Cost-effectiveness of a post-splenectomy registry for prevention of sepsis in the asplenic

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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.

CRD summary
The study objective was to assess the cost-effectiveness of a post-splenectomy registry for the prevention of sepsis in asplenic patients. The authors concluded that a registry-based approach to treatment was likely to be cost-effective in terms of mortality and rates of overwhelming post-splenectomy infection. There are limitations in the study methodology which mean the authors conclusions should be used with caution. In particular, there was a lack of data and strong assumptions regarding efficacy.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The study objective was to assess the cost-effectiveness of a post-splenectomy registry for the prevention of sepsis in asplenic patients.

Interventions
The intervention was a post-splenectomy registry approach for the delivery of treatment interventions. The comparator was the hypothetical counter-factual of no post-splenectomy register. In each cohort, patients were offered three treatments: vaccination, education and antibiotics. Vaccination was assumed to comprise of an initial receipt of routine vaccinations (pneumococcal, *Haemophilus influenzae* type B, influenza and meningococcal), followed by annual influenza vaccination and five-yearly booster vaccinations for pneumococcus and meningococcus. Chemoprophylaxis constituted universal antibiotics for two years post-splenectomy, and additional penicillin and amoxicillin for 50% of people. Education consisted of one initial education session with a registry nurse and an annual newsletter.

Location/setting
Australia/out-patient.

Methods
Analytical approach:
A Markov decision model was developed to estimate the lifetime costs and benefits of a post-splenectomy register. Outcomes for a cohort of 1,000 people covered by a registry were compared to 1,000 people not on a registry. The average age on entry was 48 years. Inputs for the model were derived from real-world hospital data (Alfred Hospital) and existing observational studies. The cost-effectiveness of the registry compared to no registry was estimated in terms of the additional cost per case of overwhelming post-splenectomy infection (OPSI) and as the additional cost per life-year gained. The authors stated that the analysis was conducted from the perspective of the health care sector.

Effectiveness data:
The primary effectiveness input was the relative uptake rates of the three treatment interventions (vaccination, education and antibiotics) for the two cohorts. For the non-registry cohort, uptake rates were derived from one published study from the literature (90% for vaccination, 67% for Chemoprophylaxis and 22% for education). Uptake rates for the registry cohort were assumed to be 100%. OPSI risk reduction was estimated for patients who received the following treatment combinations: all three treatments; vaccination and chemoprophylaxis; vaccination only. These reduction rates and the baseline OPSI rate were derived from the literature (two published papers). Mortality following OPSI was estimated from the literature to be 50%. The authors assumed (stating a lack of data to the contrary) that the cohort population had an equivalent life expectancy to the general population of Victoria, and that OPSI survivors did
not suffer reduced life expectancy.

Monetary benefit and utility valuations:
Not applicable.

Measure of benefit:
The benefit of the registry was measured in terms of the reduction in OPSI cases and increased life-years. Future benefits were discounted at an annual rate of 5%.

Cost data:
Direct costs to the health care service were modelled in the analysis. These included a per person registration administration cost (80 Australian dollars), vaccination costs (for each type of vaccination), chemoprophylaxis costs, educations costs (both on entry to registry and annual communications) and a cost for each OPSI case. All costs were derived directly from data from the Alfred Hospital. The cost of death was not included. Costs were reported in 2005 Australian dollars (AUD). Future costs were discounted at an annual rate of 5%.

Analysis of uncertainty:
Sensitivity analysis was used to assess the sensitivity of the results to key input parameters, including the uptake rates, OPSI rates and unit costs. Parameter estimates were altered between assigned value ranges to assess the effect of individual parameter uncertainty.

Results
Compared with non-registry patients, over two years the registry population gained 1.2 life-years and avoided 1.6 OPSI cases, at an additional cost of AUD 239,036. The cost per case of OPSI avoided was AUD 152,611. The cost per life-year gained was AUD 205,931. Over a lifetime (approximately 60 years) the registry population gained 81.8 life-years and avoided 12.5 cases of OPSI, at an additional cost of AUD 1,318,093. The cost per OPSI avoided was AUD 105,154. The cost per life-year gained was AUD 16,113.

The results were most sensitive to estimates of OPSI occurrence and mortality and to the risk reduction associated with the package of interventions ensured by inclusion on the registry. The authors commented that these findings suggested that future research should focus on improving estimates for these inputs.

The authors stated that their study was likely to underestimate the health benefits of a registry in reducing the known increased rate of non-OPSI infections, including opportunistic infections. In addition the authors stated that there was a research benefit to be gained from the implementation of a registry.

Authors' conclusions
The authors concluded that a registry-based approach to treatment was likely to be cost-effective in terms of mortality and rates of OPSI.

CRD commentary
Interventions:
The intervention appeared appropriate. A brief description of the intervention and comparator was supplied, and the subsequent treatment options were clearly reported. The comparator was appropriate and represented standard care in the absence of the intervention. The authors justified the choice of treatment options included, stating that they represented the current locally recommended treatments.

Effectiveness/benefits:
The effectiveness estimates were clearly reported. The sources used to derive estimates were clearly reported but the methods used to select sources were unclear. The authors justified their choice of paper used to derive uptake rates in the non-registry cohort, stating that it was chosen because it was one of a limited number of studies that measured both the uptake of all three treatment options considered. It was unclear why this paper was chosen over the mentioned alternatives, how those papers were initially selected, and why studies reporting on a selection of the treatment options were rejected. Given the lack of a systematic method of selection for sources used to derive effectiveness estimates and the exclusion of potentially relevant evidence, it was unlikely that the estimates represent best available evidence.
Several strong assumptions were adopted regarding the effectiveness of the intervention and the subsequent treatments. In particular the authors did not justify their assumption that the registry would result in 100% uptake of treatment. This assumption seems particularly strong for chemoprophylaxis and education, which both had uptake rates significantly lower than 100% in the non-registry cohort. The authors highlighted that a limitation of their study was the lack of available data, and stated that there were no randomised controlled trials of the effectiveness of a registry, or of the interventions. The reliance on non-randomised comparative data means that the results were more likely to be susceptible to bias.

Costs:
The costs included were appropriate to the perspective. The costs were appropriate to the population and setting, having been derived directly from data from the hospital in which the registry was conducted. Future costs were appropriately discounted. The unit costs applied in the model were clearly reported.

Analysis and results:
Only limited details of the model were reported. In particular the model structure was not reported, so the appropriateness of the model structure could not be assessed. The results of the analysis were clearly reported. No justification for the choice of parameter ranges used in the sensitivity analysis was given. It was unclear whether these ranges accurately reflected expected parameter uncertainty. Only a limited univariate deterministic sensitivity analysis was conducted, which was unlikely to adequately assess the effect of parameter uncertainty on the results. A probabilistic analysis (in which parameter values are drawn simultaneously from assigned probability distributions in order to assess the effect of joint uncertainty on the results) would have provided a more accurate assessment but the data may not have been available to undertake such an analysis. The interpretation of the results should account for the ranges selected for the sensitivity analyses. Given that the effectiveness and cost inputs were taken from a specific Australian hospital setting, the reader should carefully consider the applicability of the study (in particular the parameter estimates) to their situation before generalising the results.

Concluding remarks:
There are some limitations in the study methodology which mean the authors conclusions should be used with caution. In particular the analysis suffered from a lack of data and strong assumptions regarding efficacy.

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