A Survey on Critical Care Resources and Practices in Low- and Middle-Income Countries

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ABSTRACT

Background: Timely and appropriate care is the key to achieving good outcomes in acutely ill patients, but the effectiveness of critical care may be limited in resource-limited settings.

Objectives: This study sought to understand how to implement best practices in intensive care units (ICU) in low- and middle-income countries (LMIC) and to develop a point-of-care training and decision-support tool.

Methods: An internationally representative group of clinicians performed a 22-item capacity-and-needs assessment survey in a convenience sample of 13 ICU in Eastern Europe (4), Asia (4), Latin America (3), and Africa (2), between April and July 2012. Two ICU were from low-income, 2 from low-middle-income, and 9 from upper-middle-income countries. Clinician respondents were asked about bed capacity, patient characteristics, human resources, available medications and equipment, access to education, and processes of care.

Results: Thirteen clinicians from each of 13 hospitals (1 per ICU) responded. Surveyed hospitals had median of 560 (interquartile range [IQR]: 232, 1,200) beds. ICU had a median of 9 (IQR: 7, 12) beds and treated 40 (IQR: 20, 67) patients per month. Many ICU had ≥1 staff member with some formal critical care training (n = 9, 69%) or who completed Fundamental Critical Care Support (n = 7, 54%) or Advanced Cardiac Life Support (n = 9, 69%) courses. Only 2 ICU (15%) used any kind of checklists for acute resuscitation. Ten (77%) ICU listed lack of trained staff as the most important barrier to improving the care and outcomes of critically ill patients.

Conclusions: In a convenience sample of 13 ICU from LMIC, specialty-trained staff and standardized processes of care such as checklists are frequently lacking. ICU needs-assessment evaluations should be expanded in LMIC as a global priority, with the goal of creating and evaluating context-appropriate checklists for ICU best practices.

The need for intensive care is increasing worldwide [1,2]. In high-income countries, critically ill patients are routinely treated in intensive care units (ICU) by specialized physicians, nurses, and support staff. This healthcare model is expensive and often cannot be effectively transferred into low- and middle-income countries (LMIC) [3,4]. In contrast, the majority of the world's population lives in LMIC, with a disproportionately high burden of critical and life-threatening illness, resulting in unacceptably high mortality rates from potentially treatable conditions [5]. Despite this, there are limited data on critical care resources and practices in resource-limited countries [6]. Lack of human resources, adequate specialty training, equipment, and infrastructure all present barriers to safe and effective use of life-saving interventions in these settings [3,7]; however, the relative contributions of these factors toward ICU care in LMIC are not known. In addition, lack of standardized, evidence-based approaches to care may preclude optimal delivery of critical care in LMIC ICU settings. The use of checklists has previously been shown to improve adherence to processes of care and to decrease complications in a variety of ICU settings [8–12]. To facilitate timely and improved best-practice delivery and a reduction in preventable death and complications in critically ill patients, we plan to develop a simple evidence-based electronic decision support tool: CERTAIN (Checklist for Early Recognition and Treatment of Acute Illness). As a first step, we performed a web-based capacity-and-needs assessment of 13 ICU.

METHODS

We conducted a cross-sectional survey in a convenience sample of 13 hospitals with whom we have previously collaborated: 4 from Eastern Europe (2 in Serbia, 2 in Bosnia and Herzegovina); 4 from Asia (China, India, Mongolia, and Turkey); 3 from Latin America (Mexico,

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Panama, and Dominican Republic); and 2 from Africa (Rwanda). The survey was conducted between April and July 2012. Two hospitals were from low-income countries, 2 from low-middle-income countries, and 9 from upper-middle-income countries according to World Bank classification (Table 1) [13]. One physician at each participating center was contacted by an e-mail that explained the purpose of the study and provided a link to the web-based survey. Participants were asked 22 questions about ICU bed capacity, patient characteristics, human resources, available medications and equipment, education, and processes of care (Online Appendix), based on a previously published survey [14]. The ability to access resources and equipment was classified as easy, neither easy nor difficult, and difficult based on perception of the study participants. The study was exempt from institutional board review. Respondents provided consent to participate in the survey. Descriptive statistics were used to describe all survey domains.

