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## Sustaining the implementation of an evidence-based guideline for bronchiolitis

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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.

### Health technology

The use of evidence-based guidelines in the treatment of children with bronchiolitis for a period of more than one year.

### Type of intervention

Treatment.

### Economic study type

Cost-effectiveness analysis.

### Study population

The study considered infants 1 year old or younger, who were admitted to the hospital with a first-time episode of typical bronchiolitis. Infants with histories of immunodeficiency, significant congenital heart diseases, bronchopulmonary dysplasia or congenital airway diseases were excluded. They were also excluded if they had a history of any other co-morbid condition that might make the effect of the bronchioles more severe and thereby more complicated. Patients requiring ventilator or other intensive therapies were also excluded.

### Setting

The setting was an institution. The economic study was carried out in a hospital in Ohio, USA.

### Dates to which data relate

The effectiveness and resource use data were collected from 15 January through 27 March 27 for the years 1993 to 1999. The data for 1993 to 1996 (i.e. before the guidelines were implemented) were collected retrospectively. The data for 1997 to 1999 (i.e. after implementation) were collected prospectively. 1999 prices were used.

### Source of effectiveness data

The evidence for the final outcomes were derived from a single study.

### Link between effectiveness and cost data

The costing was undertaken both prospectively and retrospectively on the same patient sample as that used in the effectiveness study.

### Study sample

A sample size of 83 patients was deemed necessary to detect a 20% change in the administration of any beta2-agonist, with an alpha-value of 0.05 and 90% power. Four hundred patients were required to detect a 20% change in the administration of multiple doses of beta2-agonist with 90% power at the p=0.05 level. Data from 1,979 patients were examined. There were 1,300 records from the historical 4-year period before implementation of the guideline. These

were compared with the data from 679 patients who were discharged from the hospital with the diagnosis of bronchiolitis after implementation on January 15, 1997. The patients were not given the choice of participating in the study, as the institutional review board concluded that the guideline was primarily a patient care instrument and consent was not required.

### **Study design**

This was a prospective nonrandomised study with historical controls, which was conducted in a single centre. The length of follow-up was not stated. No loss to follow-up was reported.

### **Analysis of effectiveness**

The basis for the analysis of the clinical study (intention to treat or treatment completers only) was not explicitly stated but it appears to have been intention to treat. The outcomes examined were the admission rates, the length of stay, blood gas percentage, and the use of beta2-agonist inhalation, nasopharyngeal wash, X-rays and antibiotics.

There were no significant differences between the ages of the patients between different years. The insurance coverage characteristics for the admitted patients were different before (56% Medicaid/self pay) and after (50% Medicaid/self pay) guideline implementation with significant, but inconsistent, differences in insurance coverage distributions between the years, ( $p < 0.001$ ). There was no significant difference in the distribution of patients when tested by year of admission.

### **Effectiveness results**

The annual number of admission was 325 infants before guideline implementation and 226 after implementation. The difference was 30%, ( $p < 0.001$ ).

The mean length of stay was 2.9 (+/- 2) days before guideline implementation and 2.4 (+/- 1.5) days after, representing a 17% reduction, ( $p < 0.001$ ).

Sixty-nine per cent of the patients received beta2-agonist inhalation before guideline implementation, compared with 57% after, ( $p < 0.001$ ). The proportion of patients who received more than one dose was 57% before implementation and 41% after, representing a reduction of 28%, ( $p < 0.001$ ).

The use of nasopharyngeal wash to detect respiratory syncytial virus was 89% before guideline implementation and 43% after, representing a 52% reduction, ( $p < 0.002$ ).

X-ray films were ordered in 70% of the patients before guideline implementation and 60% after, representing a 14% reduction, ( $p < 0.001$ ).

The blood gas percentage was the only outcome that increased (by 50%), ( $p < 0.001$ ).

The use of antibiotics was 57% before guideline implementation and 50% after, representing a 12% reduction, ( $p < 0.001$ ).

There was no change in readmissions within 10 days, ( $p < 0.05$ ).

### **Clinical conclusions**

Effectiveness was generally improved after implementation of the guidelines.

### **Measure of benefits used in the economic analysis**

There was no summary measure of benefit. The study therefore constituted a cost-consequences analysis.

