The Assessment, Evaluation, and Management of the Critically Ill Child When Resources are Limited—Southeast Asian Perspective

Swee Fong Tang¹ Lucy Lum²

¹Department of Paediatrics, Universiti Kebangsaan Malaysia Medical Centre, Kuala Lumpur, Malaysia

²Department of Paediatrics, Universiti Malaya Medical Centre, Kuala Lumpur, Malaysia

Address for correspondence Swee Fong Tang, MRCP, Department of Paediatrics, Universiti Kebangsaan Malaysia Medical Centre, 56000 Cheras, Kuala Lumpur, Malaysia (e-mail: sweefongtang@gmail.com).

J Pediatr Intensive Care 2017;6:6–11.

Abstract

The Southeast Asia region comprises 10 independent countries with highly divergent health systems and health status. The heterogeneity in infant and child mortality rates suggests that there is still scope for improvement in the care of critically ill children. There is, however, a paucity of published data on outcomes and processes of care that could affect planning and implementation of intervention programs. Significant challenges in the delivery of care for the critically ill child remain, especially in pre-hospital and in-hospital triaging and emergency care and inpatient hospital care. Potential areas for continued improvement include strengthening of health systems through sustained commitment by local governments, capacity building, and sharing of research output. Simple, low cost, locally available, and effective solutions should be sought. The introduction of standards and auditing tools can assist in determining effectiveness and outcomes of intervention packages that are adapted to local settings. Recognition and acknowledgment of shortfalls between expectations and outcomes is a first step to overcoming some of these obstacles necessary to achieve a seamless interface among pre-hospital, emergency, inpatient, and critical care delivery processes that would improve survival of critically ill children in this region.

Keywords

- ▶ critically ill
- ▶ children
- ▶ Southeast Asia

Introduction

Although much progress has been made in the treatment of critically ill children in developing countries, there remains a significant disparity in the delivery of these services between full resource countries and those with limited resources.^{1,2} In most limited-resource settings (LRS), a misconception that critical care has to be complicated and technologically sophisticated could affect its development. However, it is in these areas that the burden of critical illness is especially high.³ The region known as Southeast Asia consists of 10 independent countries—Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and

Vietnam. Beyond geographical, historical, sociocultural, and political differences, the highly diverse economies have led to highly divergent health status and health systems not only between but also within these countries.^{4,5}

Brunei, Singapore, and Malaysia have infant and child mortality rates below 10 per 1,000 live births. In Thailand and Vietnam, the infant and child mortality has declined significantly to less than 10 per 1,000 live births over the past two decades but remains between 30 and 50 per 1,000 live births in Philippines and Indonesia. The infant and child mortality rates in Myanmar, Cambodia, and Laos rank among the highest in Asia at between 50 and 70 per 1,000 live births.⁶ Malnutrition remains a significant public health problem in

received
June 15, 2015
accepted after revision
February 16, 2016
published online
June 20, 2016

Issue Theme Global/International Health and Critical Care; Guest Editors: Nicole Shilkofski, MD, MEd, and Ndidiamaka L. Musa, MD

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DOI <http://dx.doi.org/10.1055/s-0036-1584672>.
ISSN 2146-4618.

this region.⁷ In these countries, infectious diseases, including pneumonia and diarrhea, account for almost half of the deaths in children.⁸ Emerging infectious diseases including those with pandemic potential such as avian influenza A H5N1, pandemic influenza A H1N1, and severe acute respiratory syndrome can have substantial public health and economic consequences.⁹ Important re-emerging diseases such as dengue fever have been associated with high morbidity and mortality.¹⁰ Furthermore, some countries in this region face the threat of multiresistant tuberculosis and *Plasmodium falciparum* malaria.^{11,12} Southeast Asia is also one of the most disaster-prone regions in the world.⁴ There is, therefore, a need for the development of emergency and advanced life support services to care for children who can be seriously ill from diseases and disasters. A search of the literature has revealed a significant lack of scientific data addressing the issues of emergency as well as advanced life support care in Southeast Asia, and a part of this review will be based on the personal experiences of the authors. The objective of this article is to discuss the challenges faced in the delivery of care to the critically ill child in this region and potential measures that can be implemented to improve care.

Prehospital Emergency Medical Care

Individual perceived needs for emergency care and the failure to meet these needs decrease the confidence in the health system and health care utilization.^{13,14} Early recognition, assessment, and prioritization of treatment are the key steps in the management of the sick child especially in LRS. Many child deaths that occur at home are often due to the inability of the child's caregiver to recognize the sick child, the long distances that some children have to travel to reach health care facilities, as well as the poor transport infrastructure. Prereferral factors that have been identified to adversely affect outcomes include delayed presentation, overwhelming disease, inappropriate or unnecessary treatment, delay in providing necessary treatment, and failure to reassess adequately during the treatment.¹⁵ The World Health Organization (WHO) developed a comprehensive approach to providing quality care to sick children called the Integrated Management of Childhood Illness (IMCI). Since 1994, this approach has been introduced in more than 100 countries globally, particularly in low- and middle-income countries (LMIC),¹⁶ including those in Southeast Asia. It is a strategy for delivering key interventions that prevent and treat the most common causes of mortality in children younger than 5 years including pneumonia and diarrhea. The IMCI strategy has three main components: improving case-management skills, improving overall health systems, and improving family and community health practices both for home care as well as health care seeking for sick children.¹⁶ The IMCI standard case management provides a systematic approach to assessing, classifying, and treating sick children. It also includes strategies for systems improvement for high-quality referrals and mechanisms for ensuring that those children who need consultation are referred properly. Interventions included in IMCI have been ranked among the 10 most cost-effective

