A Literature Review of Health Economic Evaluation: A Case of Vaccination on systematic review analysis

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ABSTRACT

Background: This study tries to provide a comparative analysis of the systematic review of economic evaluation literature available about vaccines.

Methods: PubMed database were searched by using the following keywords: “vaccination/economics [MeSH]”. All articles were included if: 1) A literature or systematic review of vaccination studies; 2) primary or secondary data; 3) published in English; 4) related to human. Exclusion criteria were as follows: 1) editorial, review or methodological articles; 2) not in health sector; 3) not applied from 2009 to 2013.

Results: From 22 records found, eleven articles met selection criteria. Only 27.3 percent (3 of 11 studies) was recorded about the methodology of conducting systematic review studies based on the PRISMA, and AMSTAR guideline. Two of eleven studies (18.1 percent) in this review, the authors evaluated the quality of vaccination systematic review studies with different levels including “Moderate” to “Moderate to good” and “Moderate to good”.

Discussion and conclusion: According to this study, it helps to understand the current situation for conducting and reporting the economic evaluation of vaccination systematic review studies. Currently, the large number of studies and systematic reviews on the effects of vaccination, high quality evidence to inform policy decisions on how best to use vaccination in health care is still lacking.

INTRODUCTION

Evidence-based policy making can rarely rely on single studies, so policy makers and the researchers that support them try to make best use of the various partially relevant studies already available (Anderson, 2010). Nowadays, economic evaluation studies is very important to ameliorate decisions about apportion of human resources in health care. Economic evaluation of drugs, medical devices, services and interventions is a useful tool for assessing important decisions regarding the optimal utilization of scarce resources (Vo TQ, 2013). Nevertheless, systematic reviews of economic studies have become a key feature of many policy making and technology assessment processes, and also a common form of published study in certain health economics journals (Anderson, 2010). The healthcare literature contains hundreds of thousands of studies of healthcare interventions, growing at tens of thousands per year (Ghersi and Pang, 2009). More recently, calls have been made for ‘rapid reviews’ to provide decision-makers with the evidence they need in a shorter time frame, but the possible limitations of such ‘rapid reviews’, compared to full systematic reviews, require further research (Ganann et al, 2010). In the last two decades, several vaccines have been developed that target a range of infectious diseases of global public health importance. Vaccines may bring economic benefits beyond just health gains and there may be various pathways for these benefits to accrue.

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Unlike other health interventions, studies find that vaccines avert illness both directly through immunization and indirectly through herd immunity (Plotkin, 2005). While all such changes can have an immense impact on a country’s economy, it is difficult to get a full picture of the economic impact resulting from immunization. Understanding the full economic benefits of vaccines is vital to policy makers whose decisions to introduce new vaccines not only impact the health of a society, but also its economy. Evidence on such economic benefits is therefore critical in assessing the full return on investment in vaccines (Ozawa et al., 2012).

Current systematic reviews, within economic evaluation types (including cost minimization analysis (CMA), cost effective analysis (CEA), cost utility analysis (CUA), cost benefit analysis (CBA), provide an evidence basis for that surgery type only (Anderson R, 2010). However, in some economic evaluation types, no systematic review currently exists and there may be few or even no trials. A systematic review of systematic reviews is a means of summarizing current evidence across specialties of the same or very similar intervention, to provide a synthesis of treatment effects (Bowater et al., 2012; Bowater et al., 2009).

In the last two decades, several vaccines have been developed that target a range of infectious diseases of global public health importance (Bowater et al., 2009). However, the list price of these vaccines in high income countries is substantially greater than for traditional vaccines. Recently, several frameworks have been proposed by which these wider benefits of vaccination can be categorized (Ganann et al., 2010; García-Altés, 2013). Nevertheless, the extent to which these broader benefits are considered in current economic evaluations of vaccines is unclear. This study tries to provide a comparative analysis of the literature review including: general information, the methods and the quality of systematic reviews on the economic evaluation of vaccination studies with the purpose of synthesizing evidence to date on the effectiveness of vaccination in various countries between 2000 and 2013.

This study analyses the vaccination systematic review studies including: The design, the method or guidelines (e.g. PRISMA, York and so on), keywords and searching, databases, the quality checklist of papers reviewed, presentation format (quality checklist of the review).

