Scoping reviews and their role in reducing research waste in health research

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Declaration of interest

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Objective

Scoping reviews and evidence map methodologies are increasingly being used by researchers. The objective of this article is to examine how scoping reviews can reduce research waste.

Study design and setting

This article summarises the key issues facing the research community regarding research waste and how scoping reviews can make an important contribution to the reduction of research waste in both primary and secondary research.

Results

The problem of research waste is an enduring challenge for global health, leading to a waste of human and financial resources and producing research outputs that do not provide answers to the most pressing research questions. Research waste occurs within primary research but also in secondary research such as evidence syntheses. The focus of scoping reviews on characterising the nature of existing evidence on a topic and of including all types of evidence, potentially reduces research waste in five ways: (i) identifying key research gaps on a topic, (ii) determining appropriate outcome measures, (iii) mapping existing methodological approaches, (iv) developing a consistent understanding of terms and concepts used in existing evidence, and (v) ensuring scoping reviews do not exacerbate the issue of research waste

Conclusion

To ensure that scoping reviews do not themselves end up contributing to research waste, it is important to register the scoping review and to ensure that international reporting standards and methodological guidance are followed.

Key words

Scoping reviews, research waste, quality, methodology, reporting

Highlights

Key findings

What this adds to what is known

- Research waste can occur in all stages of the research process from posing an irrelevant question, lack of stakeholders' contribution to the research, unfounded rationale for the research, and bias or underreporting of research data with negative results.
- The causes of research waste include poor study design, poor reporting, or poor dissemination.
- Scoping reviews potentially reduce research waste in five ways: (i) identifying type of research question and ensuring their registration before undertaking them (ii) identifying key research gaps on a topic, (iii) determining appropriate outcome measures, (iv) mapping existing methodological approaches, (v) developing a consistent understanding of terms and concepts used in existing evidence, and (v) ensuring scoping reviews do not exacerbate the issue of research waste.

What are the implications and what should change now

- We recommend researchers should look for any existing scoping reviews before embarking on any research topic. If the intention of the research is to identify areas of future research, then a scoping review should be conducted. This will help with reducing research waste by enabling researchers to map the areas that have been already researched and identify new areas for further research. This will result in reducing duplication of research that has already been undertaken

- It is important to register the protocol and to ensure that international reporting standards and methodological guidance are followed so scoping reviews do not themselves end up contributing to research waste.

Introduction

The phenomenon of 'research waste', defined briefly as 'research outcomes with no societal benefits' was first described early in 1994,(1) when statistician Douglas G Altman identified that considerable sums of money were being spent on research with inappropriate designs, unrepresentative samples, small sample sizes, incorrect methods of analysis, and inaccurate interpretation of results. (1, 2)The term was compared by Altman to a doctor who uses the incorrect treatment to manage patients, a strategy that is considered unethical and unprofessional. (3) He stated such physicians are akin to researchers who use inappropriate statistical methods to analyse data and should equally attract scandal. Altman further highlighted that many journals do not undertake statistical reviews of manuscripts submitted as part of the peer review process and this also drives manuscripts being published that do not demonstrate methodological rigor at one or all levels of the research process.(3)

Research waste can occur in all stages of the research process from posing an irrelevant question, lack of stakeholders' contribution to the research, unfounded rationale for the research, and bias or underreporting of research data with negative results.(2) Sources of research waste have been categorised by Macleod et al., into five main areas, which are: relevance of research questions to end users, the appropriateness of the research design, methods and analysis used to address the research question, the efficiency of research regulation and management in getting ethics approval and other compliance checks, the accessibility of research information including both published and unpublished work and finally, the quality of research produced and the relevance of the context used and its interpretation in the context of systematic assessment of other relevant evidence.(4)

Research could be wasteful, due to poor dissemination, poor reporting or poor study design.(5) Not being able to access research that is already undertaken can be detrimental to patients. The authors highlighted that a recent systematic review of 79 studies reported in abstracts found that only about half of them, were published after 9 years and the remainder was not published. This is a form of research waste due to the unavailability of the results to the end user. (5, 6) The authors also added that 90% of the money spent was on basic research and the remainder was on its evaluation.(6)

