Supplementary searches of PubMed to improve currency of MEDLINE and MEDLINE In-Process searches via Ovid

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Objective: The research investigated whether conducting a supplementary search of PubMed in addition to the main MEDLINE (Ovid) search for a systematic review is worthwhile and to ascertain whether this PubMed search can be conducted quickly and if it retrieves unique, recently published, and ahead-of-print studies that are subsequently considered for inclusion in the final systematic review.

Methods: Searches of PubMed were conducted after MEDLINE (Ovid) and MEDLINE In-Process (Ovid) searches had been completed for seven recent reviews. The searches were limited to records not in MEDLINE or MEDLINE In-Process (Ovid).

Results: Additional unique records were identified for all of the investigated reviews. Search strategies were adapted quickly to run in PubMed, and reviewer screening of the results was not time consuming. For each of the investigated reviews, studies were ordered for full screening; in six cases, studies retrieved from the supplementary PubMed searches were included in the final systematic review.

Conclusion: Supplementary searching of PubMed for studies unavailable elsewhere is worthwhile and improves the currency of the systematic reviews.

Keywords and Medical Subject Headings (MeSH): Databases, Bibliographic; Information Storage and Retrieval; Medical Subject Headings; MEDLINE; PubMed; Review Literature as Topic

When conducting comprehensive literature searches for systematic reviews of health care interventions, searchers almost always include one bibliographic database, MEDLINE. MEDLINE content can be searched via several search interfaces, the majority of which are provided by fee-based subscription services (e.g., Ovid, EBSCO, or ProQuest), although it can be accessed for free using PubMed. When searching for systematic reviews, PubMed has been shown to have a higher retrieval rate than fee-based versions of MEDLINE, such as Ovid [1]. PubMed enables users to search MEDLINE, PubMed citations that will never be indexed on MEDLINE, and other sources, such as online books. Despite this and the fact that PubMed is freely available, many information specialists prefer to search using sophisticated interfaces (usually fee-based) that enable the design of complex search strategies.

PubMed has relatively limited search capabilities. For example, proximity searching is not possible and truncation is limited to the first 600 variations. The lack of proximity search operators can be a significant hindrance when attempting to conduct searches for systematic reviews in PubMed, as phrase searching or use of the Boolean "AND" to combine terms are the only alternatives. This can produce a search strategy that is either too precise when using phrases or too sensitive when using the Boolean "AND." Searching MEDLINE via more sophisticated interfaces enables much greater flexibility when conducting searches for systematic reviews, allowing information specialists to find a better balance between precision and sensitivity that is not possible in PubMed.

Migration of records from PubMed into fee-based subscription services is usually quite timely. Studies indicate that indexed MEDLINE records and

MEDLINE In-Process records can be available on Ovid within 2–3 days of being available on PubMed [2, 3]. However, 2% of PubMed records are still not found on MEDLINE [2], as fee-based subscription services such as Ovid do not provide the subset of PubMed that includes ahead-of-print articles [4]. The "ahead of print" citations preceding the article's final publication are of particular interest to this investigation [5]. Ahead-of-print citations do not move to In-Process on PubMed until their publication in final or print format.

METHODS

The authors searched PubMed after MEDLINE (Ovid) and MEDLINE In-Process (Ovid) searches had been completed for seven recent reviews that Kleijnen Systematic Reviews had conducted [6–12]. The MEDLINE (Ovid) search strategies were not translated verbatim to run in PubMed. Due to the different levels of functionality in search interfaces referred to above, exact translation was not feasible; and in this instance, the objective was not to duplicate searches, rather to supplement them. It is also important to note that, as we were searching for records that were not indexed in MEDLINE, it was not possible to use Medical Subject Headings (MeSH) terms, so only free-text terms could be used. Search strategies were simplified while retaining the original conceptual structure of the MEDLINE (Ovid) search strategy. The PubMed search strategy used phrase searching predominantly to replace search lines where proximity operators had been used, rather than using the Boolean "AND." Furthermore, PubMed does not accept truncation when phrase searching, so we had to use numerous phrases to capture as many variations as possible. For example, the following line from the original MEDLINE (Ovid) search strategy was replaced with a line of phrases:

(prostate adj3 (carcinoma$ or cancer$)).ti,ab.