MATERIALS AND METHODS

Literature Search

This study was designed as a systematic review that was carried out in December 2013 to identify vaccination systematic review studies conducted in many countries five years ago with a combination of key words and MeSH term (see Fig: 1). PubMed database was used for searching with the following keywords in different combinations: “vaccination/economics [MeSH]” with filter criteria: Systematic review, five years ago and human.

All publications were included if: Systematic review set out to identify and include all articles that included a literature review of vaccination studies. Published articles were considered studies that used primary or secondary data. Economic evaluation studies were published in English language and were related to humans. All publications were excluded if: They were editorial, review or methodological articles and did not present both the costs and outcomes of a study. Studies were also rejected if they were not in health sector, were not implemented in humans and were not applied from 2009 to present.

Evaluation of studies

This study was analysis two parts, such as: general information section including the number of vaccination economic evaluations published per year, number of paper reviewed in economic evaluations of vaccines review studies, type of the design or the method or guidelines, number of databases, and the quality of economic evaluation.

About the quality and strength of evidence presented in the individual, included reviews should influence the conclusions drawn in the systematic review of these. Although the researchers will usually have to do this via an assessment of the quality of report, with the hope that initiatives such as design or method or guideline (e.g. PRISMA, York, …), keywords and techniques, databases, quality checklist of papers reviewed, presentation format (quality checklist of the review). Two reviewers were separately reviewed for all of articles. After comparison of the results, two reviewers had discussed.

RESULTS

The search yielded 22 articles about vaccination/economic from PubMed database between January 2009 to December 2013. Based on inclusion and exclusion criteria, 11 remain publications related this study. Reviewers applied the inclusion and the exclusion criteria to remain 11 papers after two steps: reviewing their title and abstract, reviewing their full-text due to mentioned to Portuguese study and not researched about systematic review, not accessed to full-text.

General information section

Table 1 illustrates the amount of publication year by year from 2009 to 2013. According the table, we can see that the number of papers were stable from two to three studies. However, in 2010, there is no study to review in this field. Of the 11 systematic review studies selected, 4 studies (3 studies had conducted in 2012 and one study were conducted in 2013) reviewed many different vaccination studies. Furthermore, seven of 11 studies evaluated the economic evaluation of one vaccination studies including: rubella vaccination, Herpes Zoster vaccination, Pneumococcal Conjugate vaccination, auto-immune inflammatory rheumatic diseases, influenza vaccination, pneumococcal polysaccharide vaccination and human papillomavirus (HPV) vaccine. Table 1 also shows the number of articles in economic evaluations of vaccines review studies. In above table, we can see in 11 papers, number of paper studies less than or equal to 20 is...
developing search strategy and locate studies, index, University of York, and Database of systematic review studies were mentioned about, 2012) The remain study show showed the process of searching and six TM

The methods of the vaccination systematic review studies

According to Table 1, we can see that the percentage of systematic review studies, which were not conducted base on guidelines, is 72.7 percent (8 studies). While only 27.3 percent (3 of 11 studies) was mentioned about the method of conducting systematic review studies. The methodology of literature review was carried out by the PRISMA guideline.

Of 11 systematic review studies, the authors performed a systematic search of online different databases. In Table 2, we present findings of the number of databases clearly, such as two databases (3 studies), three databases (4 studies), four databases (1 study), five databases (2 studies), and seven databases (4 study). The highest amount of databases for vaccination systematic review studies used for searching papers is seven databases (ref), including Medline®, EmBase™, Nursing Update, West African Journal of Nursing, CINAHL®, Web of Science®, and Global Health. All of studies in this systematic review (11/11 studies) were selected from PubMed (Medline®) database. The number of using times to use EmBase™, Center for Reviews and Dissemination (CRD), NHSEED and HTA databases for conducting systematic review are recorded four, four and three databases, respectively. For Scopus, Cochrane and EconLit databases, there are two times for using search to find the publications from reviewers. On the other hand, Databases of the CRD, they used databases in the Spanish Medical Index, University of York, and Database of Abstracts of Reviews of Effects [DARE] in the vaccination systematic review studies. Moreover, the authors had used other databases, including ISI Web of Knowledge, the Spanish Bibliographic Index of Health Sciences (IBECS), Nursing Update, West African Journal of Nursing, CINAHL®, Web of Science®, Global Health, The abstracts from the meetings of EULAR 2008 and 2009, The American College of Rheumatology (ACR) 2007 and 2008, AHRQ Evidence, and Google Scholar.

