CRD summary
This review compared gastric with small intestinal post-pyloric tube feeding in critically ill patients. The authors concluded that the studies found no difference between gastric and post-pyloric feeding for pneumonia, mortality and length of stay in the intensive care unit, but that the number of patients might have been too small to detect a clinically important difference. These conclusions are likely to be reliable.

Authors' objectives
To compare gastric with small intestinal post-pyloric tube feeding in critically ill patients.

Searching
MEDLINE (from 1966 to July 2002), EMBASE (from 1980 to 2001), HealthSTAR (from 1975 to 2001) and the authors' personnel files were searched. The reference lists in identified studies and reviews were checked. Experts in the field were contacted.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) were eligible for inclusion.

Specific interventions included in the review
Studies that compared gastric with intestinal enteral feeding were eligible for inclusion. The included studies placed jejunal tubes blindly, or used endoscopic or fluoroscopic placement. Some studies used promotility agents in all patients, some used these agents only if residuals were present, and some studies did not use these agents.

Participants included in the review
Studies of hospitalised adult post-operative, trauma, head injured, burns or medical intensive care unit (ICU) patients were eligible for inclusion. The included studies were of medical, neurosurgical and trauma patients.

Outcomes assessed in the review
Studies that reported nosocomial pneumonia, average caloric goal achieved, average daily caloric intake, time to start of tube feeds, time to reach caloric goal, ICU length of stay, or mortality were eligible for inclusion.

How were decisions on the relevance of primary studies made?
Two reviewers independently selected the studies.

Assessment of study quality
The authors did not state that they assessed validity.

Data extraction
Two reviewers independently extracted the data. Where standard deviations were not reported, they were estimated from available data (details of the methods used were given). For each study, the incidence of pneumonia and the percentage of patients reaching caloric goals were tabulated.

Methods of synthesis
How were the studies combined?
The studies were combined in a meta-analysis. The pooled odds ratios (OR) and 95% confidence intervals (CIs) were calculated for dichotomous data using a random-effects model. Pooled weighted mean differences (WMDs) and 95% CIs were estimated for continuous data.

How were differences between studies investigated?
Statistical heterogeneity was tested using the chi-squared statistic, with a P-value of less than 0.05 taken to indicate significant heterogeneity. The results for studies reporting pneumonia and the percentage of patients reaching caloric goals were presented in forest plots.

Results of the review
Nine RCTs (522 patients) were included.

The meta-analysis showed no significant difference between gastric and post-pyloric feeding for pneumonia, percentage of patients reaching caloric goal, mean total caloric intake, ICU length of stay, or mortality.

Pneumonia (7 RCTs): the OR was 1.44 (95% CI: 0.84, 2.46, P=0.19). No significant heterogeneity was detected (P=0.53).

Percentage of patients reaching caloric goal: (5 RCTs): the WMD was 5.2% (95% CI: -18, 7.5, P=0.4). Significant heterogeneity was detected (P<0.00001).

Mean total caloric intake (5 RCTs): the WMD was 169 calories (95% CI: -320, 34, P=0.009).

ICU length of stay (5 RCTs): the WMD was -1.4 days (95% CI: -3.7, 0.85, P=0.2).

Mortality (7 RCTs): the OR was 1.08 (95% CI: 0.69, 1.68, P=0.7).

The meta-analysis showed that gastric feeding significantly reduced the time till the start of enteral feeding compared with post-pyloric feeding; the WMD (3 RCTs) was 16.0 hours (95% CI: -19.5, -12.6, P<0.00001). There was no significant difference between gastric and post-pyloric (jejunal) feeding for the time to reach caloric goal; the WMD (4 RCTs) was 0.78 hours (95% CI: -3.76, 2.19, P=0.6).

Authors' conclusions
The studies found no difference between gastric and post-pyloric feeding in critically ill patients for pneumonia, mortality and ICU length of stay. However, the number of patients might have been too small to detect a clinically important difference.

CRD commentary
The review question was clear in terms of the study design, participants, intervention and outcomes. Several relevant sources were searched and the search terms were stated, but it was not stated whether any language limitations were applied. In addition, there was no attempt to locate unpublished studies, thus raising the possibility of publication bias. Two reviewers independently selected the studies and extracted the data, which reduces the potential for bias and errors. Only RCTs were included, but the quality of the included studies was not assessed.

Some relevant information on the included studies was tabulated. The data were combined in a meta-analysis and statistical heterogeneity was assessed. The authors stated that significant heterogeneity between the studies was detected for several outcomes, but the results from statistical tests for heterogeneity were only presented for pneumonia and the percentage of patients reaching caloric goals. The finding of significant heterogeneity suggests that a meta-analysis may not have been appropriate for summarising some outcomes of the studies. The authors acknowledged that heterogeneity was one of the limitations of the review, but did not explore potential reasons for this heterogeneity. As the authors correctly stated in their conclusion, the lack of a significant difference between the treatments might have been due to the small number of patients in the identified studies.
Implications of the review for practice and research

Practice: The authors emphasised the limitations of the data available but made recommendations, which they stated were based on the review and their clinical expertise. They recommended that critically ill patients who are not at risk of aspiration should have a nasogastric or orogastric tube inserted on admission to the ICU and that promotility agents be considered if there are high gastric residual volumes. They stated that patients who cannot tolerate gastric tube feeding, or who have reflux or documented aspiration, should have a small intestinal tube inserted. Patients undergoing major abdominal surgery who are at risk of gastric paresis should have a small bowel tube inserted during surgery.

Research: The authors did not state any implications for further research.

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