Journal of Critical Care 29 (2014) 764–768

Contents lists available at ScienceDirect

Journal of Critical Care

journal homepage: www.jccjournal.org

Outcomes

A cross-sectional survey of critical care services in Sri Lanka: A lower middle-income country☆

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ARTICLE INFO

Keywords:
Critical care services
Lower middle-income country
Critical care resources
Critical care staffing

ABSTRACT

Purpose: To describe the extent and variation of critical care services in Sri Lanka as a first step towards the development of a nationwide critical care unit (CCU) registry.
Materials and Methods: A cross-sectional survey was conducted in all state CCUs by telephone or by visits to determine administration, infrastructure, equipment, staffing, and overall patient outcomes.
Results: There were 99 CCUs with 2.5 CCU beds per 100 000 population and 13 CCU beds per 1 000 hospital beds. The median number of beds per CCU was 5. The overall admissions were 194 per 100 000 population per year. The overall bed turnover was 76.5 per unit per year, with CCU mortality being 17%.
Most CCUs were headed by an anesthetist. There were a total of 790 doctors (1.6 per bed), 1 989 nurses (3.9 per bed), and 626 health care assistants (1.2 per bed). Majority (87.9%) had 1:1 nurse-to-patient ratio, although few (11.4%) nurses had received formal intensive care unit training. All CCUs had basic infrastructure (electricity, running water, piped oxygen) and basic equipment (such as electronic monitoring and infusion pumps).
Conclusion: Sri Lanka, a lower middle-income country has an extensive network of critical care facilities but with inequalities in its distribution and facilities.

1. Introduction

The worldwide demand for critical care services is growing, and dedicated critical care units (CCUs) are becoming increasingly available in lower-income countries (LICs) and lower middle-income countries (LMICs) [1]. In LICs/LMICs, partly due to geopolitical reasons (disasters, both natural and manmade) and scarce resources, the burden of critical illness exceeds existing capacity [2]. This burden comprises mainly of children and young adults, in contrast with higher-income countries (HICs) where older age groups predominate [2,3]. This younger age group suffers high mortality in the LICs/LMICs, mostly caused by reversible illnesses [4]. Improving access to critical care and the quality of care can thus potentially save many lives.

Research aimed at improving critical care in LICs/LMICs is limited [2,5,6]. There is, however, increased interest and demand for work in this area [4,7]. A CCU registry, which collects basic patient data on disease severity and patient outcome, would provide valuable baseline information to compare quality of care between CCUs. This will be a valuable aid to initiate and evaluate quality improvement interventions [8–10]. Studies describing critical care services are a starting point for the establishment of such a CCU registry in a region or country by providing an understanding of staffing, equipment, service distribution, and other similarities or differences of CCUs.

Assessing the capacity and technical levels of existing facilities through a census of CCUs is also important for planning and delivery of critical care at the national and regional level [2,7]. Knowledge of the distribution of critical care resources is essential for optimal use of this scarce resource [2,4].

There have been only few detailed descriptions of CCU services at a national level in LICs/LMICs, and those available do not usually cover the entire breath of such services, such as specialist CCUs, support staff, and CCU equipment [3,11,12]. In this detailed survey, we describe the extent and variation of critical care services in state hospitals in Sri Lanka.

☆ Competing interests: The authors declare that they have no competing interests.

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http://dx.doi.org/10.1016/j.jcrc.2014.04.021
0883-9441/

2. Materials and methods

We defined CCUs as units that have at least 1 ventilator and where patients are expected to be admitted for at least 24 hours. We aimed for the findings to be comparable to previous studies [13,14] and to exclude the following facilities: ad hoc "high dependency" areas in a ward with some extra monitoring, postanesthetic ("recovery") care areas where a patient maybe ventilated for a few hours, and emergency treatment units similar to resuscitation areas in accident and emergency departments in HICs (where treatment is limited to initial stabilization before transfer to a definitive critical care area).

A list of state hospitals was obtained from the Planning Division of the Ministry of Health [15]. All government hospitals from "base" level and above were contacted by telephone, to determine the availability of a CCU in the hospital. A directory of hospitals with CCU facilities was then compiled [16].

Neonatal CCUs and CCUs of private sector hospitals were not included in our survey. Neonatal CCU facilities and distribution in Sri Lanka have already been extensively described [17]. The non-state sector CCUs were not included because of commercial sensitivity and lack of feasibility.

All CCUs catering exclusively to pediatric patients were grouped as "pediatric." The medical subspecialty CCUs such as coronary care and neurology were categorized as "medical sub." The surgical subspecialty CCUs such as obstetrics, neurosurgery, neurotrauma, accident service, cardiothoracic, and dental were categorized as "surgical sub." The general CCUs accommodate both medical and surgical patients.

We designed a data extraction sheet (see Supplement E1) to obtain information about the following broad areas:

1. The demography of CCUs (including hospital type, administration, supervision, specialism, etc).
2. The availability of facilities including equipment for monitoring, treatment and communication (desktop computer, telephone, and Internet connectivity).
3. The staffing: consultants (specialists), nonspecialist doctors, nurses, allied health staff, and services accessible.
4. Patients: sources, types, numbers, and overall CCU outcomes (for 2010 and 2011 from admission and discharge register in the CCUs).