RESULTS

ICU capacity and common causes of death

All centers (Table 1) responded to the survey (1 clinician per ICU, 100% response rate). Hospitals had a median of 560 (interquartile range [IQR]: 232, 1,200) beds. The median number of ICU beds was 9 (IQR: 7, 12) and ICU treated a median of 40 (IQR: 20, 67) patients per month. The average ICU/hospital bed ratio was approximately 1.6% (9:560). The approximate average age of critically ill patients was 51 to 60 years in 7 hospitals, 4 hospitals reported average age $\leq$50 years, and 2 hospitals reported average age of >60 years. Ten hospitals were exclusively funded by government funds and 1 by private/industry funds; 2 hospitals were supported by >1 source. All hospitals delivered care to patients in their local language, and 2 hospitals in Africa also delivered care in English and French. Six ICU (46%) listed sepsis as the most common cause of death, with road traffic trauma as the most common cause of death in 2 ICU (15%). The most common cause of death at each of the remaining ICU differed: ischemic heart disease; stroke; conditions leading to emergency operations; nutritional diseases; and diseases of the respiratory system. The major causes of death reported by each ICU are listed in Table 2.

ICU staffing and access to educational materials

Each ICU surveyed was staffed with both physicians and nurses, and 1 hospital was additionally staffed with physician's assistants and 1 with nurse's assistants. In 1 hospital, additional care was provided by patients' family and friends. Nine ICU (69%) were staffed with physicians who specialized in critical care; 9 (69%) had $\geq$1 physician certified in the Advanced Cardiac Life Support course; and 7 (54%) were staffed with $\geq$1 physician who had completed the Fundamental Critical Care Support course. Eight (61%) employed nurses with formal critical care training.

The availability of ICU staff, medications, and equipment are presented in Figures 1 and 2. Seven hospitals (54%) reported use of any kind of checklists. Five hospitals (38%) reported use of some checklists during daily rounds and 5 (38%) during ICU admission; only 2 ICU (15%) used any checklist to formulate and communicate the plan of care for acute resuscitation. Ten hospitals (77%) reported easy access to medical textbooks, 7 (54%) to medical journals, and 8 (61%) to continuing health education; 9 (69%) had reliable internet access. Eight hospitals (61%) reported easy access to consultation with other institutions for additional specialist input.

TABLE 1. Characteristics of participating hospitals

City	Country	Income	Hospital Beds (n)	ICU Beds (n)	Average Age of Critically Ill Patients (yrs)
Sremska Kamenica	Serbia	Upper-middle-income	300	5	51–60
Santo Domingo	Dominican Republic	Upper-middle-income	75	12	51–60
Mexico City	Mexico	Upper-middle-income	150	18	41–50
Ankara	Turkey	Upper-middle-income	1,200	11	51–60
Banja Luka	Bosnia and Herzegovina	Upper-middle-income	1,200	8	51–60
Belgrade	Serbia	Upper-middle-income	1,200	60	51–60
Chitre	Panama	Upper-middle-income	165	8	71–80
Sarajevo	Bosnia and Herzegovina	Upper-middle-income	1,800	6	31–40
Beijing	China	Upper-middle-income	1,000	12	61–70
Ulaanbaatar	Mongolia	Lower-middle-income	520	9	51–60
Rourkela	India	Lower-middle-income	660	11	51–60
Butare	Rwanda	Low-income	450	5	41–50
Kigali	Rwanda	Low-income	560	9	21–30

ICU, intensive care unit.

TABLE 2. Major perceived causes of death in critically ill patients in surveyed hospitals (in rank order)

