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Review Article

Quality of systematic reviews and meta-analyses published in pediatric surgery☆

Adeline Salim [a,1], Dhanya Mullassery [b,1], Paul D. Losty [a,c,*]

[a] Department of Paediatric Surgery, Alder Hey Children's NHS Foundation Trust, Liverpool, UK
[b] Department of Paediatric Surgery, St George's Hospital, London, UK
[c] Institute of Child Health, University of Liverpool, Liverpool, UK

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ABSTRACT

Aims: Systematic reviews (SRs) and meta-analyses (MAs) studies may influence and direct surgical practice. Against this background we have analyzed the quality of systematic reviews and meta-analyses published in the specialty field of pediatric surgery using the Assessment of Multiple Systematic Reviews 11-item tool (AMSTAR).

Methods: MEDLINE and EMBASE databases and the three major journals in pediatric surgery were searched for SRs and MAs in pediatric surgery. Studies involving predominantly adult populations were excluded. Two reviewers independently scored included studies against AMSTAR criteria and disagreements were resolved by consensus. A total rating of 4 or less was considered 'poor' methodological quality, 5–8 as 'fair to good' and 9 or greater as 'good'.

Results: Original searching retrieved 1,281 articles. 126 articles were included for final analysis. Examining recent trends, 4 studies were published in 1995–2000 compared to 78 in 2011–2014. Using AMSTAR scoring criteria, 35 reviews (28%) were regarded as 'poor' in terms of methodological quality, 59 (47%) 'fair', and 32 (25%) 'good' quality. We observed no improvement in AMSTAR score before and after the development of the tool (mean score pre-2008 6.8, post-2008 5.9, $p = 0.136$).

Conclusions: Despite an increase in the number of SRs / MAs published in pediatric surgery, a quarter of all studies were considered poor in terms of their quality and scientific validity. Journals must define and apply minimum criteria to ensure pediatric surgeons seeking to publish high quality SRs / MAs achieve these requirements.

Systematic reviews (SRs) and meta-analyses (MA) are used to summarize and analyze the 'best evidence' available to address and answer clinical questions. The Oxford Centre for Evidence-Based Medicine ranks such works the highest in the hierarchy of evidence [1]. As such, results from SRs and MAs are highly influential in helping to formulate clinical guidelines and generate research agendas.

Reflecting trends in other fields of medicine recent years have witnessed a significant increase in the publication of SRs and MAs in the specialty of pediatric surgery. Like any other study, SRs also vary in quality and this may result in significantly different answers to the same clinical question. Given the influence they can have on clinical practice, it is very important that these studies are strong on methodological rigor to minimize risk of bias.

The quality of any SR or MA will depend on the quality of included studies. In addition to this, several other factors influence the outcome of SRs such as searching "gray material ", study selection using a minimum of 2 authors to independently gather and analyze data and assessing / reporting the scientific quality of included studies.

Over 20 tools have been published for assessing the quality of systematic reviews to date [2]. Shea et al., reported an 11 point measurement tool for the assessment of multiple systematic reviews 11-item tool (AMSTAR) [3]. This has been shown to have good agreement, construct validity and feasibility which has been previously used to assess SRs in several medical specialties including hand surgery, oral surgery and pediatric urology [4–6]. More recently AMSTAR has also been shown to be valid when applied to assess methodological quality of SRs on non-randomized studies as well [7].

The aim of the present study therefore was to analyze the methodological quality of systematic reviews in the field of pediatric surgery using the AMSTAR scoring criteria. We hypothesized that the quality of systematic reviews in pediatric surgery were likely suboptimal as has been observed in other disciplines of surgery.

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* Corresponding author at: Division of Child Health, Institute of Translational Medicine, Alder Hey Children's Hospital NHS Foundation Trust, University of Liverpool, UK. Tel.: +44 151 228 4811; fax: +44 151 228 2024.
E-mail address: Paul.losty@liverpool.ac.uk (P.D. Losty).
[1] Equal contributing authors.

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1. Methods

1.1. Literature search

MEDLINE and EMBASE databases were searched using key words "systematic review" or "meta-analysis" and "pediatric" or "pediatric". We also searched the table of contents of three major pediatric surgery journals, namely Journal of Pediatric Surgery, European Journal of Pediatric Surgery and Pediatric Surgery International. The reference listings of relevant studies were also hand searched. A study had to be identified as either a systematic review or meta-analysis to be included for the critique. Narrative reviews, case reports, and case reports with reviews of the literature were excluded. No limit to publication date(s) were set. Only articles published in the English language were considered. Studies involving predominantly adult populations were excluded. Studies published up to December 2014 were included.

1.2. Data collection

The full texts of ALL relevant studies were obtained for analysis. Two reviewers (AS and DM) independently assessed methodological qualities and scored the included studies using AMSTAR criteria [3] and disagreements were resolved by consensus or discussion with the senior author (PDL). A total rating of 4 or less was considered 'poor' methodological quality, 5 to 8 as 'fair to good' and 9 or greater as 'good' as previously published [4].

