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Variation in ICU Resources Across Countries

Intensive care resources vary greatly across countries and impact delivery of care. Better understanding of these differences is needed to improve quality of care while minimising costs.

The delivery of healthcare occurs at the local level, yet the economics of healthcare and the resources for a given society are often shaped at a national level. While variation in healthcare resources and spending exists within regions and countries, there are also clearly defined differences in the delivery of care that occur among countries due to cultural and economic disparities (Wunsch et al. 2006). The most obvious, and quantifiable example of this is the variation in healthcare spending in different countries. For example, healthcare spending per capita is 6,014 dollars in the United States (US), almost three times that spent in the United Kingdom (UK) (2,509 dollars, in 2008, calculated using purchasing power parity) (http://stats.oecd.org/ WBOS/index.aspx).

Intensive care is one of the most expensive aspects of healthcare, accounting for 0.5-1% of the Gross Domestic Product in the US (Halpern et al. 2004), and up to a third of hospital costs (Cooper & Linde-Zwirble 2004). The true impact of economic differences on intensive care may be impossible to isolate and quantify. However, a knowledge of baseline differences in resources, such as intensive care unit (ICU) bed numbers, may allow us to gain a better handle on how economics and resources confound our examination of other aspects of intensive care, such as patient selection, organisation of ICUs, and ultimately outcomes (Angus et al. 1997).

Definition of Intensive Care

The first question to ask is what constitutes intensive care? In a recent study of ICU beds in North America and Western Europe, data on beds came from eight different sources with seven different definitions (Wunsch et al. 2008). The challenge of comparing resources is to identify the true capacity to care for critically ill patients. For example, if patients after major surgery are cared for in either an ICU or in a recovery room, depending on availability of beds, should all the recovery room beds in that hospital be counted as ICU beds? Should coronary care unit beds be counted as ICU beds if they have the capacity to care for ventilated patients? And is a patient in a "stepdown" bed or a "high dependency" bed receiving intensive care? These questions, combined with the lack of an international definition, make all comparisons challenging (Fan and Ferguson 2008).

ICU Resources

While the problem of definition may mean that we can never provide absolute numbers for any given region or country, the reality is that the differences are so stark that even rough estimates provide an important picture of differences in resources. The UK for example, is estimated to have only about one fifth of the available ICU beds of Germany (Wunsch et al. 2008). Among eight countries in North America and Western Europe, there are enormous variations in both the availability of hospital beds and ICU beds (Figure 1). However, excluding the US, there is a strong relationship between the number of acute hospital beds and ICU beds. This suggests that even though much of healthcare may occur at the local level, there is an innate balance between hospital beds and ICU beds for a given population that is used (even without national planning) by many developed countries (Wunsch et al. 2008).

Relationship with Case Mix and Outcomes

Data from the SOAP study by Vincent et al. demonstrated large variation by country with regard to the percentage of patients admitted to the ICU with sepsis (18-73%), and a strong correlation between this incidence and hospital mortality (Vincent et al. 2006). It makes intuitive sense that having fewer ICU beds would mean that the overall severity of illness of patients in the ICU should be higher, as well as subsequent hospital mortality. In fact, there is a strong correlation between the availability of ICU beds and both the incidence of sepsis and outcome, as well as a strong correlation with outcome for all ICU patients in a given country (Wunsch et al. 2008). Many questions remain, such as the impact of different availability of intermediate care beds, the ratio of ICU beds to hospital beds in a given hospital, and the potential optimal number of beds per ICU. The little data we have suggest that our ability to understand information on diseases and outcomes in intensive care must account for all this variation in order for us to fully understand findings and to move forward to improve delivery of care in any country.

Economics

In the hospital setting, costs are made up of fixed and variable components. The majority of hospital costs are fixed, usually estimated at over 80% in the US (Kahn 2006). Given the high fixed costs of intensive care beds and the enormous portion of healthcare that intensive care represents, one would expect a strong relationship between ICU resources and per capita healthcare spending. Yet, analysis of ICU beds per capita versus health care spending per capita shows only a moderate association (R=0.48, Figure 3) (Wunsch et al. 2008). This association is unaffected by the inclusion or exclusion of the US, which is a large outlier in spending.

Why is there such a weak correlation? First, hospital (and ICU care) represents only a part of healthcare costs. Within the ICU, there are different choices with regard to nurseto- patient ratios, number and type of ancillary healthcare staff, and availability of expensive care options such as dialysis machines for each bed, that will vary even fixed costs. ICU costs also vary by the day in the ICU, with the first day usually the most expensive (Dasta et al. 2005). Intensity in the use of diagnostic procedures, such as echocardiography, will also impact the cost of care. A recent study in a single US ICU demonstrated substantial variation in per patient spending depending on the physician caring for the patient, with no differences in either adjusted ICU length of stay or mortality (Garland et al. 2006). Finally, willingness to withhold or withdraw care, and overall cultural attitudes towards intensity of care at the end of life may affect the costs (Barnato et al. 2004; Barnato et al. 2007).

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The US as Outlier

It is clear from the data presented that the US represents an outlier compared with other developed countries when it comes to many aspects of the delivery of intensive care, from the ratio of ICU beds to hospital beds per capita, to overall healthcare spending per capita. The most obvious over-arching reason may be the large amount of private healthcare in the US compared with many other countries, which may drive care in different directions. For example, the different ratio of ICU to hospital beds may be due in part to the pressure from private health insurers to minimise hospital lengths of stay. This has led to a decrease in hospital beds, at the same time that there has been an increase in intensive care beds (Halpern et al. 2006). During this same time period there has been a trend towards high reliance on the use of other types of facilities, such as skilled nursing facilities after hospital discharge that may, in effect, substitute for acute care hospital beds (Barnato et al. 2004; Sirio et al. 1999). Such differences can profoundly affect both the patterns of care and perceived mortality for patients (Kahn et al. 2007).

Conclusions

Intensive care resources vary greatly across countries. We are only just beginning to understand the relationships between spending, resources, delivery of care and outcomes in critical care medicine. There are clear patterns in care that are truly international, and large differences that make the delivery of critical care unique in each country. We must continue to look across these artificial boundaries to identify the systems and practices that will allow us to maximise high quality care while minimising costs.

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