In 2012, Begley and Ellis discussed the lack of reproducibility of the results obtained in certain studies as an important challenge to research production and a contributing factor to research waste.(7, 8) The authors attributed this issue to the lack of rigour in reporting the results and the preference of journal editors to publish studies with positive results, which in turn leads to more research undertaken based on inconclusive and unrealistic results and therefore increase the problem of research waste.(7)

To reduce research waste and its associated costs to society, several researchers raised important issues to be considered by funders and researchers to improve transparency and reduce unnecessary research.(2, 4, 5, 9, 10) Strategies such as improving the yield from basic research by increasing publication of both positive and negative studies should be properly investigated in order to pursue early promising results that are reliable and could further lead to more applicable clinical research for patients' benefits.(4) Other initiatives such as transparency of funders' choices to fund research should be made public, any research that is currently in progress and showing promising results should be further strengthened by funders and lastly, any research undertaken should be based on an appropriate body of evidence. This recommendation highlighted the importance of systematic reviews in reducing waste.(4)

Systematic reviews, when conducted and reported rigorously and reproducibly, have been acknowledged as a solution to reducing research waste by identifying priority research questions and

highlighting where there is certainty in the evidence.(2) Systematic reviews can identify research waste with cumulative meta-analysis and highlight when further trials may not be necessary (11) Despite the contribution of systematic reviews to the reduction in research waste, researchers have argued that some systematic reviews might also contribute to research waste themselves due to their inclusion of small studies or studies of poor quality that can produce an uncertain effect size.(12) Some authors have lobbied for the exclusion of small quantitative studies by funders as they cannot contribute to a body of evidence that can be included in reviews.(13) This is especially important when the small studies are of poor quality and have bias concerns, in turn render the results of the systematic reviews inconclusive and lacking any usable recommendations for practice. (14) Although, systematic reviews which may have included small studies that are poor quality might help in providing recommendations for future research.

While systematic reviews can contribute to reducing research waste, they are not necessarily the best or only way to create this reduction as they generally focus on a narrow research question and typically include limited study designs with potentially narrow research strategies(12). Many systematic reviews result in inconclusive results due to reasons such as heterogeneity of studies, small sample sizes, and the lack of methodological rigour in the included studies and poor quality of systematic reviews.(15) In some areas, inconclusive systematic reviews represent 30% of all published systematic reviews.(15) Up to April 2020, only 40 Cochrane reviews (out of approx. 7,700) were declared as stable or closed and no more updates were needed.(16, 17) To avoid research waste, utilising the correct methodology of evidence synthesis has the potential to result in usable results that can inform practice and research. Therefore, it is important to recognise the importance of all types of evidence synthesis, and their individual purposes and rationale. For example, systematic reviews are not appropriate when mapping the available evidence and are better suited to answering questions of intervention, prognosis, aetiology and screening, and patient experiences.

In this paper, we propose that scoping reviews can be a feasible methodology to address research waste and can substantially reduce research wastage. Scoping reviews have been defined as a *"type of **evidence synthesis** that aim to systematically identify and map the breadth of evidence available on a particular topic, field, concept, or issue, often irrespective of source (i.e. primary research, reviews, non-empirical evidence) within or across particular contexts."* (18) Scoping reviews can be a useful tool to respond to the increasing research waste crisis as they can identify clearly where research has been conducted previously and where research is required to be undertaken. (19) We detail below several ways in which scoping reviews have the potential to reduce waste along with illustrations to support our argument as shown in Figure 1.

Methods in the development of these recommendations

These recommendations were developed by the JBI scoping review methodology group. JBI is a global research organisation that focusses on the development of methodological guidance. The group includes methodologists, researchers, clinicians, and a consumer(patient) representative who are all evidence synthesis experts. The recommendations detailed here are based on the available guidance and the experience of the JBI methodology grou. The recommendations made within this article should be used as suggestive practices to encourage the use of scoping reviews where appropriate.