For developing search strategy and locate studies, searching is the stage where a reference librarian can be extremely helpful in terms of helping to develop and run electronic searches. Generally, it is important to come up with a comprehensive list of key terms (i.e., Medical Subject Headings (“MeSH”) terms) related to each component of participants, interventions, comparators, outcomes, and study design (PICOS) to be able to identify all relevant trials in an area. Ten studies (90.9%), of these vaccination systematic review studies were mentioned about searching including keywords and techniques. By contrast, only one study (9.1 percent) was not mentioned that how the authors used keywords and the process of searching. Of ten studies, four studies (36.4 percent) showed the process of searching and six studies (54.5 percent) show keywords. Only one study of six systematic review studies was carried out by the PRISMA guideline. (Table 3).
According to table 4, there are five (45.5 percent) the economic evaluation of vaccination systematic review studies to evaluate the quality of checklist of papers reviewed. Many the quality of checklist of papers reviewed guidelines were evaluated by different authors. For instances, the guidelines embrace the Quality of Health Economics Studies questionnaire (QHES), British Medical Journal guidelines (BMJ), Grades of Recommendation Assessment, Development and Evaluation (GRADE), The Consensus on Health Economic Criteria list (CHEC) and Drummond et al. guideline. Six studies which were not mentioned the quality of checklist guidelines are account for 54.5 percent. We were recorded two studies of 11 (18.2 percent) which were mentioned the quality of each studies (Table 5).

The authors in these studies evaluated the vaccination systematic review studies two results, including “Moderate” to “Moderate to good” and “Moderate to good”. Nine studies (81.8 percent) were not evaluated the quality of articles reviewed. Three of nine studies had gave the quality checklist of papers reviewed, however the authors were not mentioned the results because of differences in study design and specific data elements collected, we were unable to compare studies or evaluate data quality.
Table 5: Evaluate the papers reviewed in each systematic review studies from 2009 to 2013.

<table>
<thead>
<tr>
<th>Number of studies</th>
<th>“Moderate” to “Moderate to good”</th>
<th>“Moderate to good”</th>
<th>Not mentioned</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>9</td>
<td>11</td>
</tr>
</tbody>
</table>

Table 6: Articles evaluated in this review (N=11).

