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
This study compared two approaches to infection control for nosocomial respiratory syncytial virus (RSV) infections in paediatric patients. The intervention was a new approach to infection control for nosocomial RSV infection, and the alternative was existing practice in the US paediatric hospital setting.

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis; cost-benefit analysis.

Study population
The study population was medical and surgical patients of any age who were admitted to a 304-bed paediatric hospital in the USA (Children's Hospital of Philadelphia) for 8 consecutive RSV seasons. A RSV season was defined as the time from the first laboratory confirmed case (November) through to the end of April. Patients were excluded if their length-of-stay spanned two RSV seasons (more than 180 days). The median age of the study population was 1 year. RSV was defined as community acquired if symptoms were seen in the first 5 days of admission, and nosocomial if symptoms developed on or after the sixth hospital day.

Setting
Secondary care.

Dates to which data relate
The effectiveness data for current practice related to the periods 1988 to 1991 and 1992 to 1996 for the intervention. Therefore, there were four RSV seasons before the intervention and 4 seasons after the intervention. The cost data were collected in 1996. The prices relate to 1996.

Source of effectiveness data
Effectiveness data were derived from a single study.

Link between effectiveness and cost data
The cost data were collected retrospectively during the post-intervention period. Costing was therefore undertaken on a different patient sample from that used in the effectiveness study.

Study sample
No power calculations were reported and there was no evidence that the study sample was appropriate for the clinical study question. Patients were selected dependent on the confirmation of a nosocomial RSV infection. Patients were automatically included in the study if they had a RSV infection. Patients with RSV infections were prospectively identified throughout the study by tracking laboratory specimens. There were 1,604 patients in the pre-intervention period and 2,065 in the post-intervention period with hospitalised community-acquired RSV infection.

**Study design**
This was a single-centre, observational study with a before and after design using different cohorts of patients. Patients were followed-up during their hospital stay for a maximum of 180 days. If patients stayed in hospital longer than this they were excluded from the study.

**Analysis of effectiveness**
It appears that all patients included in the study, with RSV infection before and after the intervention were also included in the analysis of effectiveness data, suggesting an intention to treat approach. However, this was not made clear. Comparison of RSV infection rates was achieved by calculating the incidence density of nosocomial infection using risk strata that accounted for the number of patients excreting RSV and the number of days of exposure of susceptible patients. These were presented as rate of nosocomial infection per 1,000 patient days-at-risk. Incidence rates of nosocomial RSV infection were compared before and after the intervention using relative risk and Mantel-Haenszel stratified relative risk. The number of nosocomial RSV infections prevented was estimated by applying the pre-intervention stratum-specific rates of infection to the number of days-at-risk in the post-intervention period. The characteristics of the hospital and patients groups were similar for pre- and post-intervention time periods.

**Effectiveness results**
The effectiveness results were as follows:

88 nosocomial RSV infections occurred in a total of 90,174 patient days-at-risk before the intervention and 60 nosocomial RSV infections occurred in a total of 82,196 patient days-at-risk after the intervention.

The nosocomial infection rate in the pre-intervention period was 0.98 cases per 1,000 hospital days-at-risk and 0.73 cases per 1,000 hospital days-at-risk in the post-intervention period.

The crude relative risk of acquiring nosocomial RSV infection during the post-intervention compared with before was 0.75 (95% CI: 0.54 - 1.04).

The Mantel-Haenszel relative risk was 0.61 (95% CI: 0.53 - 0.69). The authors stated that this represented a statistically significant reduction of 39% in the rate of nosocomial RSV infection in the post-intervention period.

The authors estimated that the programme prevented 40 cases of nosocomial RSV infection, or 10 infections per season.

**Clinical conclusions**
The main conclusion of the analysis was that a targeted infection control programme was successful in reducing the incidence of nosocomial respiratory syncytial virus infections.

**Measure of benefits used in the economic analysis**
Effectiveness was measured using the estimated number of nosocomial RSV infections prevented. The authors also referred to a monetary benefit, which they measured in terms of cost of preventing an infection. This is not a recognised technique for quantifying monetary benefit for the purpose of a cost-benefit analysis.
Direct costs
Hospital direct costs were reported. The three major cost components of the intervention were gown and gloves for contact isolation, additional RSV testing performed, staff and administrative supplies. The cost components of the pre-intervention period were not explicitly reported. Quantities and costs were reported separately but only costs were analysed. Staff resource use was obtained by observation during the RSV seasons. The other resource use components were estimated from the number of additional gowns and laboratory tests required during the post-intervention period. Hospital charges and salaries were used and reported for the year 1996. The time frame of the analysis was not clear. Discounting was not carried out. If the timeframe of the analysis was 1 year or less then discounting of costs was not necessary. Incremental costs were not reported, but the authors reported the mean increase in direct costs attributable to the intervention.

