Teaching hospitals and quality of care: a review of the literature
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Authors' objectives
To evaluate the relative quality of care in United States (U.S.) teaching and non-teaching hospitals.

Searching
MEDLINE was searched from 1985 to 2001 for articles that contained at least one keyword from each of the following two groups.

Group 1: 'Academic medical centers', 'hospitals, teaching', 'hospitals, university', 'hospital characteristics'.

Group 2: 'Quality of health care', 'quality indicators', 'health care', 'outcome and process assessment (health care)'.

The authors also stated that they carried out a literature search using Ovid; however, it is unclear what specific databases were searched. The reference lists of relevant studies were also examined.

Study selection
Study designs of evaluations included in the review
The study designs eligible for inclusion were not explicitly stated. All of the included studies were observational studies.

Specific interventions included in the review
Studies comparing U.S. teaching and non-teaching hospitals for quality of care were included. The majority of studies included hospitals classified as major teaching hospitals, other teaching hospitals or non-teaching hospitals. The included studies based their definition of hospital teaching status on the ratio of interns and residents to the number of beds (IRB); being the 'flagship' hospital of a medical school or medical school affiliation with residency programmes; membership of the Council of Teaching Hospitals of the Association of American Medical Colleges; and having a paediatric residency programme.

Participants included in the review
The participants eligible for inclusion were not explicitly stated. Seven of the studies included hospital patients with all diagnoses (one of which was all diagnoses admitted to an intensive care unit). The participants in the other included studies had myocardial infarction, congestive heart failure, pneumonia, stroke, hip fracture, obstructive airway disease, gastrointestinal haemorrhage, HIV/AIDS-related diagnosis, carotid endarterectomy, lower extremity bypass grafting or abdominal aortic aneurysm repair, open or laparoscopic cholecystectomy, stomach operations, intestinal operations, hysterectomy and hip replacement; or were women receiving obstetrical care. One study had participants with all diagnoses in a paediatric intensive care unit and one had low birth weight infants.

Outcomes assessed in the review
Studies assessing quality of care were included. Studies reporting process measures such as the appropriate use of drugs that have been shown to improve outcomes, or outcome measures such as risk-adjusted mortality rates or preventable adverse events that could be related to processes of care, were also included. Studies were excluded if they examined only structural measures such as hospital staffing, or compared resource use such as costs or length of stay, unless they also investigated quality of care using process or outcome measures. The included studies used outcome measures such as the following: adverse events; mortality; process measures; the use of aspirin, beta-blockers, angiotensin-converting enzyme (ACE) inhibitors and reperfusion therapy; preventable adverse drug events; patient assessment of hospital quality; myocardial infarction; cerebrovascular accident; hip fracture; post-operative complications; and problems in care identified through peer-review.

How were decisions on the relevance of primary studies made?
The authors do not state how the papers were selected for the review, or how many of the reviewers performed the
Assessment of study quality
The authors assessed the papers based on their definition of teaching status, the generalisability of the study population, and the strength of their quality measures and risk-adjustment methods. The authors do not state how many of the reviewers performed the validity assessment.

Data extraction
The authors do not state how the data were extracted for the review, or how many of the reviewers performed the data extraction.

Methods of synthesis
How were the studies combined?
A narrative synthesis was undertaken.

How were differences between studies investigated?
The studies were grouped according to whether they used data from medical records or from administrative records. Studies using data from medical records were further grouped into medical and surgical care of adults, and paediatric and neonatal intensive care.

Results of the review
Twenty studies of observational design were included (n=452,226 for the studies that reported the number of patients included; n=807,846 for the studies that reported the number of records included). The number of participants or records was not available for three studies.

Data from medical records.
Medical and surgical care of adults (7 studies).
Of the two studies examining adverse events, one reported more frequent adverse events in major teaching hospitals than in non-teaching hospitals, although they were less often due to negligence. The second study reported lower rates of preventable adverse drug events in major teaching hospitals, compared with other hospitals, but similar rates of preventable adverse events in general and in relation to procedures and diagnoses. Two studies found lower in-hospital mortality in major teaching hospitals. For one of these studies the effect was dependent upon the particular definition of teaching hospital status used. For the other study the effect was significant for all diagnoses and for some individual diagnoses. Two studies found lower 30-day mortality in major teaching compared with non-teaching hospitals. One of these studies also found better overall process measures of quality. The other study found greater use of beta-blockers and ACE inhibitors, but no difference in reperfusion therapy for ideal candidates. The final study found better overall quality of care, similar quality of therapeutic care, and worse quality of nursing care in major teaching hospitals in comparison with non-teaching hospitals.

Paediatric and neonatal intensive care (2 studies). One study found higher adjusted in-hospital mortality rates in teaching hospitals, compared with non-teaching hospitals, whereas the other study found similar mortality rates within 28 days of giving birth.

Data from administrative records (11 studies).
Four of the studies found lower mortality rates in teaching than non-teaching hospitals. In one of the studies the lower 30-day mortality rate was for private teaching hospitals, but not public hospitals. In a second study, although there were lower long-term mortality rates overall and for hip fracture, the rates for the two other conditions were similar.

One study found that mortality was lowest in limited teaching hospitals followed by major teaching hospitals, than in
non-teaching hospitals.

One study found that there were fewer problems detected by peer-review organisations in teaching than in non-teaching hospitals.

Two studies found similar mortality rates for both hospital types. For one of these studies, although the 30-day mortality rates were similar, the 90-day rates were higher for teaching hospitals. A third study found similar outcomes of hospital death, myocardial infarction and cerebrovascular accident. A further study, based on patient assessments, found similar quality assessments for both hospital types.

One study found more frequent post-operative complications for three types of surgery in teaching hospitals than in non-teaching hospitals.

**Authors' conclusions**
The authors concluded that the data support an association between quality of care and teaching hospital status, though the finding varied for particular conditions.

**CRD commentary**
The review question was clear in terms of the intervention and outcomes. However, the eligibility criteria for study designs and participants were not stated. It is unclear what databases were searched in addition to MEDLINE, therefore it is difficult to assess the adequacy of the literature searches. Since only studies of U.S. teaching hospitals were included in the review, it is unlikely that the inclusion of English language articles only had any impact. No attempt was made to identify unpublished research and no assessment was carried out of possible publication bias. The study selection, data extraction and quality assessment processes do not appear to have been carried out in duplicate, which would have helped reduce bias and error. It was appropriate to carry out a narrative synthesis of the data given the diversity of studies included, and sufficient details of the individual studies were provided in the text and accompanying tables. Although the authors carried out a quality assessment and the study findings were discussed within the context of study quality, it is unclear how systematic the quality assessment was. The authors’ conclusions appear to follow from the evidence presented, though given the restriction to U.S. teaching hospitals the generalisability of the findings are limited.

**Implications of the review for practice and research**
Practice: The authors state that their findings can help all relevant parties make better informed decisions about the best hospital type for patients with a range of conditions.

Research: The authors state that future studies should use more refined statistical methods to address confounding and selection bias.

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.