

# Intensive Care Costing Methodology: Cost Benefit Analysis of Mask Continuous Positive Airway Pressure for Severe Cardiogenic Pulmonary Oedema

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## SUMMARY

Costing data for intensive care admissions is important, not only for unit funding, but also for cost outcome analysis of new therapies. This paper presents an intensive care episode costing methodology using the example of a cost-benefit analysis of mask CPAP for severe cardiogenic pulmonary oedema (CPO). This analysis examines the intervention of admitting all patients with severe CPO to the intensive care unit for mask CPAP, compared with the previous practice of admitting only patients failing conventional non-CPAP treatment and requiring mechanical ventilation.

The episode costs were determined from a prospective study which showed mask CPAP reduced the need for mechanical ventilation from 35% to 0%. The mean cost of a mask CPAP episode was \$1,156, with a mean stay of 1.2 days, compared with ventilated patients, \$5,055 and 4.2 days. The major contributors to cost in both groups were nursing and medical salaries, and hospital overheads.

The cost of previous estimated yearly caseload of 35 ventilated patients (\$176,925) was greater than the cost associated with an increased caseload of 100 mask CPAP patients (\$115,600).

We conclude that, despite an increase in admissions, mask CPAP for severe CPO is cost-effective.

Key Words: INTENSIVE CARE: mask CPAP, pulmonary oedema, cardiogenic; costing.

Intensive Care Units (ICUs) have grown in size and number, with considerable economic consequences. In the United States, ICUs account for 7% of hospital beds and 20-30% of hospital costs.<sup>1</sup> In our situation for the period 1990-1991 the Intensive Care Unit consumed 3.6% of total hospital expenditure, or 4.8% of total inpatient expenditure. Health care resources are limited and all clinicians are accountable for appropriate utilisation of these resources.<sup>2</sup> Therefore, the evaluation of a new health care intervention following demonstration of efficacy involves the assessment of efficiency or cost-effectiveness.<sup>3</sup> The acquisition of accurate costing data for critical illnesses requiring ICU admission will be important, not only for unit funding, but also for cost outcome analyses for new ICU therapies such as mask continuous positive airway pressure (CPAP) for severe cardiogenic pulmonary oedema.

Severe CPO is a frequent cause of acute respiratory failure. Treatment has included oxygen, vasodilators, diuretics, morphine and inotropic agents. Most patients respond slowly to this medical therapy over several hours and are often observed in the accident and emergency department during this period prior to transfer to a coronary care unit or ward. However, some patients fail to improve and require mechanical ventilation. Prior to the introduction of mask CPAP for severe CPO, there were approximately 35 such patients per year requiring mechanical ventilation admitted to the ICU at Flinders Medical Centre.

The delivery of CPAP via a tight-fitting facemask for the treatment of severe CPO was first described more than fifty years ago.<sup>4</sup> However, the precise role of mask CPAP in these patients was previously poorly defined. In a prospective, randomised study we have shown that oxygen delivered via mask CPAP (the mechanical efficiency of the system is likely to be important)<sup>5</sup> increases the rate of physiological improvement when compared with oxygen therapy alone and results in a significant reduction in the need for intubation and mechanical ventilation (0% vs 35%) in patients with CPO.<sup>6</sup> Only patients who remained hypoxaemic in spite of 8 litres/minute of oxygen via a Hudson facemask following frusemide and nitrates were entered into this study. Unfortunately, this study

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