Statistical analysis of costs
No statistical analysis of costs was conducted.

Indirect Costs
Indirect costs were not included because they were not appropriate to the study perspective.

Currency
US dollars ($) (no conversion rate was reported).

Sensitivity analysis
A one-way sensitivity analysis was performed using the utilisation rates for gloves and gowns and laboratory tests.

Estimated benefits used in the economic analysis
An estimated 10 nosocomial RSV infections were prevented as a result of the infection control programme. The reported monetary benefit was valued at $9,419 per infection, but this refers to the estimated cost saving to the hospital.

Cost results
The total direct cost of the intervention was $15,627 per RSV season (range: $9,418 - $24,577). The total direct cost for the pre-intervention period was not reported. See below for further cost results presented as part of the synthesis of costs and benefits.

Synthesis of costs and benefits
An incremental analysis was not performed. The cost-effectiveness of the infection control programme was reported as the ratio of total cost of the intervention to the number of infections avoided. The authors thus reported the resulting cost-effectiveness as $1,563 per infection prevented (range: $942 - $2,458). The cost-benefit of the intervention was reported as the ratio of cost of preventing nosocomial infection ($1,563) to the cost to the hospital of a RSV infection ($9,419, range: $9,249 - $20,721). The authors reported the cost-benefit ratio for the infection control programme as 1:6.

Authors’ conclusions
The authors concluded that the infection control programme was effective without the need for isolating patients to single rooms, and that it resulted in cost-savings to the hospital.

CRD COMMENTARY - Selection of comparators
The choice of comparators was not clearly explained in this study. In particular, an accurate description of the pre-
intervention control programme should have been reported to allow an explicit comparison of the alternatives. Furthermore, only at the end of the study did the authors refer to RSV prophylactic agents, a possible alternative intervention, but no further explanation was given.

Validity of estimate of measure of effectiveness
The selection of number of infections avoided seemed appropriate. However, the authors should have reported the before and after data to allow the reader to draw comparisons with patterns of infection in their hospital.

Validity of estimate of measure of benefit
The effectiveness and cost measures were estimated from data collected on a retrospectively defined population before the intervention, and prospectively defined population after the intervention. Before and after study designs such as this are associated with potential biases and confounding variables (e.g., non-random variation in unobserved patient characteristics, changes in the organisation of care, epidemiological changes or changes in the wider environment). This means that factors other than the intervention may have been determinants of differences in the effectiveness and cost over the time period studied. Therefore the results should be treated with caution. In addition, the measure of monetary benefit was not appropriate. The authors reported a cost saving rather than estimating the monetary benefit using approved methods such as contingent valuation.

Validity of estimate of costs
The inclusion of direct costs was appropriate to the study perspective, but the authors did not report the total cost of before and after the intervention.

Other issues
The authors discussed a number of limitations to their study. These included the lack of valuation of quality of life and patient satisfaction, which they said, inappropriately, would improve the cost-benefit ratio. They also felt that assessing the programme across the entire hospital population undermined the true impact of the programme and it would have been more appropriate to explore the impact basing calculations of patients' age or underlying diagnosis.

The authors note that the reductions found in the incidence of RSV nosocomial infection (NI) are supported by the results of other studies. However, the authors also note that the differences in evaluation methods mean that the results are not directly comparable. The authors indicate that at the time, this was the first study to evaluate the cost of a hospital-based programme to reduce the incidence of NSV RI. The evaluation was limited to children admitted to the Philadelphia Children's Hospital who had documented RSV before discharge from the index admission or were re-admitted within 5 days of discharge. There was no post discharge surveillance, which means that the patients with RSV NI who were asymptomatic at the time of discharge were not included in the evaluation. You the reader need to assess whether there may be important differences between the study sample and the population affected by RSV NI, which would affect the conclusions of the study. The results of this study should be interpreted with caution. In particular, the methods used to perform the cost-benefit analysis were not sufficient to address the research question. The lack of explicit reporting of all cost and effectiveness estimates means that it is not appropriate to generalise the results to other practice settings.

Implications of the study
The authors findings show that the infection control programme resulted in cost savings to their hospital, but suggest that future studies should explore the impact of newly available RSV prophylactic agents.

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