



EVIDENCE CENTRE CRITICAL APPRAISAL

Nurse-initiation of x-rays of possible limb fractures in
hospital emergency departments.

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31 July 2000

SUMMARY STATEMENT:

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Centre for Clinical Effectiveness. Nurse-initiation of x-rays of possible limb fractures in hospital emergency departments. Southern Health / Monash Institute of Public Health & Health Services Research, Clayton, 2000.

<http://www.med.monash.edu.au/publichealth/cce>

REQUEST:

For patients presenting with possible limb fractures, does the request for x-rays by nurses rather than by doctors reduce waiting times in the emergency department?

REQUESTED BY:

Tania Hinneberg, Registered Nurse, Emergency Department, Dandenong and District Hospital, Dandenong.

METHODOLOGY

Search Strategy

The Centre for Clinical Effectiveness defined the 'best available evidence' as that research we can identify that is least susceptible to bias. We determine this according to pre-defined NHMRC criteria (see Appendix).

First we search for systematic reviews, evidence-based clinical practice guidelines, or health technology assessments, and randomized controlled trials. If we identify sound, relevant material of this type, the search stops. Otherwise, our search strategy broadens to include studies that are more prone to bias, less generalizable, or have other methodologic difficulties. We include case-control and longitudinal cohort studies in our critical appraisal reports. While we cite observational and case series studies, and narrative reviews and consensus statements, in our reports we do not critically appraise them. Some studies can produce accurate results but they are generally too prone to bias to allow determination of their validity beyond their immediate setting.

Details of Evidence Request:

Search terms:

The following search terms were used:

Table 1. Search terms used in the retrieval of articles from electronic databases and websites

Field of focus	Search term
Problem-related	x-ray/s
Intervention-related	emergency nursing; nurses; emergency service, hospital; triage

Resources Searched

We searched the following databases:

- Cochrane Library on CD-ROM, Issue 2, 2000
- Ovid Best Evidence 1991 – March/April 2000
- Ovid Medline 1966 – August Week 3 2000
- Ovid CINAHL 1982 – May 2000
- Ovid Current Contents 1993 Week 26 – 2000 Week 28
- PubMed 30 June 2000
- Australian Medical Index 30 June 2000

Refinements, Searching & Reporting Constraints:

We included items of evidence that were available to us on 27 July 2000. We applied the following inclusion and exclusion criteria:

Inclusion Criteria

- Primary studies investigating nurse-initiation of x-rays in the emergency department.

Exclusion Criteria

- Study did not include the effect of nurse-initiation of x-rays on waiting times.
- Study investigated “intention to treat” only, but did not examine waiting times associated with actual nurse initiated requests.

RESULTS:

Nine pertinent articles were retrieved by our search. Five studies were excluded following application of the criteria previously described.

The four articles that met the inclusion and exclusion criteria consisted of one randomised controlled trial and three controlled trials. (Table 2). We are reasonably confident that these studies represent the most important findings published to date.

Table 2. Study designs of articles retrieved by search

Study Design	Number included
Systematic reviews or meta-analyses	0
Evidence-based clinical practice guidelines	0
Randomised controlled trials	1
Controlled trials, cohort or case-control analytic studies	3

Articles were excluded from further appraisal as follows:

Table 3. Reasons for exclusion of articles retrieved by search

Reason for exclusion	Number
Waiting times not studied in trial	2
Only intention to treat included in trial	2
Postal survey of current practice	1

EVIDENCE SUMMARIES

Format

Evidence summaries are in the form of spreadsheets reproduced at the end of this report. Each spreadsheet contains the article citation, the study design, patient description, scientific validity of the article, results, and pertinent remarks from the authors and Centre for Clinical Effectiveness reviewer.

ARTICLES CRITICALLY APPRAISED FOR THIS REPORT

1. Lee KM, Wong TW, Chan R, Lau CC, Fu YK, Fung KH. Accuracy and efficiency of x-ray requests initiated by triage nurses in an Accident and Emergency department. *Accid Emerg Nurs.* 1996; 4:179-181.
2. Parris W, McCarthy S, Kelly A-M, Richardson S. Do triage nurse-initiated x-rays for limb injuries reduce patient transit time? *Accid Emerg Med* 1997; 5:14-15.
3. Ching LTK, Leng ELY, See NB. Initiation of x-rays by the triage nurse: competency and its effect on patients' total time spent in the accident and emergency department. *Singapore Nurs J.* 1999; 26:22-26.
4. Thurston J, Field S. Should accident and emergency nurses request radiographs? Results of a multicentre evaluation. *J Accid Emerg Med.* 1996; 13:86-89.

