The role of triage liaison physicians on mitigating overcrowding in emergency departments: a systematic review
Rowe BH, Guo X, Villa-Roel C, Schull M, Holroyd B, Ballard M, Vandermeer B, Ospina M, Innes G

CRD summary
The review found that triage liaison physician interventions may not address the main causes of emergency department overcrowding, but appeared to improve leading indicators of quality of care (such as length of stay) in adult/mixed emergency department settings. More research was required before widespread employment of triage liaison physicians. The review was well conducted and the conclusions appear appropriate.

Authors' objectives
To evaluate the role of triage liaison physicians to address overcrowding in emergency departments.

Searching
MEDLINE, EMBASE, Web of Science, Cochrane Central Register of Controlled Trials (CENTRAL), HealthSTAR, Science Citation Index Expanded, Dissertation Abstracts Online and ABI/INFORM Global were searched. Search terms were reported. Further studies were sought through searches of ClinicalTrials.gov and Current Controlled Trials databases, Google Scholar, conference proceedings and reference lists of articles retrieved. Experts were contacted. The search was limited to articles published from 2004 to May 2009, which were merged with the results of a search (1966 to 2005) conducted for an earlier review (see Other Publications of Related Interest). There were no restrictions by language and publication status.

Study selection
Randomised controlled trials (RCTs), non-randomised controlled trials (CCTs), cohort studies, interrupted time series, case-control studies and before-and-after studies on the effects of triage liaison physicians on mitigating overcrowding in emergency departments for adult (aged over 17 years) or mixed child/adult populations were eligible for inclusion. Studies were required to report numerical data on at least one of emergency department length of stay, time to physician initial assessment (primary outcomes) and patients leaving without being seen and leaving against medical advice (secondary outcomes). Studies that compared two levels of the same intervention were excluded.

Characteristics of participants in the included studies varied due to differing inclusion criteria and study settings. All studies were set in single emergency department units, mostly in USA. The intervention was usually implemented by either a senior physician or by a team. The comparator in nearly all studies was nurse-led triage. Triage liaison physician responsibilities varied widely. Intervention durations ranged from four days to 12 months.

Two reviewers independently selected studies. Disagreements were resolved by consensus.

Assessment of study quality
The Effective Public Health Practice Project quality-rating tool (Thomas 2004) was used to rate the overall quality of each study (strong, moderate or weak) based on ratings for each of the components: participant selection, design, management of confounders, blinding, data collection and management of withdrawals and dropouts.

Two reviewers independently assessed study validity. Disagreements were resolved by consensus.

Data extraction
Risk ratios (RRs) were extracted or calculated for dichotomous outcomes and mean differences for continuous outcomes, with 95% confidence intervals (CIs). Where standard deviations were not reported these were calculated from other reported data or imputed from similar studies. In some cases data were extracted from graphs.

Two reviewers independently extracted data. Disagreements were resolved by consensus. Attempts were made to contact primary study authors for more information where required.
Methods of synthesis
Where studies were sufficiently similar, they were combined to calculate pooled risk ratios or weighted mean differences (WMDs), with 95% CIs, using a Mantel-Haenszel random-effects model. Heterogeneity was assessed with $\chi^2$ and $I^2$. Meta-analysis was not possible for non-RCTs due to high statistical heterogeneity ($I^2$ over 90%), so data were summarised for each outcome as median differences with interquartile ranges (IQR).

Publication bias was assessed by means of funnel plots. Subgroup analyses investigated the effects of type of triage liaison physician (team or single physician) and patient acuity (Canadian Triage and Acuity Score (CTAS) level 3).

Results of the review
Twenty-eight studies were included in the review (n=more than 400,000, range 143 to 121,894): two RCTs, seven CCTS, one interrupted time series, two prospective cohorts and 16 before-and-after studies. Three studies were rated as strong quality, two as moderate and 23 as weak. Common weaknesses were poor study design, poor data collection methods and failure to address confounding.

Emergency department length of stay (19 studies): Triage liaison physicians significantly reduced emergency department length of stay compared to nurse-led triage (WMD -36.85 minutes, 95% CI -51.11 to -22.58, $I^2$=0%; two RCTs, n=6,746) and in 13 out of 15 non-randomised studies (non-RCTs) length of stay was significantly shorter in the intervention group. The median absolute improvement was -36 minutes (IQR -46 to -21mins). The funnel plot for this analysis suggested publication bias. Findings in subgroup analyses (by type of triage liaison physician and CTAS level 3 patients) were similar.

Time to physician initial assessment (nine studies): Triage liaison physicians significantly reduced time to physician initial assessment in the only relevant RCT (MD -30.00 minutes, 95% CI -56.91 to -3.09) and in six out of eight non-RCTs. Median absolute improvement was -19 minutes (IQR -26 to -11 minutes); findings in subgroup analysis of CTAS level 3 patients were similar.

Secondary outcomes (12 studies): In RCTs, triage liaison physicians did not significantly reduce the rate of patients who left without being seen (one RCT) or against medical advice (one RCT), but there was a significant reduction in five out of nine non-RCTs.

A high level of heterogeneity in non-RCTs was not fully explained by subgroup analyses.

Authors' conclusions
Triage liaison physician interventions may not address the main causes of emergency department overcrowding, but appeared to improve leading indicators of quality of care (such as length of stay) in adult or mixed emergency department settings. More research was required before widespread employment of triage liaison physicians.

CRD commentary
The objectives and inclusion criteria of the review were clear. Relevant sources were searched for studies. There were no restrictions by language and publication status. Publication bias was formally assessed. Steps were taken to minimise risks of reviewer bias and error by having more than one reviewer independently select studies, undertake validity assessment and extract data. Appropriate statistical techniques were used to pool data and assess and explore heterogeneity between studies. There was persistent unexplained heterogeneity in non-randomised studies.

As the authors noted, the review was limited by the poor quality of most of the studies, failure to report relevant outcomes (including potential negative effects of triage liaison physicians) and possible publication bias. The review was well conducted and the authors' conclusions appear appropriate.

Implications of the review for practice and research
Practice: The authors stated that the review findings could not be generalised to all emergency department settings due to high heterogeneity and a lack of multicentre studies.

Research: The authors stated that future studies of triage liaison physicians in emergency departments should have robust designs (such as RCT or interrupted time-series), adequate duration (more than a few days), report pre- and post-intervention data, report outcomes for all participants, use blinding and adjust for confounders. Studies should report
waiting times, leaving without being seen, patient and provider satisfaction and costs and should clearly describe the setting.

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