City	Country	Major Causes of Death
Sremska Kamenica	Serbia	1. Sepsis 2. Chronic lung diseases 3. Pulmonary embolism 4. Congestive heart failure 5. Diseases of the respiratory system
Santo Domingo	Dominican Republic	1. Stroke 2. Ischemic heart disease 3. Diseases of the respiratory system 4. Conditions leading to emergency operations 5. Pulmonary embolism
Mexico City	Mexico	1. Sepsis 2. Pneumonia or influenza 3. Diseases of the respiratory system 4. Diabetes 5. Renal failure
Ankara	Turkey	1. Sepsis 2. Cancer 3. Diseases of the respiratory system 4. Pulmonary embolism 5. Congestive heart failure
Banja Luka	Bosnia and Herzegovina	1. Ischemic heart disease 2. Diseases of the respiratory system 3. Renal failure 4. Diabetes 5. Stroke
Belgrade	Serbia	1. Conditions leading to emergency operations 2. Complications of operations 3. Conditions leading to elective operations 4. Road traffic accidents 5. Burns
Chitre	Panama	1. Sepsis 2. Diseases of the respiratory system 3. Road traffic accidents
		4. Stroke 5. Cancer
Sarajevo	Bosnia and Herzegovina	1. Sepsis 2. Pneumonia or influenza 3. Stroke 4. Congestive heart failure 5. Renal failure
Beijing	China	1. Diseases of the respiratory system 2. Chronic lung diseases 3. Renal failure 4. Stroke 5. Congestive heart failure
Ulaanbaatar	Mongolia	1. Nutritional diseases 2. Sepsis 3. Congestive heart failure 4. GI bleeding 5. Congenital heart diseases
Rourkela	India	1. Road traffic accidents 2. Stroke 3. Diseases of the respiratory system 4. Malaria 5. Toxins
Butare	Rwanda	1. Sepsis 2. Conditions leading to emergency operations 3. Burns 4. Maternal complications of pregnancy and childbirth 5. Congestive heart failure
Kigali	Rwanda	1. Road traffic accidents 2. Tetanus 3. Burns 4. Conditions leading to emergency operations 5. Diseases of the respiratory system

GI, gastrointestinal.

Factors limiting quality of ICU care

Among the surveyed ICU, there was wide variability in how decisions were made to not initiate or to stop intensive care treatment. Factors considered included patient and

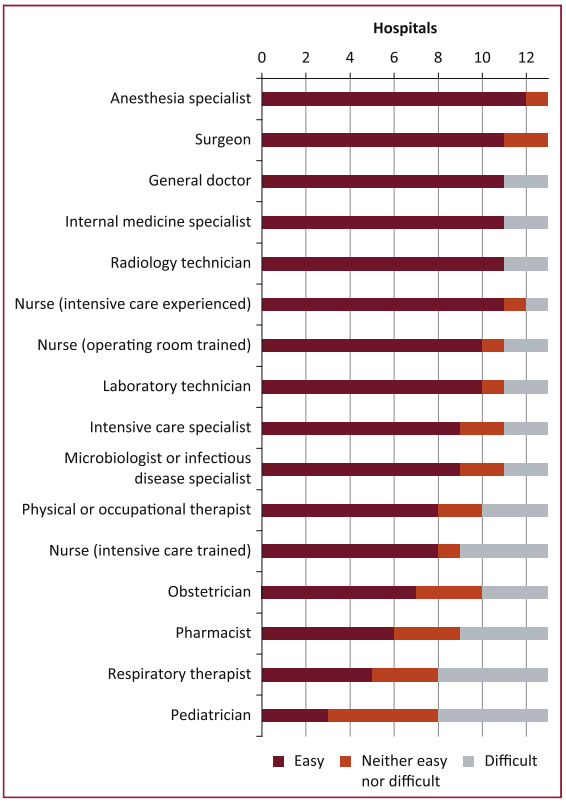

FIGURE 1. Access to human resources in surveyed low- and middle-income intensive care units.