<table>
<thead>
<tr>
<th>No.</th>
<th>Study (Review year)</th>
<th>Design / Method / Guideline</th>
<th>Databases</th>
<th>Search strategy (Keywords + Techniques)</th>
<th>Quality checklist of papers reviewed</th>
<th>Presentation format (Quality checklist of the review)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Anna García-Altés (2013)</td>
<td>n/a</td>
<td>PubMed/MEDLINE - SCOPUS - ISI Web of Knowledge - Databases of the Center for Reviews and Dissemination, as well as in the Spanish Medical Index (IME) - The Spanish Bibliographic Index of Health Sciences (IBECS)</td>
<td>Appendix 1.</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>3</td>
<td>Thomas D. Szucs et al. (2013)</td>
<td>n/a</td>
<td>PubMed - Embase</td>
<td>- ‘Herpes zoster vaccine’ or ‘herpes zoster vaccination’ or ‘varicella zoster vaccine’ or ‘varicella zoster vaccination’ • AND ‘(cost-)effectiveness’ or ‘CRS and comment’</td>
<td>- The British Medical Journal guidelines of Drummond and Jefferson - The Quality of Health Economic Studies (QHES)</td>
<td>“Moderate” To “Moderate to good”</td>
</tr>
<tr>
<td>4</td>
<td>Sachiko Ozawa et al. (2012)</td>
<td>PRISMA</td>
<td>Pubmed (MEDLINE) - Econlit (EBSCO host)</td>
<td>“economic benefit” AND “vaccine” AND “low- and middle-income country” [MeSH]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>5</td>
<td>Rohan Deogaonkar et al. (2012)</td>
<td>PRISMA</td>
<td>MEDLINE - EconLit</td>
<td>- The National Health Service Economic Evaluation Database (NHSEED)</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>6</td>
<td>Terri B. Hyde et al. (2012)</td>
<td>n/a</td>
<td>Pubmed - Medline - Embase - Nursing Update - West African Journal of Nursing - CINAHL® - Web of Science® - Global Health</td>
<td>Appendix 2.</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>7</td>
<td>Chantal W.B. Boonacker et al. (2011)</td>
<td>n/a</td>
<td>Pubmed - The Centre for Reviews and Dissemination databases (Database of Abstracts of Reviews of Effects [DARE]) - NHS Economic Evaluation Database [NHS EED] and Health Technology Assessment database [HTA])</td>
<td>‘otitis media’, children’, ‘cost effectiveness’, ‘cost’ and ‘vaccine’</td>
<td>The Drummond checklist</td>
<td>Moderate to good</td>
</tr>
<tr>
<td>9</td>
<td>Isla Ogilvie et al. (2009)</td>
<td>n/a</td>
<td>Pubmed, - Embase - Cochrane reviews - AHRQ Evidence - the Center for Reviews and Dissemination databases.</td>
<td>cost; economic; cost effectiveness; cost utility; cost benefit; and pneumococcal polysaccharide vaccine</td>
<td>Evers S et al. - Chiou CF et al. - Gerkens S (QHES, CHEC or BMJ)</td>
<td>n/a</td>
</tr>
<tr>
<td>10</td>
<td>Jaume Puig-Junoy et al. (2009)</td>
<td>n/a</td>
<td>Pubmed, - NHS EED and HTA, from the Centre for Reviews and Dissemination (University of York)</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>
There are presently two known validated tools available for assessing the quality of systematic review (i.e. AMSTAR (an acronym for ‘a measurement tool to assess systematic reviews’), and an overview quality assessment questionnaire (OQAQ) (Smith et al., 2011); a number of authors have also devised their own measures (Table 6, 7).

### DISCUSSION AND CONCLUSIONS

Systematic reviews (or overviews) of reviews are a logical and appropriate next step, allowing the findings of separate reviews to be compared and contrasted, providing clinical decision makers with the evidence they need. Currently, the large number of studies and systematic reviews on the effects of vaccination, high quality evidence to inform policy decisions on how best to use vaccination in health care is still lacking. AMSTAR, if used widely after external validation, could also enable methodological research (i.e. meta-regression of item of AMSTAR and effect size of reviews). Our instrument is an attempt to achieve consensus amongst current mainstream opinions. Inevitably, new evidence will modify current thinking in some areas and at that point, the AMSTAR will be updated. This is indeed likely to be the case with techniques to identify and quantify publication bias. Although a number of alternative tests for publication bias exist, none

Publication bias remains an area of contention amongst those who assess the quality of systematic reviews. It remains a research priority because it is unclear what the impact of publication bias is on making decisions in health care. We are aware of the 20 years of work that has gone in this area of research. This has given us some clear answers as to the effect publication bias may have on the overall results of estimating the impact of interventions.

AMSTAR will remain a living document and advances in empirical methodological research will be reflected in further improvements to the instrument. A measurement tool for assessment of multiple systematic reviews (AMSTAR) was developed. The tool consists of 11 items and has good face and content validity for measuring the methodological quality of systematic reviews. Additional studies are needed with a focus on the reproducibility and construct validity of AMSTAR, before strong recommendations can be made on its use.

Limitation of this study: As the current article is the first to review reviews of reviews, there was no existing measure of quality to assess reviews of reviews. Accordingly, this review devised the following eleven-item measure of methodological quality of reviews of reviews based on recently published guidelines for conducting systematic review of systematic review.

As the field is rapidly, evolving, different kinds of knowledge are also in demand, e.g. a stronger focus on economic analyses of vaccination, the methodology of conducting the
vaccination systematic review studies including technique (databases, the keywords), and the process of searching, and so on. Information needs of stakeholders from different sectors (including health, finance and external donors) should be obtained to guide incorporation of broader benefits into economic evaluation, as well as their effective national immunization program.

**Conflict of interests**

The authors have declared that no competing interests exist.

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