Fewer interventions in the immediate post-extubation management of pediatric intensive care unit patients: safety and cost containment


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
Two strategies for the management of pediatric intensive care unit patients in the immediate post-extubation period were compared.

Strategy A was to routinely administer 3 nebulised albuterol treatments one hour apart and to obtain a chest radiograph within 60 minutes of extubation.

Strategy B was to administer 1 nebulised albuterol treatment only. Supplemental oxygen was administered as necessary under both strategies.

Additional treatments or diagnostic tests were administered under both protocols if necessary.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness study.

Study population
Children who had been on mechanical ventilatory support for less than 5 days. Exclusion criteria included a history or presence of: heart failure, chronic cardiac disease or recent complex open heart surgery, cystic fibrosis, bronchopulmonary dysplasia or other chronic pulmonary disease, tracheostomy, oropharyngeal or tracheal problems or upper airway obstruction.

Setting
Hospital. The economic study was carried out in Miami, Florida, USA.

Dates to which data relate
No dates are given for the collection of effectiveness data or costs. The article was originally received for publication in February 1997.

Source of effectiveness data
Evidence for final outcomes was based on a single study.

Link between effectiveness and cost data
Costs were based on the same patient sample as that used for the effectiveness study and were collected retrospectively.
Study sample
Power calculations were not used to determine sample size and it is not evident that the sample size was large enough to detect differences in safety to the patient. There were 22 patients in the study and informed consent was given by a parent or guardian but it was not explained how the sample was selected. Numbers and the percentage who refused to participate and the percentage who were excluded (after the study criteria were fulfilled) were not given. 11 patients were randomised to each group.

Study design
Randomised non-blinded controlled trial. The study was single centred. Subjects were assigned randomly to each group but the method of randomisation was not given. Duration of follow up was 24 hours after extubation. There was no loss to follow up.

Analysis of effectiveness
All patients completed the treatment to which they were initially allocated (intention to treat basis). Primary health outcomes were the avoidance of complications such as respiratory distress, stridor or reintubation within 24 hours of extubation. Multiple clinical outcomes were also measured including heart rate, respiratory rate, arterial blood pressure, continuous pulse oximetric arterial saturation levels and arterial blood gas analyses results. There were equal numbers of each sex in each group and the mean ages of the groups were not statistically different (p => 0.05). Other factors were not analysed.

Effectiveness results
There were no complications in either group. There were no statistically significant differences between groups in clinical measurements except PaO2 and PaCO2. In the control group (strategy A) PaO (mm Hg) was 174 (+/- 87) and in the intervention group (strategy B) it was 119 (+/- 86), (p = 0.02). In the control group PaCO2 (mm Hg) was 43 (+/- 6) and in the intervention group was 37 (+/- 5), (p = 0.05). However these differences were not clinically significant.

Clinical conclusions
There were no clinically significant differences between groups and fewer interventions resulted in no increased risk to the patient.

Measure of benefits used in the economic analysis
The study showed that there were no clinically significant differences in outcomes between the 2 groups and the economic analysis was therefore based on costs only.

Direct costs
The numbers of procedures used in each strategy were given along with an overall charge for each. The charge for a portable chest radiograph was given separately from the radiologist’s interpretation fee but other than that charges were not itemised. No price date was given. Costs were not discounted as the time frame within which they occurred was less than 1 year. Patient charges were taken from prevailing hospital and radiography physician charges at the time of the study. The cost boundary was therefore that of the purchaser.

Currency
US dollars ($).

Estimated benefits used in the economic analysis
Not applicable.
Cost results
Total charges for the procedures in protocol A were $863.50 per patient and for those in protocol B $476.00 per patient.

Synthesis of costs and benefits
Not applicable.

Authors' conclusions
A reduced number of standard procedures following extubation led to cost charge saving of $476 per patient (which would amount to $232,500 per year for the hospital) with no apparent risk to patients. Further studies are needed to validate the safety of the reduced protocol and to study the possibility of eliminating all routine post-extubation interventions.

CRD COMMENTARY - Selection of comparators
The control protocol was explained as the standard in use at the study centre, but the authors stated that there was great variability in practice between care units and this may limit the relevance of the study. The authors did not explain why they chose to leave the particular routine intervention they did in the intervention strategy. The authors themselves suggested a further study with no routine interventions as one arm of the trial.

Validity of estimate of measure of effectiveness
The study was too small and the duration of follow up too short to detect differences in outcomes and in the safety of patients. The authors call for a larger trial and the sample size of that should be determined by power calculations to detect the difference in outcome measures that the authors consider to be clinically significant.

Validity of estimate of costs
There was too little detail in the costing. Using hospital charges instead of itemised costs and prices led to lack of clarity and difficulty of generalisation to another institution or health service. The size of the sample might have been too small to detect cases requiring non-routine procedures resulting in underestimation of costs.

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MeSH
Administration, Inhalation; Adolescent; Albuterol /administration & dosage /economics; Blood Pressure; Bronchodilator Agents /administration & dosage /economics; Child; Child, Preschool; Cost Control; Critical Care /economics /methods; Fees, Medical; Female; Heart Rate; Hospital Charges; Humans; Infant; Intensive Care Units, Pediatric /economics; Intubation, Intratracheal /economics; Male; Oxygen /blood; Postoperative Care /economics /methods; Prospective Studies; Respiration; Respiration Disorders /physiopathology /prevention & control; Treatment Outcome