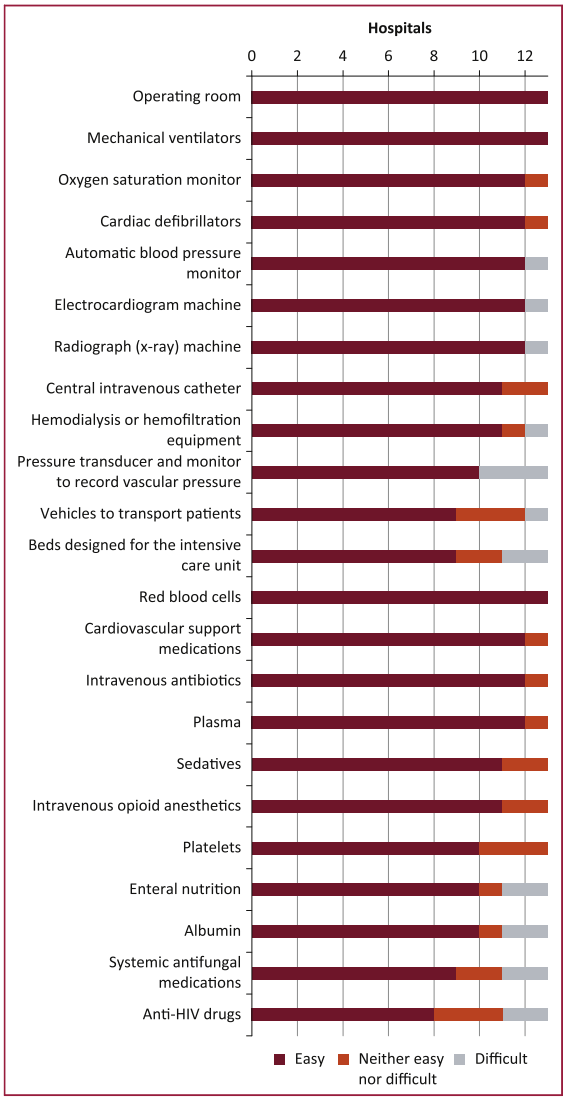

FIGURE 2. The availability of intensive care unit equipment and medication classes in surveyed low- and middle-income intensive care units. HIV, human immunodeficiency virus.

family preferences (n = 3, 23%), lack of adequate treatment response (n = 2, 15%), family financial resources for critical care treatments (n = 2, 15%), and physician medical decisions (n = 1, 8%). In the majority of ICU, the decision to continue ICU care was based on multiple factors that included the likelihood of survival and patients' and family's preferences, but 3 ICU (23%) reported that critical care was provided regardless of these considerations as there were no regulatory or legal framework regarding withdrawal or withholding of life-sustaining therapy.

When asked to list the resources currently lacking but perceived necessary to improve the care of critically ill patients, most respondents listed trained staff (n = 10, 77%), followed by mechanical ventilators (n = 2, 15%), monitors (n = 2, 15%), and medications or blood bank (n = 2, 15%). Other perceived infrastructure needs included ultrasound machines (n = 2, 15%), extra-corporeal membrane oxygenation (n = 3, 23%), hemofiltration and plasmapheresis (n = 2, 15%), additional ICU beds (n = 2, 15%), electronic medical records (n = 2, 15%), inhaled nitric oxide (n = 1, 8%) left-ventricular assist devices (n = 1, 8%) and transesophageal echocardiography (n = 1, 8%).

DISCUSSION

Our survey describes critical care practices in a convenience sample of 13 hospitals in 10 low- and middle-income countries across 4 continents. Although limited to few hospitals, the survey responses represent a sampling of critical care provision across economic settings globally. Sepsis and road traffic accidents were reported as important causes of death in many hospitals, consistent with World Health Organization data [15,16]. A recent observational study on the worldwide burden of critical illness, albeit with limited representation from low-income countries, showed that sepsis remains a major health problem globally, with significant association between mortality and national income [17].

Despite the clear need for ICU-level care in resource-limited settings and patient and physician interest in

building ICU capacity in LMIC, respondents identified numerous infrastructure gaps, most prominently in human resources. The average number of ICU beds was 1.6% of total hospital beds, which almost certainly would overestimate national capacity if extrapolated, due to exclusion of district hospitals with no ICU in our survey. Nevertheless, this figure is still considerably lower than in most high-income countries [18]; in the United States, 13.4% of the hospital beds are used for critical care [19]. Our results also highlight the frequently reported lack of specialty-trained staff and standardized processes of care such as checklists. The latter deficit highlights an opportunity to improve care. Data exist showing that the worldwide implementation of a simple World Health Organization surgical safety checklist improves outcomes, even in LMIC [20]. Checklist use in operating rooms [8,21], ICU [9,22,23], emergency departments [24,25], and other acute settings [12,26] have also led to substantial improvement in efficiency of the daily plan of care and were associated with decreased complications. Similarly, best practices in critical care include implementation of bundled care, such as the "ventilatory bundle" [27]. Such protocolized care is likely to be particularly important early in the course of critical illness, when errors and delays may lead to complications and poor outcomes. However, high-income country bundles of ICU treatment may not be feasible in low-income settings due to multiple barriers identified in this survey, which are consistent with a recent study showing that implementation of current sepsis guidelines in Sub-Saharan Africa was limited by lack of facilities, equipment, and medications [3]. Based on these findings, process-based care and checklist development should be research priorities for LMIC.