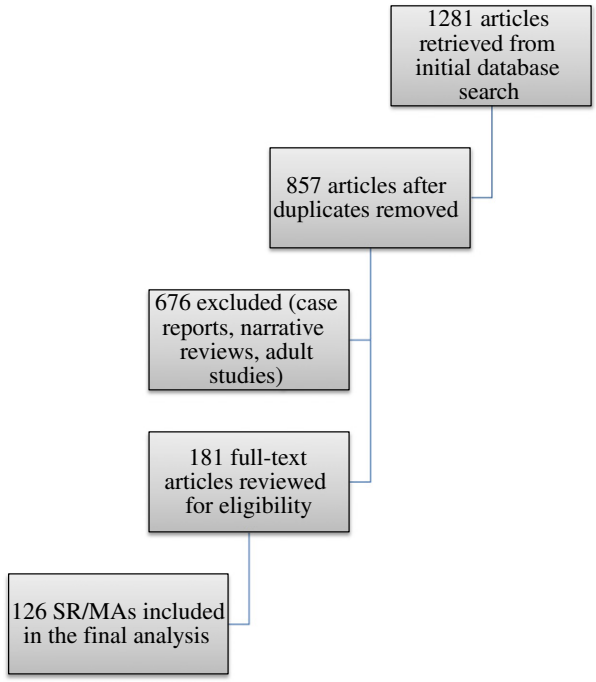

Fig. 1. Selection of articles included in this review.

2. Results

2.1. Characteristics of included studies

The original literature search retrieved 1281 articles. After removing duplicates, 857 titles were screened and 181 full-text articles were reviewed for eligibility. One hundred and twenty six articles were included for final analysis, which comprised 72 systematic reviews and 54 systematic reviews with accompanying meta-analysis (Fig. 1). These studies were published during the 20 year period covering 1995–2014. The list of studies included and excluded at the stage of full paper review is listed in Appendices 2 and 3 respectively.

In recent years, there has been an increase in the number of SR / MA published in pediatric surgery - 4 (3%) articles were published between 1995 and 2000 compared to 78 (62%) articles during 2011–2014 (Fig. 2). One hundred and fifteen studies used the term 'systematic review' in the manuscript title as recommended by PRISMA guidelines [8]. A smaller proportion of studies (6/29 vs. 5/97) reported after the publication of the PRISMA consensus statement failed to use the term 'systematic review'. These observations reflect both the increased interest of such studies in the specialty of pediatric surgery as well as the trend(s) in favor of evidence-based medicine. However it was noteworthy that the proportion of MAs had not increased in recent years (24/48 from 1997 to 2010 versus 30/78 in the 2010–2014 eras) indicating that there is a significant limitation of such studies fully amenable to quantitative review / analysis in pediatric surgery.

The quality of a SR/MA will inherently dependent on the quality of included studies.

The studies included in this current analysis were found to be predominantly systematic reviews of observational / non-randomized studies (n = 82, 65%), 31 (25%) studies included here were randomized and non-randomized studies and only 13 (10%) studies we reviewed were solely randomized-controlled trials (RCTs) – 3 of which were associated with the Cochrane collaboration [9–11] (Fig. 3). Regardless, while it is acknowledged that is not always feasible to conduct RCTs, several other factors are known to influence the quality of a systematic review as explained by the validated AMSTAR scoring system [3,6].

2.2. Methodological quality

While most methodological items assessed in the AMSTAR tool were well conducted by investigators there were notable key categories that were inadequately assessed (Fig. 4).

Methodological quality of included studies was assessed in 85 studies (67%) and heterogeneity was calculated in 73 studies (58%), which consequently resulted in pooled statistics and meta-analysis in 54 reported studies. However, less than a fifth of published studies provided a listing of 'excluded' as well as 'included studies' (17%) and / or described the assessment of publication bias using Funnel plot(s) (15%).

Using AMSTAR scoring criteria, 35 publications (28%) were regarded as 'poor' in terms of methodological quality (meeting 4 or less in AMSTAR scoring criteria), 59 (47%) were 'fair' and 32 (25%) 'good' quality (Fig. 5). We then compared the scores of SRs / MAs published in and after 2008 to those published before 2008 to establish whether there had been any improvement in the quality of reporting studies following the development of AMSTAR guidelines in 2007. There were 27 SRs / MAs published before 2008 with a mean AMSTAR score of 6.8 ± 2.5 and there were 99 studies published in and after 2008 with a mean score of 5.9 ± 3.0 (p = 0.13).

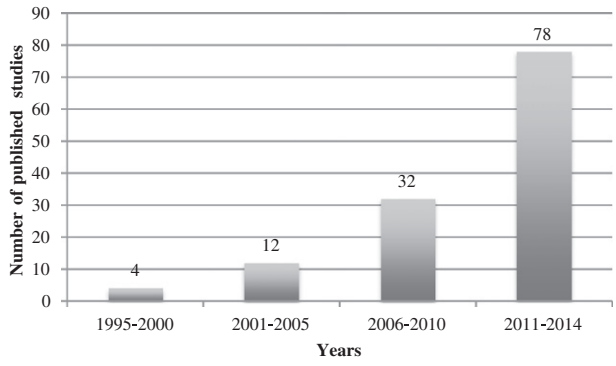

Fig. 2. Number of systematic reviews/meta analyses published in recent years.

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