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REDUCING WORKLOAD IN SYSTEMATIC REVIEWS ON MEDICATION MANAGEMENT

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Background

- Systematic reviews are essential for evidence-based decision-making in hospital pharmacy but require labor-intensive manual screening (title/abstracts) prone to error due to the large numbers of irrelevant records.

- Large language models have enabled artificial intelligence tools using active learning (AL)-assisted screening.

- AL-assisted screening ranks abstracts by inclusion probability, updating as decisions are made. AL-based tools (e.g. ASReview) may reduce the screening workload [1].

Objectives

- Determine if AL-assisted screening can indeed *reduce screening workload* without increasing the risk of missing relevant articles.

- Determine if AL-assisted screening tools may help *minimize human screening errors.*

- To develop *practical guidance* on how to use the AL-assisted screening tool ASReview in the best possible way, including which settings to choose for the tool to work most effectively.

Conclusions

- ASReviews assisted screening **can reduce screening workload by almost 90%** whilst maintaining accuracy of full text includes comparable or better than that of manual screening.

- ASReview can also **aid in identifying human errors** in manual screening.

- Optimal parameters depend on dataset characteristics: full-text labeling is best for most, but title/abstract labelling with simpler models may be preferable when the overall proportion of includes in the final systematic review is very low.
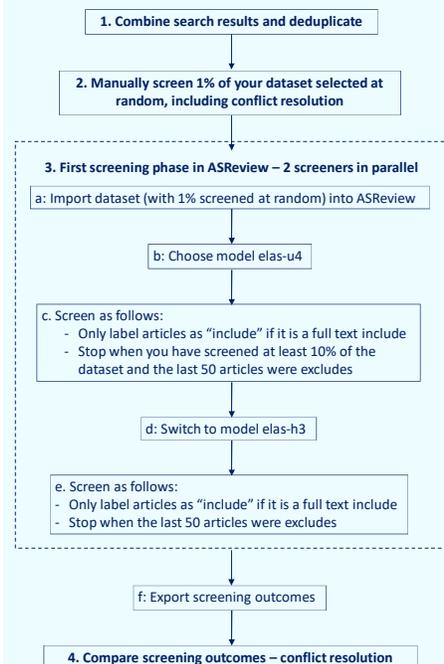
Methods

- ASReview was used, an open-source tool for AL-assisted screening.

- Screening of four large systematic review datasets was simulated using ASReview. The systematic reviews focused on summarizing prescribing cascades, adverse drug reactions/events, hospital pharmacy interventions on length of stay, and pharmacy technician interventions on wards.

- The four systematic review datasets had 3475–16,218 records; eventually, 0.08–1% of articles was included in the final systematic review.

- ASReview parameters were systematically varied [2], including labeling strategies. Since ASReview learns from each new labeled record, accurate labeling is critical for tool performance.

    - In title/abstract labeling, only the title/abstract is used to label potential includes. Final inclusion is determined in a second stage based on reviewing the full text, and initial title/abstract include labels are often incorrect.

    - In full-text labeling, an include label of a paper is determined after reading the complete article.

- In addition, ASReview was trained with 1% of random abstracts, and including at least one relevant article. The top 100 records selected by the tool were manually checked by dataset lead researcher to detect missed inclusions.

- Primary outcome: screening efficiency; secondary outcome: human error detection.

- Descriptive analysis was used.

Results

- ASReview reduced records to screen by ~90% while maintaining sensitivity.

- For three datasets, optimal performance was achieved with recommended ASReview parameters [2] and full-text labeling (100% full-text includes, 89–90% screening reduction).

- For the largest dataset (16,218 abstracts, 0.08% eventual included articles), 87% of full-text includes were detected with the ASReview parameters and full-text labeling. With simpler models and title/abstract labeling 100% detection was achieved.

- In two datasets, ASReview identified an additional article inclusion in the top 100 which was mistakenly excluded during the initial manual title/abstract screening.

- The proposed workflow (see flowchart) shows a practical guidance for using ASReview for most systematic reviews.

Proposed workflow for screening with ASReview

1. Combine search results and deduplicate

2. Manually screen 1% of your dataset selected at random, including conflict resolution

3. First screening phase in ASReview – 2 screeners in parallel
   a: Import dataset (with 1% screened at random) into ASReview
   b: Choose model elas-u4
   c: Screen as follows:
      - Only label articles as "include" if it is a full text include
      - Stop when you have screened at least 10% of the dataset and the last 50 articles were excludes
   d: Switch to model elas-h3
   e: Screen as follows:
      - Only label articles as "include" if it is a full text include
      - Stop when the last 50 articles were excludes

   f: Export screening outcomes

4. Compare screening outcomes – conflict resolution

More details on the study setup & outcomes

Verdonschot et al. (2025)
https://doi.org/10.1101/2025.09.26.25336705

References

1. Van de Schoot et al. (2021).
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