The greatest perceived need for hospitals surveyed was for ICU-specialized healthcare providers, as reported by 77% of respondents. The majority of LMIC lack a formal critical care fellowship training [28]. Even more concerning are studies reporting that physicians from LMIC who are training to become intensivists in high-income countries remain in the high-income countries to practice [6]. In our survey, which is similar to previous reports [5,28], physicians and nurses with critical care training were not available in many hospitals. Respondents also reported insufficient numbers of pharmacists and respiratory therapists. The lack of ICU-trained staff was perceived to be a more significant obstacle to delivering critical care than the availability of medications and equipment.

Based on these findings, our interdisciplinary international team of acute care clinicians and researchers plans to implement and test the effectiveness of a decision-support tool (CERTAIN) in critical care environments across Eastern Europe, Asia, Africa, and Central and South America [29]. This tool could facilitate timely, evidence-based care of critically ill patients by standardizing interventions such as early appropriate antimicrobial treatment; rapid recognition and treatment of cardiorespiratory failure; low tidal volume mechanical ventilation; prophylaxis against deep vein thrombosis and stress ulcers; as well as ventilator-weaning protocols, sedation, and physical therapy. Such processes often require little specialized equipment and provide a framework to optimize care and avoid errors and omissions in care.

The generalizability of our results is severely limited by our convenience sample of 13 hospitals from 10 countries in various economic settings. Because of the high proportion of middle-income country hospitals surveyed here (9 of 13, 69%), our results may reflect better availability of equipment and drugs than previous studies in low-income country ICU have [3,5,14,30]. In addition, most hospitals were large tertiary care centers, and, therefore, these data do not represent rural hospitals, which deliver a high proportion of all hospital-based care in LMIC. Lastly, the survey design focused on perceptions of current practices and needs, and did not quantitatively evaluate actual observed ICU processes or deficiencies, which may differ considerably from self-reported assessments.

CONCLUSIONS

We report a survey-based capacity and needs assessment for ICU across LMIC. In a convenience sample of 13 ICU, specialty-trained staff and standardized processes of care such as checklists are frequently lacking. Our results may serve as a platform to design and conduct further studies on requirements for human resources and ICU infrastructure, burden of treated critical illness, and quality-improvement interventions for delivery of context-appropriate critical care in LMIC ICU.

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We have designed this survey to better understand the resources available for critically ill patients at your hospital. Your responses will help us construct a decision support tool that is most useful for you, your colleagues, and your patients. In the survey, we ask you to describe your hospital, your patient population, and your resources.

By completing this survey, you consent to the use of your information. Your responses are confidential. Please answer to the best of your ability. We do not expect you to refer to other sources or check with other people, but if you are able to do this to improve accuracy of responses, we would appreciate it. If you cannot answer a particular question, leave it blank.

We sincerely appreciate your participation!

General definition: A critically ill patient requires very frequent monitoring and/or active treatment of failing organs, without which the patient would likely die.

1. How many beds does your hospital have?
2. Is there a designated place in your hospital with specialized personnel and resources to treat critically ill patients?
3. How many patients can be accommodated at one time in the designated place in your hospital where critically ill patients are treated?
4. Do personnel in your hospital have specific training for the care of critically ill patients?
   a. Healthcare professional (doctor or clinical officer or nurse) with critical care specialization
   b. Advanced trauma life support (ATLS)
   c. Advanced cardiac life support (ACLS)
   d. Pediatric advanced life support (PALS)
   e. Fundamentals of Critical Care Support (FCCS)
   f. Other
5. Approximately how many patients treated in your ICU in the last 1 MONTH had critical illness?
6. What is approximate average age of critically ill patients that you treated in the last 1 MONTH?
   a. 0-10 years
   b. 11-20 years
   c. 21-30
   d. 31-40
   e. 41-50
   f. 51-60
   g. 61-70
   h. 71-80
   i. >80

7. Who provides care and monitors critically ill patients at the bedside EVERY DAY? (Please check all that apply, even if only for a portion of the day)
   a. Patient's family or friends
   b. Nurse's assistant
   c. Nurse
   d. Doctor
   e. Doctor's assistant (such as clinical officer)
   f. Other personnel (please specify)

8. Two questions from one table
   a. How commonly do you treat patients with critical illness caused by each condition below? Please CIRCLE one response per condition in the table.
   b. On the same table, please RANK the top 5 causes of death in patients you treat. Please use '1' for the most common cause and '5' for the fifth most common cause.

