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Seeing the forest (plot) for the trees – the importance of evidence synthesis in older adult care

Commentary on ‘Special Collection in Evidence Synthesis for Older Adults’

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Abstract: Systematically reviewing all the available evidence and then creating summary analyses of the pooled data is the foundation of evidence-based practice. Indeed, this evidence synthesis approach informs much of the care of older adults in hospital and community. It is perhaps no surprise that the journal *Age and Ageing* is a frequent platform for publishing research papers based on systematic review and synthesis. This research has evolved substantially from the early days of evidence-based medicine and the Cochrane Collaboration. The traditional approach would be a quantitative summary, calculated using pair-wise meta-analysis of randomised controlled trials of drug versus placebo, or a synthesis of observational studies to create summaries of prevalence, associations and outcomes. Methods have evolved and newer techniques such as scoping reviews, test accuracy meta-analysis, and qualitative synthesis are all now available. The sophistication of these methods is driven in part by the increasingly complex decisions that need be made in contemporary older adult care. *Age and Ageing* continues to champion established and novel evidence synthesis approaches, and in the accompanying Collection exemplars of these differing methods are presented and described. While there is marked heterogeneity in the techniques used, the consistent and defining feature of all these papers is the desire to comprehensively, and critically summarise the evidence in order to answer the most pertinent questions regarding older adult care.

Keywords: evidence, meta-analysis, older adults, systematic review

Key Points

- Evidence synthesis seeks to collate, appraise, and summarise all the available information on a topic, and can identify gaps in evidence.
- Systematic review and meta-analysis have informed many aspects of older adult care.
- Methods for evidence synthesis have evolved in line with the increasing complexity of clinical decision making.
- Meta-analysis and other evidence synthesis techniques now allow for summary analyses of epidemiological, prognosis, qualitative and test accuracy research.
- Evidence synthesis is at the core of guideline recommendations and policy.

Evidence synthesis - greater than the sum of the parts

With the almost exponential increase in biomedical science, including a welcome increase in published research that is relevant to older adults, staying up to date is increasingly difficult. A comprehensive assessment of the available evidence, accompanied by an accessible summary of results, can help the busy clinician, academic or policy maker. The process of systematic review and meta-analysis, or evidence synthesis, attempts to offer this.

Early attempts at meta-analysis date back to more than 100 years ago, but the term was first used in a statistics paper from 1976.[1] Systematic review and meta-analysis fuelled the evidence-based medicine movement, and groups such as the Cochrane Collaboration developed the methods and raised their visibility. Over time, approaches to evidence synthesis have increased in complexity, partly in response to the increasing complexity of healthcare, and their limitations have been recognised. However, at the core of all these reviews is the same structure and ethos, to offer an objective, critical summary of all the available information – and identification of gaps and limitations in the evidence - that gives the reader something greater than the sum of the individual parts.(Figure 1)

This approach has informed many of the seminal and practice changing papers in older adult medicine, including reviews demonstrating: the value of Comprehensive Geriatric Assessment (CGA) [2]; the utility of dedicated stroke unit care [3]; and the impact of multicomponent interventions on delirium incidence.[4] Papers describing best practice in the application of evidence synthesis methods, in performing systematic reviewing, and assessing risk of bias, to older adults are available[5,6] and older adult focussed reviews are now an important part of Age and Ageing content.

In the accompanying collection[7] we have selected exemplar evidence synthesis papers recently published in Age and Ageing. These papers were not chosen only for their interesting and clinically relevant topics, but to showcase the diversity of methods that are now included under the auspices of 'evidence synthesis'.

Reviews of interventions

Traditional meta-analyses were based on a quantitative summary of randomised trials comparing a drug to placebo, but evidence syntheses relevant to older adults now need to include assessment of complex healthcare interventions. An example is this review of falls prevention strategies, which found that patient and staff education reduced inpatient falls, with some effect from multi-factorial interventions.[8] To improve our understanding of complex interventions, it is important to move beyond estimates of the effect of multicomponent interventions where the intervention is treated like a 'black box'. Emerging methods such as component meta-analysis can open up the black box and suggest which parts of an intervention have greatest efficacy.[9]

In contemporary healthcare the most appropriate comparator is rarely placebo, and in many areas of practice there will be more than one potential intervention of interest. Increasingly the clinical question of interest is not, 'does this intervention work?', but rather, 'which of the available interventions works best?'. Network meta-analysis (NMA) can compare the effects of various interventions, offering indirect estimates where treatments have not been compared head-to-head, for example in this NMA of frailty interventions, resistance training seemed the most likely to reduce incident frailty.[10]

Individual participant data (IPD) meta-analysis uses the individual data from each study participant across all the relevant studies. When these individual data points are combined, this allows for more detailed analyses of subgroups and potential effect moderators, for example in this analysis of subclinical hypothyroidism trials.[11] This approach allows the full richness of the trial data – rather than the aggregate published data - to be used to answer novel questions.

