

## Commentary

# ICUs worldwide: Results of a nationwide survey of Colombian intensive care units

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### Abstract

Sixty-three of 89 identified intensive care units in Colombia (Evaluation of Intensive Care in Colombia) participated in this voluntary study. A convenience sample of 20 intensive care units, each submitting 200 patients or more, was chosen, from which the following information is presented. The Intensive Care National Audit and Research Center (UK) protocol was used to evaluate patient severity, length of stay, raw and anticipated mortality, intensive care unit patient admission/rejection criteria, and human and technologic resources available. Information was drawn from public and private institutions.

**Keywords** admissions, Columbia, intensive care, mortality, resources

Colombia's first intensive care unit (ICU) was established in the early 1960s at San Juan de Dios Hospital in Bogota. This was soon followed by additional facilities at the Shaio Clinic, Military Hospital, San Jose Hospital and Caja Nacional de Prevision. Similar to the international community, Colombian critical care has expanded to meet the needs of improving the increasingly complex care mandated by improvements in health care delivery, medical technology and vulnerable populations at the extremes of age.

The Clinical Epidemiology and Bio-Statistics Unit of the Javeriana Medical School and the Colombian Critical Medicine and Intensive Care Association collaborated in 1997 to establish an Intensive Care Unit/System Delivery evaluation program in parallel with government and private sector efforts to expand medical coverage nationwide [1].

Evaluation of Intensive Care in Colombia was funded through the following organizations: Pontificia Universidad Javeriana, Colciencias, Colombian Ministry of Health; International Development Department, United Kingdom; Rockefeller Foundation International Clinical Epidemiology Network; and the Colombian Association of Critical medicine and Intensive

Care. The study was modeled on the Intensive Care National Audit and research Center (UK) questionnaire to obtain reliable information for comparison with external benchmarks [1,2].

### Study objectives

The study was instituted to prospectively analyze information from the following areas [1]: the description of human and technologic resources available in the ICU; ICU demographics, to include severity of illness and case mix; the description of costs and resource consumption in the ICU; the description of staffing patterns, patient care protocols and unit direction; the comparison of the expected and true mortality based on admission severity across selected units; the contrast of Colombian ICUs according to unit management and care processes and mortality; and the comparison of Colombian and English experiences.

### Identification of participating ICUs

Eighty-nine ICUs were identified in the country, and 63 units participated voluntarily to develop the present study. Twenty ICUs were chosen after evaluation of data submitted from the original questionnaire. Ten ICUs were located in Bogota and

the remaining 10 were located throughout the rest of the country [1].

Acute Physiologic and Chronic Health Evaluation (APACHE) II and APACHE III, Simplified Acute Physiology Score (SAPS) II, Mortality Probability Model (MPM) II<sub>0</sub> and MPM II<sub>24</sub> methods were utilized to evaluate the severity of illness for different patient populations and to calculate the expected mortality [3,4].

The structure of critical care service delivery in Colombia was categorized in terms of human and technologic resources and outcome, in both public sector and private sector facilities. Results were compared with National Standards for Intensive Care promulgated by the Ministry of Health (Colombia). Factors leading to patient refusal for ICU admission were researched.

## Results

Initial information was obtained from 63 of the 89 ICUs contacted (72% response) [1]. The public hospital ICU length of stay was statistically longer at 6.1 days than 4.3 days in the private sector in 1996 ( $P=0.05$ ). The public versus private maximum average length of stay was 44 days versus 30 days ( $P=0.04$ ). Private hospital ICUs admitted more patients per month ( $P=0.02$ ) and had a higher bed turnover ( $P=0.03$ ) than those in the public sector.

No significant differences were found in technology available in all areas. When compared with nationally approved standards, however, the number of available beds consistently exceeded recommended technologic resources.

Of the public hospital ICUs, 42% reported that patients requiring ICU services were refused admission one to 10 times per week, versus 14% in the private sector ( $P=0.0049$ ). While the lack of available beds was the most frequent cause in over 85% of the ICUs in both sectors, the lack of available nurses was four times more frequently the cause for admission refusal in the public institutions.

