Capture-mark-recapture to estimate the number of missed articles for systematic reviews in surgery

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Abstract

BACKGROUND: Systematic reviews are an important knowledge synthesis tool, but with new literature available each day, reviewers must balance identifying all relevant literature against timely synthesis.

METHODS: This study tested capture-mark-recapture (CMR), an ecology-based technique, to estimate the total number of articles in the literature identified in a systematic review of adult trauma care quality indicators.

RESULTS: The systematic review included 40 articles identified from online searches and citation references. The CMR model suggested that 3 (95% confidence interval [CI]: 0 to 6) articles were missed and the database search provided 93% (one-sided 95% CI: 83%) of known articles for inclusion in the systematic review. The search order used for identifying the articles was optimal among the 24 that could have been used.

CONCLUSIONS: The CMR technique can be used in systematic reviews in surgery to estimate the closeness to capturing the total body of literature for a specific topic.

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Systematic reviews are increasingly used in surgery to synthesize knowledge so that evidence can inform clinical practice (eg, guideline development). Exhaustive searching in multiple large bibliographic databases is time consuming and resource intensive, but it needs to be efficient so the results are presented before the information becomes outdated. However, this is difficult because the amount of literature that exists on any given topic is unknown.

Capture-mark-recapture (CMR) is a technique originating in ecology that has been applied to systematic reviews of randomized controlled trials of interventions in osteoporosis, gastroenterology, and hematology1–3 to estimate
We performed a scoping review to identify quality indicators for evaluating trauma care and subsequently systematically reviewed the evidence. Our search of MEDLINE, Embase, and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) identified 6,362 articles (titles or abstracts reviewed) of which 186 included quality indicators for evaluating trauma care and subsequently included in systematic review. The search order used for identifying the articles was optimal among the 24 that could have been used.

CMR is a technique that can be applied to estimate the total number of relevant articles for a given topic. This study demonstrates that CMR can be successfully used for systematic reviews of observational studies in surgery. Future systematic reviews may consider including horizon estimates as possible stopping rules (eg, search until 80% of articles captured) to identify when a sufficient literature search has been completed. CMR may help improve the completeness and efficiency of systematic reviews.

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Author Contributions:

Study concept and design: Stelfox, Foster, Goldsmith; Acquisition of data: Stelfox; Analysis and interpretation of data: Stelfox, Foster, Niven, Kirkpatrick, Goldsmith; Draft of the manuscript: Stelfox; Critical revision of the manuscript: Stelfox, Foster, Niven, Kirkpatrick, Goldsmith; Statistical analysis: Foster, Goldsmith; Administrative, technical, or material support: Stelfox; Study supervision: Stelfox, Goldsmith.

### References


### Table 1

<table>
<thead>
<tr>
<th>Databases</th>
<th>Articles selected for full text review (n = 186)</th>
<th>Articles included in systematic review (n = 40)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Known articles (Horizon estimate) (95% CI)</td>
<td>Missing articles (Horizon estimate) (95% CI)</td>
</tr>
<tr>
<td>MEDLINE</td>
<td>155</td>
<td>NA</td>
</tr>
<tr>
<td>MEDLINE + Embase</td>
<td>174</td>
<td>186 (180–194)</td>
</tr>
<tr>
<td>MEDLINE + Embase + CINAHL</td>
<td>186</td>
<td>236 (211–284)</td>
</tr>
</tbody>
</table>

CI = confidence interval; CINAHL = Cumulative Index to Nursing and Allied Health Literature; NA = not available.