1. **Ensuring scoping reviews do not exacerbate the issue of research waste**

Although scoping reviews have the potential to reduce research waste it is important to ensure they do not contribute to waste themselves. Scoping reviews have been deemed problematic due to

inconsistent methodological approaches undertaken by reviewers. Scoping reviewers should therefore follow appropriate conduct (JBI guidance on scoping reviews) and reporting (PRISMA-ScR) guidance and ensure the involvement of knowledge users in the development and prioritisation of research questions to reduce the unescessary work being conducted. (20-22) In addition, as with systematic reviews, scoping review protocols should be registered in advance to avoid duplication of effort.e Although PROSPERO does not current accept the registration of scoping review protocols. However, OpenScience Framework, Figshare and protocols.io (https://www.protocols.io/) are websites that will allow for scoping review protocols to be placed online to increase transparency or to be registered. (22, 23)

Another consideration in ensuring scoping reviews are not contributing to research waste is using the right methodology to answer research questions. The expansion of knowledge synthesis methodologies make it challenging to choose the right methodology for the right review. Amog et al., have developed a "Right Review tool" (https://whatreviewisrightforyou.knowledgetranslation.net/) to help reseachers to select the right methodology for the right question of the research. The tool consists of 15 questions that enable the researcher to choose from 41 methods and guidance of evidence synthesis.(24)

2. Identification of research gaps

Scoping reviews are often used to map the literature regarding a particular topic. By mapping the work that has already been undertaken in a particular area, researchers can identify gaps in topics that have not been addressed. The advantage of scoping reviews in identifying research gaps is that they can include all types of research evidence investigated and are not limited to the quantitative domain of randomised controlled trials.(20) Identifying where research has already been undertaken, and where further research is required, can avoid potential duplication or repeated research efforts within the same context. Scoping reviews are also able to identify the elements lacking in the existing evidence, including study designs, types of interventions and outcome measures.

This can then inform areas for both primary research and (in the case where substantial primary research exists) a synthesis may be required.

A recent scoping review was undertaken to map all palliative care research undertaken in Australia over an 18-year period.(26) The authors examined 1200 citations addressing this topic and presented the results in a clear format showing various types of research undertaken in the area, the participants involved in the research and the types of chronic conditions patients were experiencing during their end-of-life palliative care treatment. As the extraction phase included extraction of high-level data, it enabled research gaps in this area to be identified. From the understanding gained by this scoping review, the authors were able to recommend future primary research to focus on areas with minimal research conducted.(26)

Another recent example was undertaken by Baral in 2021.(27) The researcher conducted a rapid scoping review to inform the United Nations Research roadmap for COVID-19 recovery. The review highlighted important areas of research that were currently being undertaken including research focussed on vulnerable populations, health care workers, environmental sustainability, maternal and reproductive health, malaria, Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome, Tuberculosis, cancer, immunisation, and others. The review highlighted the absence of research in digital health, drug shortages and vaccine hesitancy as topics that required to be captured in future research.(27)

However, scoping reviews should not be used to address specific and narrow questions about the effectiveness, feasibility, meaningfulness and appropriateness of interventions as systematic reviews are more suited to address these types of research questions. (13) **3. Mapping various methodologies**

Scoping reviews to identify and map the study designs and methodologies adopted by primary research projects can also lead to a reduction in research waste. Identifying what study designs have been reported can clearly demonstrate the volume of experimental, quasi-experimental, observational, qualitative or mixed method designs available for synthesis. Furthermore, prior studies can be used to inform the design of new primary studies.(28) Additionally, mapping the reported methodologies from primary research projects also enables pooling of primary research but also identifies where the gaps in methodology lie and the need for further primary research. This information can clearly guide research and review teams and avoid teams conducting reviews and research based on convenience and opportunity.

By mapping, the methodologies used to research a particular topic. Scoping reviews can identify sample characteristics (sample size, gender and other demographics characteristics of studies), interventions characteristics (length of follow up time, types of data collected to capture the effectiveness of the intervention) and any comments related to bias associated with included studies if this is of interest to the researcher. While systematic reviews map the details of study characteristics, sources of bias, types of interventions and outcomes, scoping reviews have a broader scope as they can describe and include a variety of study types without the need for collating the results as in a meta-analysis where it is limited to a study type.