Reviews of observational data

Synthesis of trials allows assessment of the effectiveness of interventions, but the importance or size of an issue is best summarised using observational or epidemiological data. These reviews can also include participants who would be ineligible or excluded from trials. For example, this review illustrates how common frailty is in acute stroke: around one in four stroke admissions had pre-stroke frailty. This paper also showed the various adverse outcomes associated with pre-stroke frailty.[12]

Reviews of observational data are also useful to explore the heterogeneity between studies on a shared topic. In this review looking at the global prevalence of frailty [13], including 240 studies from 62 countries, there were important differences in frailty by subgroups. The authors found that frailty prevalence varied by definition, sex, and study methods, but regardless of subgroup, frailty was still prevalent in all international older adult populations studied.

Reviews of tests, scales and tools

Much of older adult practice and research concerns itself with clinical assessment and measurement, with assessments of clinical observations, balance, cognition, performance in activities of daily living and many other functions assessed routinely in a hospital admission. Papers describing how measurement scales perform can also be summarised using the evidence synthesis approach. For example, in this review the authors show across 58 studies that four tools designed to assess older adults' concerns over falls are all suitable for clinical use.[14]

The evidence synthesis approach allows for estimates of the accuracy of an assessment against a gold standard comparator. Systematic collation of all the available research can be particularly useful here as the individual studies often lack the power to give definitive answers on the utility of a test. While these methods are labelled 'diagnostic test accuracy (DTA)', they are not limited to tests that are diagnostic in purpose. In this paper, the delirium screening test, the 4AT is compared against a gold standard of formal clinical assessment.[15] The results show reassuringly high levels of sensitivity and specificity and would support the use of the 4AT as a first line screening tool.

If a test is assessed against a future health state, rather than a contemporaneous gold standard, then the evidence synthesis approach moves from diagnosis to prognosis. Trying to predict future outcomes is core business in older adult care, indeed it could be argued that assessment of frailty is prognostic in intent. In this review, the team that originally described a frailty index approach, collate papers to show that a frailty index based solely on laboratory results can predict future adverse outcomes.[16]

Scoping and rapid reviews

Traditional systematic reviews or meta-analyses can be seen as daunting due to their comprehensiveness and extensive prescribed processes. However, there are alternative methods such as scoping reviews, which are designed offer a more time efficient overview of a topic area. Such reviews are often done to map the extent of existing research or to identify knowledge gaps, and therefore risk of bias assessment and meta-analysis steps may not be required. In this scoping review of outcome measures used in care-home studies, the number of differing outcomes used in trials was more than double the total number of papers included[17], leading to further work to develop a consensus-based approach to outcome assessment.

Another alternative method, particularly when topics are so urgent or dynamic that a timelier synthesis is required, is a rapid review. This remains scientifically robust, but is performed more quickly than the traditional comprehensive review. An example is this review of virtual wards in the UK NHS. [18] The authors found that available evidence was limited, an important finding to support calls for more primary research in a service that is rapidly being adopted at scale.

Qualitative reviews

Age and Ageing increasingly includes primary research and synthesis of qualitative research relevant to older people's health and social care. As the number of qualitative research studies relevant to older adults increases, the value of a synthesis of these papers also increases. A rigorously conducted review of qualitative studies can provide useful information for implementation of complex evaluations or services, such as this review of decision making when care-home residents may require unscheduled hospital care.[19] Common themes across included papers were around the varying power dynamics and that decisions on transfer are rarely based on the severity of the illness alone.

Reviews of reviews

The growth of evidence-based medicine and evidence synthesis is something to be celebrated. However, some have criticised the exponential increase in systematic reviews complaining that there are now more reviews than original research papers. An interesting response has been the development of methods that allow for a synthesis of reviews. Depending on the approach, varying terms are used including overview, umbrella review and review of reviews. A benefit of these reviews is the ability to summarise a diverse body of research, although it is important to ensure that single studies are not represented more than once. In this umbrella review, reviews of comprehensive geriatric assessment (CGA) were collated, and the authors demonstrated the many positive outcomes associated with CGA and the varying healthcare settings where CGA can have value.[20]

Policy makers and guideline producers often use evidence synthesis, and it is important that the beguiling simplicity of summary results are not translated into practical recommendations without a good understanding of their limitations. Methods for evidence synthesis of clinical practice guidelines are now described and reviews of international guidelines are available. In this review of glycaemic control in older adults living with type 2 diabetes mellitus, there was substantial variation in recommended treatment targets,[21] despite being based on the same underpinning evidence. This takes us full circle in emphasising the importance of robust, comprehensive synthesis of older

adult research, with awareness of its strengths and limitations, to inform clinical practice and policy both at public health and individual level.

