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CRD summary
The review found that use of clinical pathways was associated with lower risk of four common complications after hip fracture, although short-term mortality rates were not significantly reduced. Given the poor quality of studies in the review, and the lack of clear evidence of a causal link between pathways use and clinical outcomes, the authors' findings may require cautious interpretation.

Authors' objectives
To evaluate the impact of clinical pathways for hip fractures on in-patient complications and short-term mortality.

Searching
MEDLINE, EMBASE, CINAHL and the Cochrane Central Register of Controlled Trials (CENTRAL) were searched to September/October 2008. Search terms were reported. Reference lists of included studies and selected reviews were checked. The search was not restricted by language. Unpublished studies and abstracts were excluded.

Study selection
Experimental, quasi-experimental and observational studies comparing a comprehensive clinical pathway for adults with hip fractures (femoral neck, intertrochanteric or subtrochanteric) were eligible for inclusion. Studies were required to report deep vein thrombosis, pressure ulcer, surgical site infection, urinary tract infection, pneumonia, and/or death, occurring from September 1993 onwards. A comprehensive clinical pathway was defined as a written tool detailing patient care and expected progress, and including at least two preoperative, intraoperative or postoperative recommendations applying to at least two care disciplines. The pathway topics assessed in the review derived from a list of eight review-specific recommendations for hip fracture care compiled by the reviewers (based on two recent evidence-based reviews).

Participants in the included studies were aged 65 or older (where reported). Some studies were restricted to participants with femoral neck fracture, and some excluded participants with pathological fractures. The studies reported on five to eight pathway topics; items included deep vein thrombosis prevention, routine preoperative antibiotics, postoperative analgesia, nutritional support and timing of urinary catheter removal. The review reported rates of mortality in-hospital or within 30 days.

Two reviewers independently selected the studies, with disagreements resolved by consensus.

Assessment of study quality
The following components of study quality were assessed: study design, patient selection, definition of intervention, reporting of participant comorbidities, definition and measurement of outcomes. Quality scores were not assigned due to the questionable validity of the measures.

Two reviewers independently conducted the assessment, with disagreements resolved by consensus.

Data extraction
Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated from the numbers of events in the two treatment groups of each study. Primary study authors were contacted for more information as required.

Two reviewers independently extracted the data, with disagreements resolved by consensus.
Methods of synthesis
Studies were combined to calculate pooled odds ratios and 95% confidences. Random-effects analyses using the DerSimonian and Laird model were reported in the review. Heterogeneity was assessed using the $\chi^2$, $\tau^2$ and $I^2$ statistics. Publication bias was assessed with funnel plots. For the outcome of mortality, subgroup analyses were conducted by length of follow-up (in-hospital or 28/30-day mortality).

Results of the review
Nine studies were included in the review (n=4,637 patients, approximately 2,613 in the intervention group and 2,029 in the control group), including one prospective quasi-randomised controlled trial (n=111 patients), one prospective non-randomised controlled trial (n=481 patients), and seven before-and-after studies (five prospective with 2,854 patients; two retrospective with 1,191 patients). Six studies reported inclusion criteria and eight assessed baseline comorbidities. Most studies described the intervention but provided little information about outcomes assessment.

Use of clinical pathways was associated with significantly lower rates of deep vein thrombosis (OR 0.33, 95% CI 0.14 to 0.75; four studies), pressure ulcer (OR 0.48, 95% CI 0.30 to 0.75; six studies), surgical site infection (OR 0.48, 95% CI 0.25 to 0.89; three studies) and urinary tract infection (OR 0.71, 95% CI 0.52 to 0.98; five studies). There was no statistically significant difference between the groups in rates of pneumonia (six studies) or mortality (six studies).

There were no statistically significant differences between the groups in any subgroup analyses.

$\chi^2$ tests did not suggest heterogeneity for any of the analyses. Funnel plots suggested possible publication bias in favour of studies with low event rates for the outcomes of urinary tract infection and pneumonia.

Authors' conclusions
Use of clinical pathways was associated with lower risk of four common complications of hospitalisation after hip fracture, although pathways did not appear to significantly reduce short-term mortality rates.

CRD commentary
The objectives and inclusion criteria of the review were clear, but the scope of the review was restricted to a reviewer-defined list of pathway topics. Relevant sources were searched for studies, without language restriction. However, the exclusion of unpublished studies meant that the review was at risk of publication bias, and funnel tests provided some evidence of this. Steps were taken to minimise the risk of reviewer bias and error by having more than one reviewer independently undertake review processes.

Study quality was assessed, but differences in quality between the studies did not appear to be taken into account in the interpretation of findings. Overall study quality appeared poor. Appropriate statistical techniques were used to combine the studies, assess for heterogeneity and explore potential differences between studies. As the authors suggested, there was high potential for confounding in the primary studies and little evidence of a causal link between pathways use and clinical outcomes. There were few studies, most with small sample sizes, and differing methodologies. No details were given of control group conditions or how they differed from clinical pathways care.

In view of the poor quality of the primary studies, and lack of clear evidence of a causal link between pathways use and clinical outcomes, the authors' findings may require cautious interpretation.

Implications of the review for practice and research
Practice: The authors stated that in the short term, insurers and regulators could use outcomes other than mortality to assess the quality of hospital care of hip fracture, and that incentives could be offered to hospitals for quality improvement practices, such as the institution of clinical pathways. They also noted that the assessment of hospital quality based on short-term mortality may not reflect important improvements in patient outcomes that hospitals may achieve using clinical pathways.

Research: The authors stated that larger and more definitive studies are required on the effect of evidence-based clinical pathways on mortality and patient function after hip fracture, and to improve the design of clinical pathways.
Further research is required into hospital practices that may reduce mortality rates associated with hip fracture.

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