All ICUs reported the day and night shifts worked by medical staff and nurses. The equivalent average full-time number of nurses for each ICU was four, and no difference was noted between the public and private ICUs surveyed. Only 25% of the nurses stated that they had received some degree of intensive care training.

More than 90% of all ICUs reported the presence of a full-time Medical Director: 64% were internists and 27% were anesthesiologists, and 5% reported specialized training/certification in intensive care.

Although medical specialists (internal medicine, anesthesiology) and residents in training (internal medicine,

anesthesiology, surgery) cover medical care at night in some areas, over 50% of ICUs reported that all care was performed/covered by general practitioners without formal critical care training. This was more frequent in the public sector than in the private sector (73% versus 39%,  $P=0.034$ ).

There is a significant deficit with respect to available human resources and technologic support in Colombian ICUs. To upgrade the units to comply with published national standards would cost approximately US\$10 million for the 63 ICUs from which accurate data is available. Extrapolating these projections, under the assumption that no significant differences would be found in resources, organizational structure and staffing patterns, to the remaining 26 ICUs results in additional costs of US\$5 million for the first year.

There are 12,987 hospital beds and 460 ICU (3.5%) beds in the reporting hospitals. If it is assumed that 5% (ideally it would be 10%) of available beds will be available for critical care services, there would be an additional deficit of 320 ICU beds (1997 survey data), with requisite staffing and technologic support consuming additional funding.

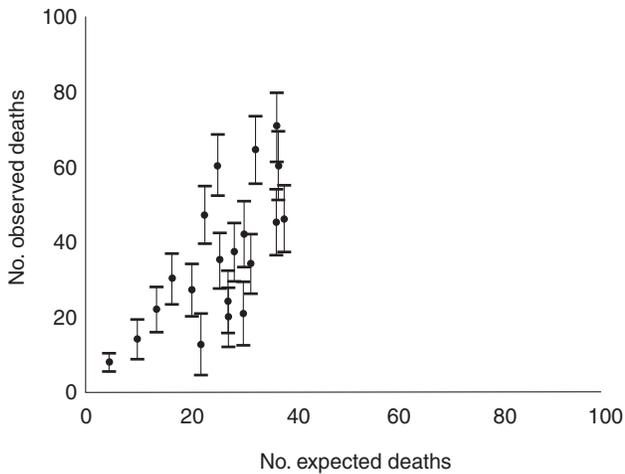
Fixed costs were higher than variable costs in all reporting ICUs and represented 82–87% of the total costs associated with patient care. Direct variable costs were distributed as follows: medication, 45–63%; blood bank, 19–30%; and nutrition, 6–21%. Clinical laboratories and radiology services required significantly lower budgets.

Further analysis of medication costs revealed that sedatives accounted for 30–50%, antibiotics accounted for 26–41%, and inotropes and other medications accounted for the remainder.

Significant mortality differences in the reporting ICUs were noted utilizing the APACHE II, SAPS II, MPM II<sub>0</sub> and MPM II<sub>24</sub> methodologies. These data were reported to the directors of the respective units. The observed mortality/expected mortality ratio with 95% confidence limits is shown in Fig. 1.

## Conclusions

There is a marked difference between public sector and private sector ICUs in Colombia. Private ICUs normally show better results than do those of the public sector. The differences reside primarily in the quantity and training of the personnel, and in the availability of technology. Lack of formal training was more frequently seen in physicians and nursing staff working in the public sector. Two out of four ICUs with high mortality rates did not have invasive monitoring technology. There seems to be a clear correlation between the lack of specialists and trained nursing personnel and the poor results that public ICUs present [1,2].

**Figure 1**

Number of deaths observed versus number of expected deaths using the APACHE II method from 22 July 1997 to 2 October 1998 (2615 patients). Data taken from [1].

Improvements in human resources and technologic support are needed in public sector and private sector facilities. In comparison with English patients, Colombian ICU patients are younger and represent a lower severity of illness.

### Competing interests

None declared.

### Acknowledgement

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