Condition causing critical illness in your patients	Very Uncommon	Uncommon	Not common or uncommon	Common	Very Common	RANK the 5 top causes of death
Road traffic accidents	1	2	3	4	5	
Maternal complications of pregnancy and childbirth	1	2	3	4	5	
Burns	1	2	3	4	5	
Toxins (for example, poisoning, snake bites)	1	2	3	4	5	
Intentional injuries (self-Inflicted or assault)	1	2	3	4	5	
Illness in newborn children	1	2	3	4	5	
Pneumonia or influenza	1	2	3	4	5	
TB (tuberculosis)	1	2	3	4	5	
Malaria	1	2	3	4	5	
Tetanus	1	2	3	4	5	
HIV-related illness	1	2	3	4	5	
Rheumatic heart disease (acute or chronic)	1	2	3	4	5	
Congestive heart failure	1	2	3	4	5	
Ischemic heart disease	1	2	3	4	5	
Congenital heart disease	1	2	3	4	5	
Nutritional diseases	1	2	3	4	5	
Cancer	1	2	3	4	5	
Diseases of the respiratory system	1	2	3	4	5	
Chronic lung diseases (for example, emphysema)	1	2	3	4	5	
Asthma	1	2	3	4	5	
Stroke	1	2	3	4	5	
Conditions leading to elective operations	1	2	3	4	5	
Conditions leading to emergency operations	1	2	3	4	5	
Complications of operations	1	2	3	4	5	
Renal failure	1	2	3	4	5	
Diabetes mellitus	1	2	3	4	5	
Mental illness	1	2	3	4	5	
Other 1 (please specify):	1	2	3	4	5	
Other 2 (please specify):	1	2	3	4	5	

9. How easily can you access the following resources to help you to treat critically ill patients? Please CIRCLE one response per resource in the table.

How easily can you access these resources?	Very difficult	Difficult	Neither easy not difficult	Easy	Very Easy
Personnel					
Doctor (any)	1	2	3	4	5
General doctor	1	2	3	4	5
Anesthesia specialist	1	2	3	4	5
Internal medicine specialist	1	2	3	4	5
Pediatrician	1	2	3	4	5
Obstetrician	1	2	3	4	5
Surgeon	1	2	3	4	5
Intensive care specialist	1	2	3	4	5
Microbiologist or infectious disease specialist	1	2	3	4	5
Doctor assistant (for example, anesthesia assistant)	1	2	3	4	5
Nurse (any)	1	2	3	4	5
Nurse (intensive care trained)	1	2	3	4	5
Nurse (intensive care experienced)	1	2	3	4	5
Nurse (operating room trained)	1	2	3	4	5
Nurse assistant	1	2	3	4	5
Pharmacist	1	2	3	4	5
Physical or occupational therapist	1	2	3	4	5
Respiratory therapist	1	2	3	4	5
Laboratory technician	1	2	3	4	5
Radiology (x-ray) technician	1	2	3	4	5
Equipment					
Hospital beds/stretchers	1	2	3	4	5
Area of hospital specifically for critically ill patients	1	2	3	4	5
Beds designed for the intensive care unit	1	2	3	4	5
Operating room/theater	1	2	3	4	5
Oxygen saturation monitor	1	2	3	4	5
Electrocardiogram machine	1	2	3	4	5
Automatic blood pressure monitor	1	2	3	4	5
Peripheral intravenous catheters	1	2	3	4	5
Central intravenous catheter	1	2	3	4	5
Pressure transducer and monitor to record vascular pressure	1	2	3	4	5
Mechanical ventilators	1	2	3	4	5
Anesthesia machine	1	2	3	4	5
Cardiac defibrillators	1	2	3	4	5
Radiograph (x-ray) machine	1	2	3	4	5
CT scan machine	1	2	3	4	5
Ultrasound machine	1	2	3	4	5
Peritoneal dialysis equipment	1	2	3	4	5
Hemodialysis or hemofiltration equipment	1	2	3	4	5
Transfusion laboratory/blood bank	1	2	3	4	5
Reliable electricity supply	1	2	3	4	5
Electricity generator back-up	1	2	3	4	5
Reliable and safe water supply	1	2	3	4	5
Vehicles to transport patients	1	2	3	4	5
Adequate patient finances or health insurance to pay for intensive care	1	2	3	4	5
Drugs					
Intravenous antibiotics	1	2	3	4	5
Oral antibiotics	1	2	3	4	5