An example of such a scoping review is the one published by Nyanchoka et al., 2019. The authors used a scoping review methodology to map the methods used to identify, prioritize, and display gaps in health research. The authors were able to identify almost 2000 references in which they included 52 studies in the final review where they described the various methods used including scoping reviews to be the majority of the studies.(29)

Another example is a scoping review of rapid review methods, which was used to inform a survey and Delphi to select an intervention currently being tested in a prospective quasi-experimental study on rapid review methods (https://osf.io/fnx36).(28, 29) Another example is a scoping review of individual patient data network meta-analysis (IPD NMA) methods used in the literature, which guided the analysis for an IPD NMA commissioned by Health Canada (manuscript in press).(30)

4. Studies reporting with various outcome measures

Heterogeneity in outcome measures across studies can reduce the potential for pooling of results in meta-analyses. Scoping reviews can usefully map outcome measures and their measurement tools related to specific health domains to guide subsequent research as well as to inform the development of core outcome sets (Comet) for specific health conditions or topics.(30) Before beginning primary research in a topic area, it is beneficial to conduct a scoping review to identify and map all outcome measures reported in the area of interest, whether there are core outcome sets available/established in the topic, and which outcome measures are reliable and valid in the population of interest. This can then enable robust choices of outcome measures by research teams for primary research projects and assist in determining the feasibility of a systematic review. The scoping review authors can also provide recommendations for future research conduct to promote standardisation across a field, enabling in designs to better facilitate future meta-analysis and comparability between studies.(31) Once outcomes are established from undertaking a scoping review, this will facilitate the undertaking of systematic reviews to help with pooling of the results and a meta-analysis if appropriate.

For example, a scoping review undertaken by Khalil et al. addressed medication safety programs characteristics in primary care. The authors mapped the various outcome measures used to collect the efficacy and characteristics of scoping reviews. Moreover, the authors highlighted that the lack of consistency of outcome measures reported across studies made conclusions related to efficacy of these programs very difficult to conduct and implement in practice. (32)

Veras et al., also published a scoping review detailing the various outcome measures used in telerehabilitation. The authors were able to collate data from 28 studies and identified the breadth of the outcome measures used in the literature. The review also has recommendations to inform researchers, clinicians and policy makers about the most appropriate measures used for these types of interventions for future practice and research.(33)

5. Consistency of terms and concepts used in the literature to guide further research

Scoping reviews are also used to clarify terms, definitions and or concepts in the literature, especially when multiple synonyms are used to describe the same concept. Using consistent terminology is crucial in the literature as it can potentially reduce research waste. As scoping reviews routinely include global evidence, it can also clarify terms, definitions and concepts across cultures and contexts. This is particularly useful when studies are undertaken to map a particular concept. A recent example of a scoping review clarifying the concept of rehabilitation potential was undertaken by Shun et al., . The authors were able to generate a clear definition of their concept of interest based on their mapping of the literature and highlighted the need to develop a standardised assessment of their concept to ensure equitable access by all patients. In this case the authors were able to highlight the confusion in the literature between two closely related concepts; rehabilitation potential and rehabilitation outcome which have been used interchangeably in the literature but yet have distinct and different meanings.(34)

Another example of using scoping review methodologies to clarifying concepts is the one published by Grabovschi et al., , where the authors mapped the concept of vulnerability related to health care disparities. (35) The authors were able to confirm their hypothesis and highlighted recommendations for further research as a result of the clear gaps identified from their findings.

6. **Scoping reviews used for non-health topics**

While there are published scoping reviews for clinicians including nurses and pharmacist other health related professions, scoping reviews methodology has been used widely in a variety of discipline such education, environmental sustainability, computer science, engineering, renewable energy and climate change. The methodology is not restricted to the health sector.(20, 21, 36-40)

Conclusion

As a scientific community we need to address the deleterious issue of research waste. Scoping reviews can map the available evidence through a systematic and comprehensive method. Ultimately, this mapping could identify what type of research has been conducted, where further research is needed, and whether outcome measures (and their measurement tools) or terms and concepts can be standardised. Subsequently, scoping reviews, if performed in a rigorous and transparent manner, could reduce research duplication, identify research gaps and limit the wasting of resources, which could reduce the burden of research waste.

Contributions

HK designed the concept of the study and drafted the manuscript. All the other authors added comments and built on some of the ideas presented here

Declaration of interest

None to declare

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