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Review

Systematic review of economic evaluations of the 23-valent pneumococcal polysaccharide vaccine (PPV23) in individuals 60 years of age or older

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ABSTRACT

Objectives: To systematically review the economic evaluations of 23-valent pneumococcal polysaccharide vaccine (PPV23) in adults aged ≥60 years to inform the development of local studies through the discussion of parameters and assumptions that influence the results of the analyses.
Methods: We searched the MEDLINE, *Excerpta Medica*, Cochrane Library, Latin-American and Caribbean Health Sciences Literature (LILACS), Brazilian Regional Library of Medicine, National Health Service Economic Evaluation, and Centre for Reviews and Dissemination—as well as the Scopus citation index and the Web of Science for full economic evaluations of PPV23 published up to March 2016. Two independent reviewers screened the articles for relevance and extracted the data. Main study characteristics and methods (clinical and epidemiological data, cost and incremental cost-effectiveness ratios (ICERs) were extracted and compared. Costs were updated to 2016 international dollars.
Results: Twenty-seven studies published from 1980 to 2016 were reviewed. Most studies were conducted in Europe and the USA; three studies were conducted in Latin America (Brazil, 2; Colombia, 1). In addition to the scenario comparing the vaccination with the PPV23 to non-vaccination, three studies also compared PPV23 to pneumococcal conjugate 13-valent vaccine (PCV13). All studies used static models. Most used a lifetime (44.4%) or 5–6 year's time horizon (33.3%). Only three studies considered herd protection from children immunization with PCV13 in the model. Most studies considered PPV23 cost-effective (less than US$50,000 per LYG or QALY) and sometimes cost-saving (results ranging from cost-saving to US$84,636/QALY). The estimates of disease burden, the efficacy/effectiveness of PPV23, and the effects of herd protection from childhood immunization had most influence on the results.
Conclusions: Well-designed cost-effectiveness studies of PPV23 that represent the current epidemiological scenario and reduce uncertainty related to efficacy/effectiveness are extremely relevant to informing the decision-making process.

Contents

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1. Introduction

Streptococcus pneumoniae is a major cause of morbimortality worldwide and is currently a public health priority, receiving considerable attention from international health organizations [1]. The groups most affected are children under two years of age, adults aged ≥60 years, and individuals with chronic diseases [2–5].

The 23-valent pneumococcal polysaccharide vaccine (PPV23) provides moderate protection against invasive pneumococcal disease (IPD) and bacteremic pneumococcal pneumonia (BPP), with 50–80% efficacy [6]. Studies evaluating the protection of PPV23 against pneumonia have produced controversial results, mainly due to the great heterogeneity of such studies [6]. Moberley et al. [6] observed PPV23 global efficacy of 29% (95% CI, 3–48%) against all-cause pneumonia (ACP) among the elderly; however among elderly in low-income countries, PPV23 had efficacy of 46% (95% CI, 33–57%). Three observational studies conducted in Spain associated PPV23 use in the elderly with approximately 25% reduction in the rate of hospitalization due to ACP [7–9].

In view of the indirect effects of pneumococcal conjugate childhood vaccination programs, countries that had recommended adults vaccination with PPV23 prior to the childhood vaccination implementation have recently adopted different adults vaccination strategies [10]. In 2011, the US Food and Drug Administration approved the 13-valent pneumococcal conjugate vaccine (PCV13) use in adults aged ≥50 years, based on immunogenicity studies [11]. In 2014, the US Centers for Disease Control and Prevention (CDC) Advisory Committee on Immunization Practices (ACIP) recommended a dose of PCV13 followed by a dose of PPV23 for adults aged ≥65 years [11,12]. That decision was based on the results of a randomized placebo-controlled trial conducted in the Netherlands, which demonstrated the PCV13 efficacy against IPD and pneumococcal pneumonia (PP) in the elderly [11,12]. In 2018, that recommendation will be reviewed because the benefits of adults vaccination might be drastically reduced by the probable reduction in disease caused by serotypes included in PCV13, resulting from childhood immunization [10].

In 2015, the UK Joint Committee on Vaccination and Immunization maintained its recommendation of vaccinating adults aged ≥65 years and other high-risk individuals with PPV23, given that it provides at least short-term protection and includes 11 serotypes not included in PCV13. That recommendation will also be reassessed in 2018, when the epidemiological scenario is expected to stabilize after the replacement of PCV7 with PCV13 [13].

There is a recognized need for economic studies of vaccination programs, and agencies tasked with the incorporation of new technologies consider the synthesis of such information a key element in the decision-making process [14,15]. Systematic reviews of economic studies provide an important basis for generating knowledge by identifying the most relevant studies, allowing the establishment of new methodologies, as well as the evaluation of potential key economic trade-offs in a decision problem or treatment area [14,15].

Three systematic reviews of economic evaluations of the pneumococcal vaccines in adults aged ≥60 years were published from 2005 to 2016: van de Vooren et al. [16] focused on PCV13; Porchia et al. [17] focused on PPV23 and PCV13; and Ogilvie et al. [18] focused exclusively on PPV23. Ogilvie et al. [18] reviewed 11 studies published from 1997 to 2007, all of which evaluated PPV23 vaccination in adulthood in comparison with non-vaccination. All those studies were carried out in developed countries, and most were conducted prior to the incorporation of pneumococcal conjugate vaccines into childhood immunization programs. Other economic evaluations of PPV23 in adults have been published since then. Therefore, the aim of this current study is to systematically review the published economic evaluations of PPV23 in adults aged ≥60 years to inform the development of local studies through the discussion of parameters and assumptions that influence the results of the analyses.

2. Methods

We followed the methodological guidelines for systematic reviews of economic evaluations published by the Centre for Reviews and Dissemination [19]. Because this review does not contain results of clinical relevance directly for patients, it was not registered with the International Prospective Register of Systematic Reviews, although a protocol was developed prior starting the review.

2.1. Eligibility criteria

The inclusion criteria were being a full economic evaluation, including cost-effectiveness analyses (CEA), cost-utility analyses

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