The data collection tool was pretested in 5 CCUs, and feedback from users was incorporated into the final version. Data collection was performed by a trained preinternship doctor during January and February of 2011, from the Sister/Nursing Officer in charge of the CCU, either through personal visits (13 CCUs in Northern and Eastern provinces and 15 CCUs in the National Hospital of Sri Lanka) or by telephone (71 CCUs). The overall CCU outcomes for 2011 were collected separately during the first week of January 2012.

The quality of the data collected was validated by the "test-retest" method. Three months after completion of the survey, 10 randomly chosen CCUs were contacted by telephone and 11 selected fields from the study tool were resurveyed and compared with the initial assessments, which were not disclosed to those contacted. We were aware that some parameters were likely to change, for example, staff numbers. The original data were used for analysis (repeatability was high, as described below).

Data were analyzed using SPSS-10 statistical software program (SPSS, Inc., Chicago IL). Standard descriptive statistics was performed. Student t test was used to compare continuous variables. The reproducibility within the test-retest method was expressed using Cohen κ coefficient.

Permission to conduct the survey was obtained from the Ministry of Health, Sri Lanka, and individually from the directors of the hospitals concerned. Ethical clearance was obtained from the ethics review committee of the Faculty of Medicine, University of Colombo.

3. Results

We identified 99 CCUs among 50 hospitals at the time of the survey, and information was obtained from all units (response rate 100%). Four CCUs did not have admissions and deaths recorded separately because these units were functioning as part of larger general wards. The admissions and deaths for these CCUs were thus not obtained. All available data were used in the analysis.

The Cohen κ coefficient of the data items collected after the test-retest method was greater than 0.94 (see Table E2).

Table 1 summarizes the main characteristics of CCUs. The distribution of CCU functionality (total and per 100 000 population) by province is described in Table 2.

A total of 75 (75.8%) CCUs were managed directly by the Ministry of Health at the national level, with the remainder being administered by various provincial authorities, as part of devolution.

On average, there were 2.5 CCU beds per 100 000 population (total number of CCU beds in Sri Lanka divided by total population of Sri Lanka, ranging from 0.89 to 4.42 between provinces), and 13 CCU beds per 1000 hospital beds. The median number of beds per CCU was 5 (range, 2-10). Larger CCUs with 7 beds or more were concentrated in the Western, Southern, and Central Provinces. On average, tertiary hospitals had 17 CCU beds per 1 000 hospital beds, whereas base hospitals had 7 beds per 1 000 hospital beds, and provincial and district general hospitals 12 beds per 1 000 hospital beds.

The overall bed turnover (defined as the number of admissions per bed per year) was 76.5. According to type of CCU, the lowest turnover was in the neurologic CCU (31.4) and highest in the coronary care units (146). The overall number of CCU admissions per 100 000 population per year was 194 (range, 87.7-348.8, between the provinces).

Overall CCU mortality was 17%, with mortality in medical CCUs being significantly higher ($P < .001$) than surgical CCUs. General CCUs (mixed medical and surgical) had a mortality rate significantly lower ($P < .05$) than Medical CCUs, although the proportion of medical/surgical admissions in these CCUs is not known.

The lowest mortality rate was observed for obstetric CCUs (1.6%). Surgical CCUs with emergency surgical admissions (trauma and other emergency services) had higher mortality (27.2%). Within the surgical CCUs, the mortality rate was highest in patients with neurotrauma (21.6%) or those who underwent neurosurgery (21.8%). In medical CCUs, the highest mortality was observed in neurologic patients (24.2%).

4. Staffing

Most CCUs (72; 72.7%) were headed by a consultant anesthetist. An anesthetist was head in 33 (94.3%) of 35 of the general CCUs and 9 (90%) of 10 of the surgical CCUs. A consultant physician was head in 6 (60%) of 10 medical CCUs, whereas in all 6 medical subspecialty CCUs, the consultant in the relevant subspecialty was the head.

There were a total of 790 nonspecialist doctors employed in the surveyed CCUs, 1.6 per bed (range, 1.34-2.25, between provinces). There were a total of 1 989 nurses (3.9 per bed; range, 2.17-4.87, between provinces) and 626 health care assistants/"attendants" (1.2 per bed; range, 0.71-1.65, among provinces). There was a "nursing sister" (specially trained clinical nurse manager) as "in charge" CCU nursing officer in 52 (52.5%) of the surveyed CCUs.

In most (87; 87.9%) CCUs, the nurse-to-patient ratio was at least 1:1, whereas 11 (11.1%) CCUs had a ratio of 1:2 and 1 CCU had a ratio of 1:3.

With regard to the training level of nursing staff, 226 (11.4%) of nurses had received formal intensive care unit (ICU) training, whereas 56 (56.6%) of "nurses in charge" had received similar training. Most (114, 48.2%) of trained nursing staff were in the Western Province. Surprisingly, tertiary hospitals, in comparison, had the lowest proportion of nurses with formal ICU training (134; 10.6%).

Self-declared participation in continuous professional development activities during the last 6 months by CCU nursing staff was 265 (13.3%), and by health care assistants, 49 (7.8%). Figures for doctors were not collected.