(continued)

Continued

How easily can you access these resources?	Very difficult	Difficult	Neither easy not difficult	Easy	Very Easy
Systemic antifungal medications	1	2	3	4	5
Anti-malarial agents	1	2	3	4	5
Anti-tuberculosis medications	1	2	3	4	5
Anti-HIV drugs	1	2	3	4	5
Drugs to treat asthma or emphysema (for example, salbutamol)	1	2	3	4	5
Intravenous opioid anesthetics					
Oral opioid analgesics	1	2	3	4	5
Sedatives (for example, diazepam, lorazepam, midazolam)	1	2	3	4	5
Inhaled anesthetic agents (for example, halothane or isoflurane)	1	2	3	4	5
Intravenous anesthetic agents (for example, ketamine)	1	2	3	4	5
Cardiovascular support medications (for example, norepinephrine, adrenaline, dopamine, dobutamine)	1	2	3	4	5
Crystalloid fluids (for example, 0.9% saline, Ringer's lactate)	1	2	3	4	5
Albumin solution	1	2	3	4	5
Enteral nutrition	1	2	3	4	5
Blood products					
Whole blood	1	2	3	4	5
Red blood cells	1	2	3	4	5
Platelets	1	2	3	4	5
Plasma	1	2	3	4	5
Cryoprecipitate	1	2	3	4	5
Reference information					
Textbooks	1	2	3	4	5
Medical journals	1	2	3	4	5
Reliable internet access	1	2	3	4	5
Continuing health education	1	2	3	4	5
Partnerships/consultations with other institutions	1	2	3	4	5

10. What factors are used to make decisions about not initiating or stopping intensive care for your patients (for example, when your patient is not getting better)? Please CIRCLE one response per factor in the table.

Factor used to decide to stop intensive care	Very uncommonly used	Uncommonly used	Neutral	Commonly used	Very commonly used
No transportation to take patient to hospital with intensive care	1	2	3	4	5
Doctor decides intensive care should be stopped	1	2	3	4	5
Nurse decides intensive care should be stopped	1	2	3	4	5
Patient or family decides intensive care should be stopped	1	2	3	4	5
Patient treated for a specific period of time and not better	1	2	3	4	5
Patient cannot pay for intensive care	1	2	3	4	5
Another patient needs intensive care more than this patient	1	2	3	4	5
Lack of resources to care for patient AFTER intensive care	1	2	3	4	5
Other (please specify):	1	2	3	4	5

11. Please briefly describe, in your words, how decisions are made to stop or limit intensive care where you work?
12. Please briefly describe, in your words, the process of daily ICU rounds (who participates, how is the plan of care communicated, do you use any checklists or other tools
13. Please briefly describe, in your words, the process of new ICU admission (who participates and how plan of care formulated and communicated, do you use any checklists or other tools)
14. Please briefly describe, in your words, the process of acute resuscitation in your ICU (shock resuscitation, CPR, management of other ICU emergencies — respiratory failure, increased intracranial pressure etc.) - who participates and how plan of care formulated and communicated, do you use any checklists or other tools?
15. Please list the four (4) most useful resources that you currently do not have that you think would greatly improve the care and outcome of critically ill patients in your hospital?
16. What is your country of practice?
17. What is your city/town/village of practice?
18. Who gives money to your hospital? (Please CHECK ALL that apply.)
    a. Government
    b. Private individuals
    c. Industry/Companies
    d. Military
    e. Mission/NGO
    f. Other (please specify):
19. Which language(s) us used for critical care delivery?

Modified from Westcott M, Martiniuk AL, Fowler RA, Adhikari NK, Dalipanda T. Critical care resources in the Solomon Islands: a cross-sectional survey. BMC International Health and Human Rights. 2012;12:1.