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### Cost-Effectiveness Analysis in Critical Care

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Critical care medicine is becoming more and more costly. To keep it viable, a cooperative atmosphere must be created among all healthcare stakeholders in order to manage this economic issue without compromising quality or access to critical care services. Cost-effectiveness analysis (CEA) may be the key management tool for aiding decision-making concerning the allocation of scarce healthcare resources.

#### Introduction

Through the development of new therapeutic and diagnostic techniques, the greying of the population and the changing profile of the ICU patient, the demand for acute and high-tech care is increasing (Vandijck et al. 2006). As a consequence, critical care medicine places a heavy weight on the healthcare budget. With only 5-10% of the total beds, the ICU now accounts for about a quarter to almost one third of total hospital costs (Halpern et al. 2004). Applying economic tools to control the exponential growth of healthcare resources use has become increasingly important. CEA may help us understand the consequences of new interventions available for critical care.

## What is CEA?

CEA is an economic evaluation technique designed to compare the costs and benefits of one healthcare intervention with those of an alternative solution. In its most common form, CEA compares a new strategy with current practice and the result is expressed as a ratio (fig. 1) (Gold et al. 1996).

The core aim of CEA is to assess whether the new therapy is worth implementing, relative to the resources available. In other words, CEA analyses the cost to achieve the desired effect of a therapy (expressed as life-years or symptomfree days gained) (2002). Economic effects can also be described in terms of quality of life, expressed in quality-adjusted life years (QALYs) (Haentjens and Annemans, 2003). The cost savings due to an intervention are taken into account in the numerator of the cost-effectiveness ratio. The difference between the costs of the new and the current strategies is called a "net cost". If it is negative then the new strategy would lead to a net cost saving.

In CEA, it is conventional to distinguish between "direct costs" (e.g. personnel time, drugs, laboratory tests, increased hospital stay), "indirect costs" (e.g. production losses, families' time) and the so-called "intangibles" (e.g. pain, complications, discomfort, suffering) (Russell et al. 1996). The latter may be difficult to quantify. However, from an economic point of view, intangibles should also be included in the final cost estimate (Jarvis 1996). To ensure appropriate interpretation, it is essential to specify which costs were taken into account in the CEA.

## How to Interpret CEA?

Although not expressed in monetary terms, a CEA ratio might be considered as 'the price' of the additional benefit of a new practice. Different scenarios are possible, as shown in figure 2. Most new and effective interventions are not cost-effective because of their high price (quadrant Ia). However, if their price is not much higher than that of the current practice, then it could be considered cost-effective (quadrant Ib). Ideally, the new strategy would be more advantageous and lower-priced (quadrant II). In the worst case, it should be excluded (quadrant IV). A third-quadrant situation implies that the new practice is less beneficial than the current one, therefore its value is questionable.

Being cost-effective according to CEA does not mean the new strategy will necessarily save money. There are additional factors such as personal and social value, governmental priorities, ethical dilemmas and so on that may also influence one's interpretation of the analysis.

## Critical Care and Cost-Effectiveness Analysis

In a recent review article by Talmor and co-workers, the authors gave an overview of well-conducted CEA studies in critical care medicine (Talmor et al. 2006). As this topic is still emerging within the field, only 19 studies directly related to the management of the critically ill and reporting cost per QALY, were found and considered for further investigation. Although measuring cost-effectiveness is not clear-cut, there seems to be an international consensus that interventions with a CEA ratio of approximately €50,000 per QALY or lower are acceptable. Some CEA studies in critical care report either extremely high or very low CEA ratios ( $\geq$ €200,000 vs.  $\leq$ €10,000 per QALY, respectively). However, most fall somewhere in-between.

## Conclusion

Critical care medicine is expensive, and this trend will not be curbed soon. For all healthcare players involved, it is of the utmost importance to allocate the available resources as appropriately as possible. CEA may be therefore a valuable tool to support the decision-making process in critical care medicine.

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