Surgical adverse events: a systematic review
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CRD summary
This review aimed to identify the adverse events associated with surgery to help target patient safety improvement efforts. The authors concluded that efforts should not only target errors in surgical technique but also non-operative management. The evidence base was insufficient to completely answer the review question. The findings should be interpreted with caution as they may not be reliable.

Authors' objectives
To identify the adverse events associated with surgery to help target patient safety improvement efforts.

Searching
Five databases including MEDLINE and the Cochrane Library were searched up to February 2011 for peer-reviewed articles in English. Search strategies were reported in supplementary data. Reference lists from eligible articles were searched manually.

Study selection
Clinical studies that assessed the frequency of adverse events (as defined in the review) in adult surgical patients in an acute hospital setting were eligible for inclusion. Secondary outcomes were severity of outcomes and their preventability, consequences and causation. Abstracts were excluded, as were studies that incorporated only single subspecialties of general surgery.

Included studies were conducted in nine countries including one study in England and one in Scotland. Study periods ranged from 1984 to 2005. Studies included between one and 51 hospitals. Most studies included all surgical populations. All studies except one used a two-stage method for reviewing adverse events that included initial screening of criteria by trained nurses, trained reviewers or medical students followed by a review by physicians. Most studies included adverse events that occurred before or during the index hospital admission and detected during the index admission.

Two reviewers independently screened studies for inclusion. Disagreements were resolved through referral to a third reviewer.

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

Data extraction
Data on frequency, severity, preventability, consequences and causation of surgical adverse events were extracted to calculate medians (%) and interquartile ranges (IQR).

It appeared that two reviewers extracted outcome data.

Methods of synthesis
Outcome data were grouped into common categories for adverse event severity (minor, moderate, severe or fatal).

Results of the review
Fourteen retrospective record review studies (approximately 16,424 patients) were included in the review.

A median of 14.4% (IQR 12.5% to 20.1%) of surgical patients experienced at least one event (six studies); the severity of adverse events was mostly minor (median 40.5%, IQR 28.6% to 42.4%) or moderate (median 35.3%, IQR 34.5% to 44.3%).

The median frequency of adverse events per surgical patient was 11.6% (IQR 6.1% to 16.2%; six studies). A median of
5.2% of surgical patients (IQR 4.2% to 7.0%; four studies) had one or more potentially preventable adverse events and a median of 4.4% of surgical patients (IQR 3.2% to 5.7%; two studies) had preventable adverse events.

The most frequent consequences of surgical adverse events were wound problems and genitourinary, cardiovascular and gastrointestinal consequences (three studies). The most frequent potentially preventable surgical adverse event consequences were wound problems, followed by bleeding, sepsis (including abscess) and cardiovascular consequences (two studies).

The most frequent causes of surgical adverse events included non-operative management errors. These included monitoring, incorrect or delayed treatment and diagnostic error or delay. Other secondary outcome results were reported in the review.

**Authors’ conclusions**

The authors appeared to conclude that analysis of surgical adverse event causation demonstrated that patient safety improvement efforts should not only target errors in surgical technique but also focus on non-operative management.

**CRD commentary**

The review question and supporting criteria were stated clearly. Several sources were searched for relevant data. The search was restricted by language and publication status so relevant data may have been missed. Screening of studies and data extraction were performed in duplicate which reduced potential for reviewer error and bias.

There was considerable heterogeneity between the review studies and data were collected across various countries and time points so the generalisability of the findings was unclear. The included studies were retrospective and only a small number of studies reported on the various outcomes.

The authors acknowledged that the review question was only partly answered due to insufficient evidence. Their recommendations for patient safety improvement efforts were based on limited evidence and should therefore be interpreted with caution as they may not be reliable.

**Implications of the review for practice and research**

**Practice:** The authors stated that patient safety improvement efforts should not only target errors in surgical technique but also focus on non-operative management.

**Research:** The authors stated that more rigorous studies were required and should include all admitted patients and detect all adverse events occurring as a consequence of the index hospital admission with postdischarge follow-up.

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