An emergency department-based pneumococcal vaccination program could save money and lives

Stack S J, Martin D R, Plouffe J F

Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
Emergency department (ED)-based pneumococcal vaccination (PV) programme in preventing pneumococcal bacteremia (PB) in high-risk patients.

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
Adult patients (aged over 18 years) admitted to a tertiary care hospital for treatment of culture-positive Streptococcus pneumoniae.

Setting
Tertiary care hospital. The economic analysis was carried out in the USA.

Dates to which data relate
Effectiveness data corresponded to patients enrolled in the study between December 1990 and June 1997. The price year was not explicitly specified.

Source of effectiveness data
Effectiveness data were derived from a single study and assumptions made by the authors.

Link between effectiveness and cost data
Costing was conducted retrospectively on the same patient sample as that used in the effectiveness analysis.

Study sample
Power calculations were used to determine the sample size (a total of 7,086 charts were needed to achieve an error (half the width of the confidence interval) less than 1%). The hospital records of 188 consecutive adults with PB were reviewed to determine how many were treated in the ED from 1 to 72 months before their admission for bacteremia. A retrospective review of 10,650 ED charts determined the percentage of patients with PV indications and the relative frequency of indications.
Study design
This was a retrospective cohort study, carried out in a single centre. The duration of the follow-up appears to have been for 72 months and until admission for PB. Loss to follow-up was not explicitly specified. To obtain a representative sample of all patients seen in the ED during a 1-year period, a monthly review was made of the ED charts of all patients seen in the ED during the 7-day period from the 15th through the 21st of each month during the 12-month period of June 1995 to May 1996. Charts were reviewed to determine whether the patients had any of the indications noted by the Centres for Disease Control and Prevention (CDC) for receiving the pneumococcal vaccine. This chart review was used to estimate the percentage of patients during a 1-year period with indications for PV, and the distribution of specific vaccine indications.

Analysis of effectiveness
The principle used in the analysis of effectiveness (intention-to-treat or treatment completers only) was not explicitly specified. The health outcomes were the percentage of patients with PB who were treated in the ED from 1 to 72 months before their admission for bacteremia; the percentage of PB patients treated in the ED who had indications for PV and the number of times they were evaluated in the ED during the 72-month period; number of deaths among these patients; hospital stay for survivors; the percentage of ED patients who had documented PV indications; and the most prevalent PV indications.

Effectiveness results
The effectiveness results were as follows:

One hundred and four (55%) of the 188 patients with PB were seen in the ED 72 months or more before their admission for PB.

91 (88%) of the 104 seen in the ED 72 months or more before their admission for PB had indications for PV.

These 91 patients had been evaluated in the ED an average of 3.4 times per patient during the 72-month period.

Nine patients (10%) died before discharge.

Mean hospital stay for the 82 survivors was 11.2 days.

Of 10,650 ED charts reviewed, 2,011 (19%) had documented PV indications.

Most prevalent PV indications were age 65 years or older (42%), diabetes mellitus (35%), malignancy (12%), chronic renal failure (11%), and immunosuppression (11%).

Clinical conclusions
This study demonstrates that the ED offers an opportunity to increase PV rates. At least 55% of patients admitted to the study hospital during a 6.5-year period with the diagnosis of PB had been seen in the study ED during the 72 months before their bacteremic episode. Using current CDC indications for the pneumococcal vaccine, 88% of these patients were at high risk of pneumococcal disease and could have received PV during one of their ED visits.

Methods used to derive estimates of effectiveness
Assumptions about effectiveness were made by the authors.

Estimates of effectiveness and key assumptions
It was assumed that 25% of the patients had already received the pneumococcal vaccine, and that the vaccine had a protective efficacy of 65%.
Measure of benefits used in the economic analysis
The benefit measure was the number of cases with PB prevented and the reduction in mortality had an ED-based PV programme been in place in the study ED. If it had been as successful as the current tetanus programme (100% of eligible patients would be offered the vaccine and 100% would elect to receive the vaccine).

Direct costs
Costs were not discounted due to the short time frame of the cost analysis (first year of a PV programme). Some quantities were reported separately from the costs. Some cost items were reported separately. Cost analysis covered the costs of hospitalisation and PV vaccine. The perspective adopted in the cost analysis was claimed to be that of both the study hospital and society. The total cost for the first year of a PV programme was calculated based on the study institution's patient census estimates. The cost of the programme was subtracted from the total cost savings calculated by assuming a prevention rate of 65% of the cases of PB. The cost of hospitalisation and vaccine were based on institutional cost estimates. The price year was not explicitly specified.

Indirect Costs
Not included.

Currency
US dollars ($).

Sensitivity analysis
A worst-case scenario (arrived at by changing vaccine cost and efficacy rate, and other parameters of the cost calculations) was considered in order to test the robustness of the study results.

Estimated benefits used in the economic analysis
Under the most optimistic scenario, the ED-based PV programme could have prevented 44 cases of PB. The expected mortality could have been reduced from 9 (10%) patients to 3 (3%) patients. Under the worst-case scenario the number of potential cases of preventable PB was reduced to 34.

Cost results
The net total cost savings for the study institution would be $427,380 under the most optimistic scenario versus $168,940 under the worst-case scenario.

Synthesis of costs and benefits
Costs and benefits were not combined since the intervention was the dominant strategy.

Authors' conclusions
ED-based PV programmes would result in considerable cost savings and decreased mortality.

CRD COMMENTARY - Selection of comparators
The strategy of not implementing the ED-based PV programme was regarded as the comparator. This allowed the active value of the potential intervention to be evaluated.

Validity of estimate of measure of effectiveness
The internal validity of the effectiveness results can not be guaranteed due to the retrospective nature of the study
design, and the fact that insufficient justifications were given for the assumptions made regarding the effectiveness probabilities. However, the power calculations performed may have enhanced the internal validity of the effectiveness results, and the study sample appears to have been representative of the study population.

Validity of estimate of measure of benefit
The estimate of benefits was obtained directly from the assumptions made by the authors. This choice of estimate could have been supported by more details about the existing evidence.

Validity of estimate of costs
Some quantities were reported separately from the costs. Adequate details of methods of cost estimation were not given. As a result, it is not clear whether all important direct cost elements were included in the cost analysis, although it was acknowledged that costs occurring over time were not included in the analysis. The price year appears not to have been specified. It is not entirely clear whether the cost analysis was based on true costs, charge data, or reimbursement data. The perspective adopted in the cost analysis (hospital's perspective) was specified. The effects of alternative procedures on indirect costs were not addressed, as a result, the authors’ claim that the societal perspective was also incorporated in the economic analysis, cannot be justified. Statistical analyses were not performed on resource consumption or cost data. Cost results may not be generalisable outside the study setting.

Other issues
The authors’ conclusions may not be fully justified given the retrospective nature of the study design, the apparently arbitrary assumptions, and the lack of extensive sensitivity analyses, or statistical analysis of costs. Regarding whether the study sample was representative of the study population, it was acknowledged that this study did not address morbidity and mortality expected in patients with nonbacteremic pneumococcal diseases, which may have altered the study’s cost analysis. Other limitations of the study enumerated by the authors were as follows: the cost analysis did not consider that the vaccine may have variable efficacy depending on the specific indication for immunisation; and also it was not documented whether the ED patients received previous PV. The issue of generalisability to other settings or countries was not addressed. Appropriate comparisons were made with other studies.

Implications of the study
The ED offers numerous opportunities to vaccine patients at high-risk of PB. An ED-based PV programme should be able to readily identify patients' vaccine indications and result in considerable cost savings and decreased mortality.

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None stated.

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