"prostate carcinoma"[tiab] or "prostate carcinomas"[tiab] or "prostate cancer"[tiab] or "prostate cancers"[tiab] or "prostate cancerous"[tiab]

The searches were then limited to records not in MEDLINE or MEDLINE In-Process, using the following limit:

(pubstatusaheadofprint OR publisher[sb] OR pubmednotmedline[sb])

RESULTS

The PubMed searches for all seven systematic reviews [6–12] identified additional unique records (Table 1). These unique records consisted primarily of ahead-of-print citations. A description of records indexed in PubMed, but not in MEDLINE, is available from the National Library of Medicine [13]. A description of PubMed record status is also available [5].

After screening the title and abstracts of these unique records, the review teams retrieved full-text articles for further analysis in each case. In 6 of the 7 cases, at least 1 record met the inclusion criteria of the systematic review [14–19]. Reviewer screening time took on average between 30 and 40 minutes. The average number of unique records identified by the PubMed supplementary searches was 160 (median 53, range 633). The average time for an included study record to move from PubMed to MEDLINE In-Process was 3.3 months (median 3.5 months, range 5 months), and from PubMed to MEDLINE was 10.5 months (median 10.5 months, range 12 months).

DISCUSSION

Our study indicates that there is sufficient time-lag between a record entering PubMed before it reaches MEDLINE (fully indexed or In-Process) to influence the results of a systematic review. In some cases, it appears that the time-lag can be considerable, as was the case with one study [14], which took more than six months to move from entry into PubMed to in process status and a further year to be finally indexed for MEDLINE.

The literature searches used during this investigation were relatively straightforward, easily translated, and quickly conducted. It may be of interest to explore whether it is possible to justify simplifying longer, more complex search strategies. At what point does translating and conducting a supplementary PubMed search become too time consuming and unjustified? A good example of a complex literature search would be for a review with various different strands requiring separate searches: clinical effectiveness, cost effectiveness, adverse events, and health-related quality of life (HRQoL). It is possible that the clinical effectiveness search strategy in such a scenario might be relatively straightforward to translate, but it is rarely, if at all possible, to easily translate searches for adverse

Systematic review: included study	Date included study was added to PubMed	Date included study was added to In-Process	Date included study was indexed for MEDLINE	Date of supplementary PubMed Search
Prostate cancer review [6]: included study [15]	2014/03/04	2014/04/03	2014/07/06	2014/03/05
Cannabis review [7]: included study [14]	2014/01/05	2014/07/22	2015/05/27	2014/04/14
Cannabis update review [8]: included study [17]	2015/04/07	2015/06/29	2016/04/01	2015/04/08
MiniMed diabetes review* [9]	—	—	—	2014/09/05
SHPT review [10]: included study [18]	2014/10/23	2015/04/01	2016/02/16	2015/01/15
Incontinence review [11]: included study [19]	2015/02/01	2015/06/26	2015/09/15	2015/05/18
PCT review [12]: included study [16]	2014/07/10	2014/08/01	2015/04/20	2014/07/14

* There were no included studies that were identified by the supplementary PubMed search for this review.
PCT=procalcitonin testing, SHPT=secondary hyperparathyroidism.
The table reports the date on which each included study that was identified by the supplementary PubMed search was entered into PubMed and the dates that the included study moved to a different section of PubMed. Also reported is the date when the supplementary PubMed search was conducted for each systematic review.

Table 1

PubMed citation status of included studies that were identified by supplementary searches and the date that the supplementary searches were conducted

events or HRQoL. Further, it could be that the search strategy is straightforward to adapt and conduct, but if the search results are large, the time that reviewers spend screening might exceed acceptable limits.

LIMITATIONS

Our investigation was based on supplementary PubMed searches for only seven, quite diverse, in-house systematic reviews conducted by Kleijnen Systematic Reviews. A longer-term investigation of many more systematic reviews, produced by a range of different organizations, is required to test the generalizability of our findings.

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