ARTICLES NOT INCLUDED IN THE APPRAISAL

1. Freij RM, Duffy T, Hackett D, Cunningham D, Fothergill J. Radiographic interpretation by nurse practitioners in a minor injuries unit. *J Accid Emerg Med* 1996; 13:41-43.
2. Kelly A, McCarthy S, Richardson S, Parris W, Kerr A. Triage nurse-initiated x-rays for limb injuries are accurate and efficient. *Emergency medicine* 1995; 7:81-84.
3. Lindley-Jones M, Findlayson BJ. Triage nurse requested x rays – the results of a national survey. *J Accid Emerg Med* 2000; 17:108-110.
4. Salt P, Clancy m. Implementation of the Ottawa Ankle Rules by nurses working in an accident and emergency department. *J Accid Emerg Med.* 1997; 14:363-365.
5. Seaberg DC, MacLeod BA. Correlation between triage nurse and physician ordering of ED tests. *Am J Emerg Med.* 1998; 16:8-11.

APPENDIX

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Levels Of Evidence

As Defined By "A Guide To The Development, Implementation And Evaluation Of Clinical Practice Guidelines" (National Health & Medical Research Council, Canberra, 1998):

Level I		Evidence obtained from a systematic review or meta-analysis of all relevant randomised controlled trials.
Level II		Evidence obtained from at least one properly designed randomised controlled trials.
Level III	-1	Evidence obtained from well-designed pseudo-randomised controlled trials (alternate allocation or some other method).
	-2	Evidence obtained from comparative studies with concurrent controls and allocation not randomised (cohort studies), case control studies or interrupted time series with a control group.
	-3	Evidence obtained from comparative studies with historical control, two or more single-arm studies or interrupted time series without a parallel control group.
Level IV		Evidence obtained from case series (either post-test or pre-test and post-test), opinions of respected authorities (narrative reviews), descriptive studies, reports of expert (i.e. consensus) committees, case studies.

Evidence Summary Intervention <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> Nurse-initiated x-rays and patient waiting times. </div>	Study 1 Thurston J et al. Should accident and emergency nurses request radiographs? Results of a multicentre evaluation. J Accid Emerg Med. 1996; 13:86-89.	Study 2 Parris W et al. Do triage nurse-initiated x-rays for limb injuries reduce patient transit time? Accid Emerg Nurs. 1997; 5: 14-15.
STUDY DESIGN & NHMRC LEVELS OF EVIDENCE	Randomised-controlled trial. Level II	Pseudo-randomised controlled trial, Level III-1
DESCRIPTION: Subjects, Interventions, Comparisons, Outcomes, Inclusion & Exclusion Criteria	Patients: 1833 patients Intervention: nurse-initiated x-rays Comparison: doctor-initiated x-rays Outcome: Timing of various stages of a patient's passage through A&E department. Incl & Excl Criteria: Inclusion criteria: injury within previous 24 hours and at the elbow or distal to it, or at the knee or distal to it. Exclusion criteria: patients with other injuries, or who were aged 5 years or less.	Patients: 175 patients in total Intervention: x-rays initiated by triage nurse Comparison: x-rays initiated by medical officer Outcomes: transit time – total time in ED from presentation to discharge Inclusion & Exclusion Criteria: Patients aged 14 years or more presenting with isolated injuries to wrist or ankle were included in the trial. Patients who did not have x-rays performed during the ED visit were excluded, as were patients with severe pain in need of urgent analgesia and patients admitted to inpatient wards.
VALIDITY: Methodology, rigour, selection, opportunity for bias.	Randomisation: Randomised allocation by use of a randomisation list generated by a pseudo random number generator. All patients accounted for: Yes. Patients treated equally: Not entirely possible with this protocol, otherwise not stated. Similar groups: Not stated. Potential for bias: Radiographers were apparently not blinded to the origin of x-ray requests and sometimes changed the area x-rayed from that originally requested by nurses.	Randomisation: Odd/even dates of presentation – somewhat subject to bias. All patients accounted for: Not clear. Patients treated equally: Not stated. Similar groups: Not stated. Potential for bias: Some potential depending on the composition of the two groups and numbers in each group, other factors impinging on service times on odd/even dates, unblinded nature of trial.
RESULTS: Generally favourable or unfavourable, specific outcomes of interest, estimate of experimental effect and precision if appropriate	There was a significant reduction in the time spent in A&E when no x-ray was requested. The average time saved in the "Doctor First" (DF) group was 51 minutes and in the "Nurse First" (NF) group 36 minutes. For those who were sent for a x-ray, 14 minutes was saved by getting the patient to see the nurse first. However, because the overall referral rate for x-rays was greater in the NF group this potential benefit was largely lost. Overall the average waiting time in the DF group of 92.5 min (95% confidence interval: 89.2 to 96.1 min) was reduced to 88.5 min (95% CI: 85.2 to 91.8 min) in the NF group, a non-significant saving of 4 min.	Triage-initiated x-rays did not result in a significant reduction in ED transit times for patients.
AUTHORS COMMENTS: Risk/benefit, limitations	"The findings are somewhat against expectations but do identify that specific training and constant monitoring is essential if nurses are to request peripheral limb radiographs..."	"Factors that may have contributed to" the lack of effect "are the relatively short transit times identified in the study and the variations in workload of the x-ray department and treatment area." "...only 77% of patients for whom an x-ray was ordered from triage had that x-ray before seeing the doctor."
REVIEWER'S COMMENTS: Risk/benefit, methodology, conclusions		