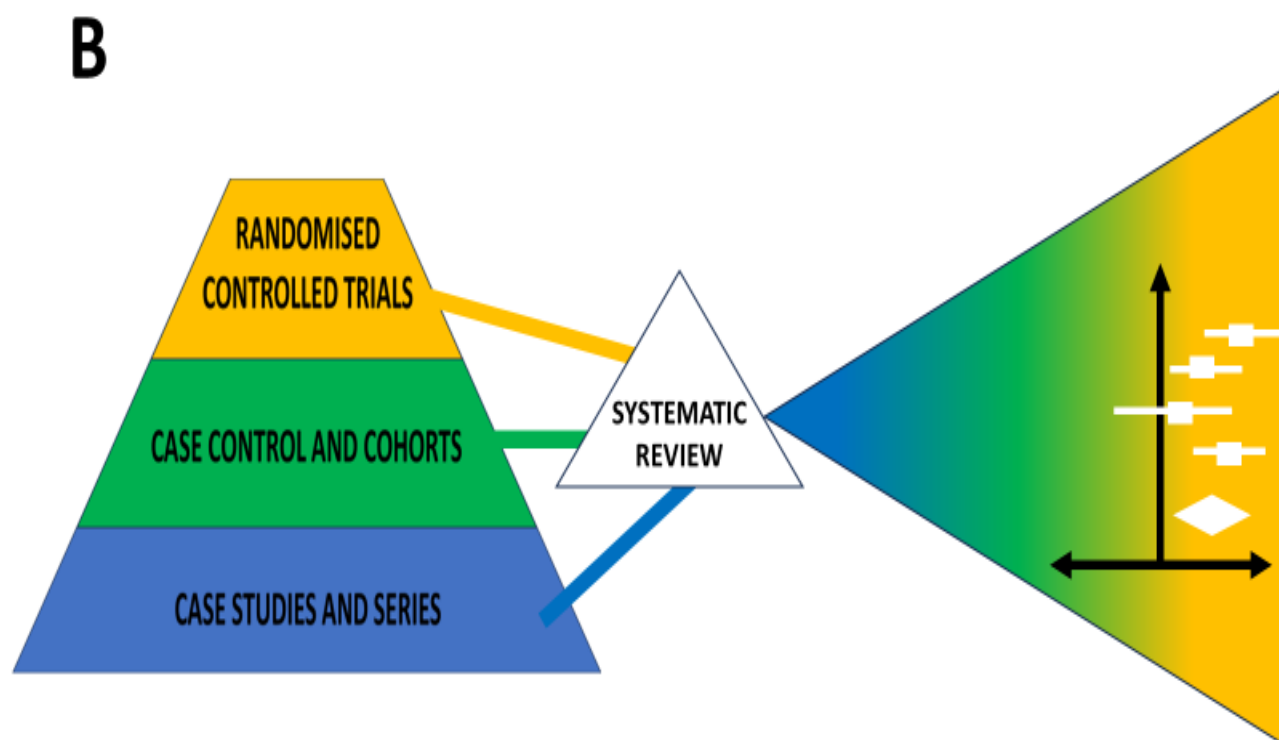
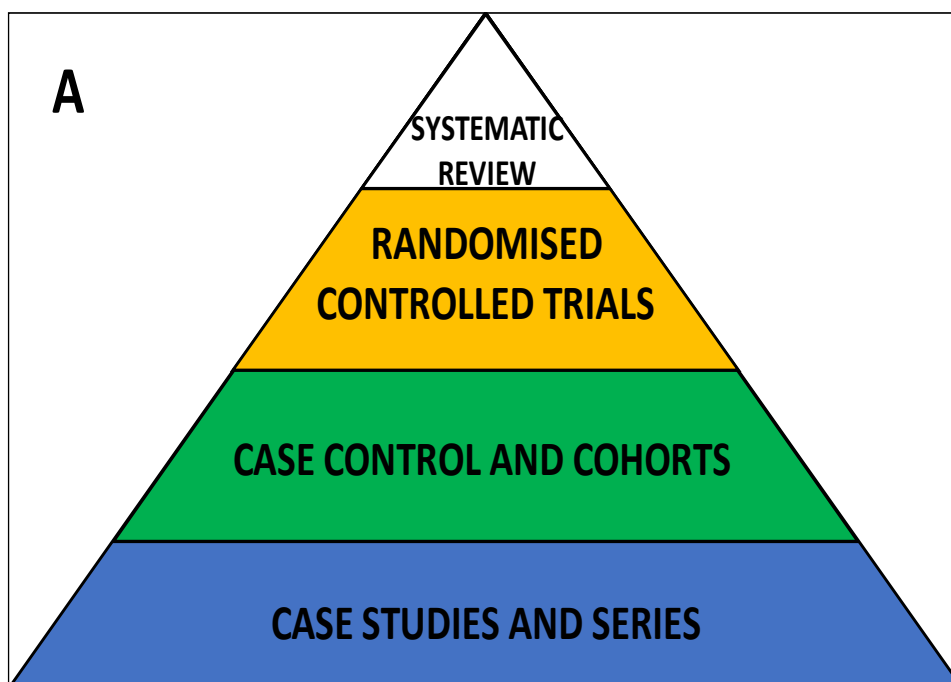


Figure 1: Evidence synthesis is often described as the pinnacle of evidence for decision making (A). This is debatable, as a poor evidence synthesis is less helpful than an adequately powered trial. Perhaps it is more useful to think of evidence synthesis as a lens (B) that can help bring together evidence from a range of methodological designs and create a useful summary.

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