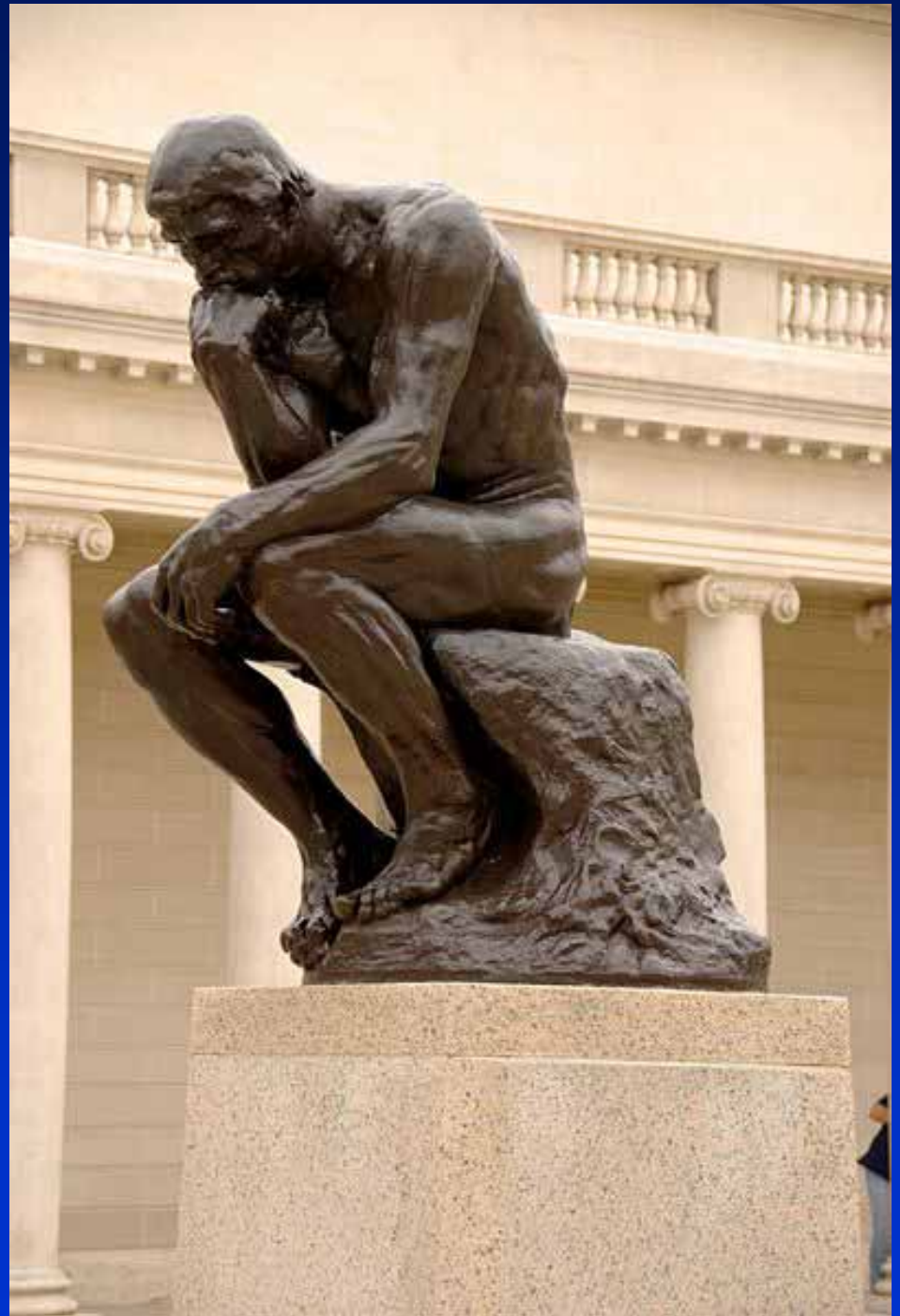
Reduction in imaging by clinician group (%)



Interpretation of results

- Change in practice at both sites
- Noarlunga Hospital - used the rule but not the request
- Uptake and documentation of OAR best by NPs at both sites, RMOs at Noarlunga
 - ? receptivity to teaching and practice change

What did I learn?....



What did I learn? - Data

- **Biggest challenge !**
- **Data routinely collected by hospitals is for financial rather than quality end points**
- **Data systems determine the scope of the project**

What did I learn? – Implementation

- **Evidence – practice gap**
 - Data is powerful
- **Barriers**
 - Process mapping is illuminating
 - Be responsive to the changing environment
- **Engage the target group**
 - “What’s in it for me?” – tell them

What did I learn? - Implementation

- **Interventions**

- Each change needs a strategy
- “Nothing is so simple it cannot be misunderstood”
- Make them appealing, easy to use, fit into normal workflow

- **Sustainability**

- Embed the changes
- “Future-proof” if possible
- RESOURCES