### **Direct costs**

Discounting was not carried out as the costs were incurred over less than 2 years. The quantities and the costs were analysed separately. The quantities were estimated from actual data. The resources ancillary to bed occupation, length of hospital stay, and all other information used as a basis for generating hospital costs, were obtained retrospectively from the hospital financial and clinical computer systems. Medical records reviews were used selectively to abstract some retrospectively collected data, and also for confirmation as a measure of guideline compliance. The actual cost of each resource used during hospitalisation was extracted on the basis of relative value units. These were computed by the hospital financial system after adjusting all costs to 1999 values for comparability. According to the authors, the cost figures for use of resources ancillary to bed occupancy were easier to define and more reliable. The hospital charges were not included.

### **Statistical analysis of costs**

The data were stratified categorically, based on whether they represented information about care delivered before or after the introduction and implementation of the guideline. Categorical variables were analysed using chi-squared tests, while t-tests were performed for normally distributed continuous variables. Wilcoxon rank sums were used for non-normally distributed data.

### **Indirect Costs**

The indirect costs were not considered as the study was conducted on the basis of a health service/insurance perspective.

### **Currency**

US dollars (\$).

### **Sensitivity analysis**

A sensitivity analysis was not carried out.

### **Estimated benefits used in the economic analysis**

See the 'Effectiveness Results' section.

### **Cost results**

The total mean costs were \$3,297 (+/- \$2,188) for the period before guideline implementation and \$2,825 (+/- \$1,898) after implementation, indicating a 14% reduction, ( $p < 0.001$ ).

The mean costs for all ancillary resources were \$1,028 (+/- \$735) for the period before guideline implementation and \$609 (+/- \$355) after implementation. The change was 41%, ( $p < 0.001$ ).

The mean costs for the use of respiratory care services alone were \$293 (+/- \$291) for the period before guideline implementation and \$81 (+/- \$101) after implementation, indicating a reduction of 72%, ( $p < 0.001$ ).

The respiratory care data set included zero values, thus these costs were tested after transformation to their square roots. The difference was significant, ( $p < 0.001$ ).

### **Synthesis of costs and benefits**

Not relevant.

### **Authors' conclusions**

An evidence-based clinical practise guideline for the care of patients encountered in a paediatric care facility has been successfully sustained beyond the initial year of its introduction to practitioners in Southwest Ohio, as illustrated by the clinical and cost results.

### **CRD COMMENTARY - Selection of comparators**

The reason for the choice of the comparator was clear. It was chosen because it represented the current practice for infants with bronchiolitis in the authors' setting. You should consider whether this represents current practice in your own setting.

### **Validity of estimate of measure of effectiveness**

The study was used a prospective nonrandomised design with historical controls which, as highlighted by the authors, may have limitations. For example, the potential for bias and confounding. However, the study sample was shown to be broadly representative of the study population and the patient groups were shown to be comparable at analysis. The authors highlighted the fact that the results of these measures may have been attributable to other factors, as the tool was still being developed as the study progressed. The authors could have conducted a sensitivity analysis on these measures to control for some of the other events that were taking place in the hospital at this time.

### **Validity of estimate of measure of benefit**

There was no summary measures of benefit.

### **Validity of estimate of costs**

All the categories of cost relevant to the perspective adopted were included in the analysis. The costs and the quantities were reported separately, thus increasing transparency and generalisability,. The authors indicated that they used natural logs of the values to carry out the statistical analysis since the data were not of a normal distribution. The authors reported that the results of the natural logs may reduce the reliability of these results. Discounting was, appropriately, not undertaken since all the costs were incurred over less than two years.

### **Other issues**

The authors made appropriate comparisons of their findings with those from other studies. They cited several limitations in their study, as the conclusions were drawn from populations that were not concurrent in time. The authors highlighted the fact that it was not possible to control for all confounding factors. For example, a shift in diagnosis might have explained the fewer bronchiolitis admissions. However, this was considered unlikely as admitting diagnoses were assigned by the emergency department physician and not by the referring practitioner. The authors acknowledged that, coincident with the bronchiolitis implementation, there were other changes in hospital practices that may have played a role in improving patient care and financial outcomes. The study was also affected by the fact that the guidelines were under development as the study progressed. The results were reported in full. The authors' conclusions were appropriate for the scope of the study.

### **Implications of the study**

The authors indicated that, although the success of the guidelines has not been perfect, they have great potential for reducing the costs of managing children with bronchiolitis. Therefore, there is clearly a need for further research due to the limitations that the authors highlighted.

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None stated.

### **Bibliographic details**

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