<p>Evidence Summary Intervention</p> <p>Nurse-initiated x-rays and patient waiting times.</p>	<p>Study 3</p> <p>Lee KM et al. Accuracy and efficiency of x-ray requests initiated by triage nurses in an accident and emergency department. <i>Accid Emerg Nurs.</i> 1996; 4:179-181.</p>	<p>Study 4</p> <p>Ching TK et al. Initiation of x-rays by the triage nurse: competency and its effect on patients' total time spent in the accident and emergency department. <i>Sing Nurs J.</i> 1999; 26:22-26.</p>
<p>STUDY DESIGN & NHMRC LEVELS OF EVIDENCE</p>	<p>Non-randomised controlled trial, Level III-2</p>	<p>Non-randomised controlled trial. Level III-2.</p>
<p>DESCRIPTION: Subjects, Interventions, Comparisons, Outcomes, Inclusion & Exclusion Criteria</p>	<p>Patients: 934 patients Intervention: triage-nurse requests for x-rays Comparison: review by case doctor, "699 cases outside the study group ...randomly taken during the study period" Outcomes: agreement by doctor on need for x-ray, presence of fracture, length of service time Inclusion & Exclusion Criteria: Patients with blunt injury to one region only of a limb were included. Patients who were critical, younger than 3 years, with multiple limb injuries, or with hip or pelvis injuries were excluded.</p>	<p>Patients: 193 patients in study group, 83 matched controls Intervention: triage nurse-initiated x-rays Comparison: doctor-initiated x-rays Outcome: Doctor's assessment of need for x-ray, triage and total service times Incl & Excl Criteria: Patients with simple extremity and skull injuries were included in the study. Pregnant patients and those with complicated and multiple injuries were excluded.</p>
<p>VALIDITY: Methodology, rigour, selection, opportunity for bias</p>	<p>Randomisation: No apparent randomisation of study group. All patients accounted for: In study group, yes. Patients treated equally: Not stated. Similar groups: Not stated. Potential for bias: As the patients in the comparison group may not have had blunt injuries to one limb, there is great potential for bias when comparing service times for the two groups.</p>	<p>Randomisation: No stated randomisation of study group. The "matched control" was "randomly" selected from patients "who were triage within the same timeframe, treated and discharged without any minor surgical procedure implemented or any outpatient follow-up." Method not stated. All patients accounted for: Not clear. Patients treated equally: Not clear. Similar groups: Different group sizes, other characteristics not stated. Potential for bias: Non-randomisation of selection of patients, different group sizes, frequency of skull vs limb injuries within each group not stated.</p>
<p>RESULTS: Generally favourable or unfavourable, specific outcomes of interest, estimate of experimental effect and precision if appropriate</p>	<p>The difference in agreement between doctors and nurses on the need for x-rays was not statistically significant. Total service time for those with radiographs requested by the nurse was on average 18.59 minutes less than the overall average ($p < 0.001$). When minor procedures were required an average of 2.45 minutes in total service time was saved ($p > 0.05$).</p>	<p>From 193 x-rays analysed, 192 (99.49%) x-rays initiated by triage nurses were relevant to the patients complaint. Only 3 of the x-rays (1.54%) were considered unnecessary by the attending doctors. Additional views on the same region in 10 (5.13%) of the patients were requested by the attending doctors.</p> <p>Nurse initiated x-rays were found to reduce total time in A&E by an average of 24.45 minutes, from a mean of 89.35 \pm 51.59 minutes for x-rays initiated by doctors to a mean of 64.9 \pm 43.09 minutes for x-rays initiated by nurses.</p>
<p>AUTHORS COMMENTS: Risk/benefit, limitations</p>		
<p>REVIEWER'S COMMENTS: Risk/benefit, methodology, conclusions</p>	<p>As the composition of the "control" group is unclear, it is not possible to interpret the differences in triage or total time.</p>	<p>The potential for bias in this study makes it difficult to accurately interpret the results.</p>