interventions in LMIC.¹⁷ Globally, several studies have demonstrated the benefits of this program in improving childcare services as well as in reducing child mortality.^{18–20} The combination of interventions that make up IMCI has been adapted by some countries in the Southeast Asia region to include conditions that are important in the local settings and for which treatment or preventive interventions exist. For example, dengue fever has been added to the list of diseases to monitor for in children with fever in Cambodia, the Lao People's Democratic Republic, the Philippines, and Vietnam.²¹ However, not all low-income countries in this region have implemented the IMCI program or adapted it for local use.²² In those that have implemented the IMCI guidelines, the pace of progress in implementation has been slower than expected and geographic coverage is not universal in all districts in some of these countries. Although recognizing a holistic approach to the management of sick children, the IMCI training package does not fully address issues of problem solving by the teams or their commitment in ensuring that the program is implemented to achieve the goals.²³ Further problems identified during implementation of IMCI in some Southeast Asia countries include the nonuniversal application of management strategies to all children, shortage of trained staff and insufficient supply of IMCI drugs and equipment, as well as lack of facilities and infrastructure.²⁴

Disease-specific guidelines produced by the WHO have also been implemented in some countries in this region. Evaluation performed by the authors in some of these countries has revealed that only some portions of these intervention packages are adhered to. For example, a focus on the administration of intravenous fluids without repeated clinical evaluation has resulted in increased morbidity and mortality from fluid overload in dengue and septic shock patients. This is further compounded by the unsupervised use of home intravenous fluids (personal experience). A lack of adequate training in the application of these disease-specific guidelines could lead to a narrowed perspective of management rather than a holistic approach to the patient. The treatment of sepsis is also more challenging due to the rampant prehospital misuse of broad-spectrum antibiotics and the development of drug-resistant organisms.

Hospital Care

Although most sick children can be managed at ambulatory care centers, 12 to 30% are seriously ill and need referral to hospitals for further assessment and treatment.^{25,26} Severely ill children brought to hospitals often die because the severity of their illness is not recognized in time and the capacity of hospitals to manage them is often limited. The quality of hospital care is therefore likely to have an impact on the health and survival of many children in LRS. Data from full resource countries indicate that clinical outcome for specific conditions, including risk of death, is correlated with quality of hospital care. Little information exists regarding the quality of hospital care in LRS in the Southeast Asia region or its relation to outcome. Available data regarding quality of hospital care in Indonesia in the areas of case management

for common childhood illnesses, neonatal care, and patient monitoring shows an urgent need for improvement in all these areas.²⁷ Organizational issues such as inappropriate or late triage, inadequate assessment, poorly organized facilities, delayed admission for inpatient care, lack of supplies for emergency treatment, inappropriate use of antibiotics, fluids, and feeding have been identified in a significant number of patients as reasons for poor quality care.¹⁵ Inadequate knowledge and reported incorrect practice of health care providers for common childhood conditions, such as dehydration, pneumonia, malnutrition, hypoglycemia, and sepsis, were found to occur more frequently in doctors in district hospitals, and nurses and medical assistants in teaching and district hospitals compared with doctors in teaching hospitals. Medical assistants performed similarly to nurses. Among these five conditions evaluated, performance in assessment and management was worst for sepsis and hypoglycemia, particularly among doctors in district hospitals, and nurses and medical assistants in teaching and district hospitals.¹⁵ In some countries, the quality of care is also affected by the need for a significant proportion of patients to pay for medications and intravenous fluids before the hospital's pharmacy will provide them, even in emergencies. Parents must often procure the medications themselves from the local market.¹⁵

There is substantial global experience with strategies and interventions that can be used to improve quality of care for children in hospitals with limited resources. This includes the development of a toolkit by WHO containing adaptable instruments, including a framework for quality improvement, evidence-based clinical guidelines in the form of a *Pocketbook of Hospital Care for Children*,²⁸ teaching materials, and assessment and mortality audit tools. Experiences in using the Pocketbook have highlighted the need to adapt the book to align with local epidemiology and policies. The Emergency Triage, Assessment, and Treatment (ETAT), a validated component of the WHO IMCI program, provides simplified algorithms for triaging and treating patients in the inpatient setting.²⁹ Good quality emergency care, which is deficient in many countries, is an important part of improving hospital care.^{30,31} Simple, low cost, locally available and effective solutions such as the ETAT course have been conducted in several LRS, including in the Southeast Asia region. Once implemented, quality improvement programs are needed to ensure that there is retention of knowledge, continued access to the necessary materials to practice skills, and attainment of the desired standards.³²⁻³⁴

When children are admitted to the inpatient ward, there is often no formalized surveillance system to provide continued monitoring and timely clinical intervention. Often the task of identifying deteriorating patients in the inpatient ward setting is left to undertrained junior health workers. Overcrowded wards further compound the severity of this situation. The use of Pediatric Early Warning System scores that have been used in developed countries to identify and triage patients before their need for urgent resuscitation are not suitable for LRS, as these are based on severity of illness scores that require more invasive monitoring.^{35,36} There is

no published evidence regarding the utilization of such scores and its relation to outcome in this region. Scores such as the inpatient triage, assessment, and treatment, which emphasizes mainly basic clinical assessment, may be more suitable for use in LRS.³⁷ Although there is a need to have such early detection systems in place, the choice of monitored parameters for these systems should be adapted to diseases associated with highest morbidity and mortality in these countries.

Guidelines for the treatment of sepsis in children have been proposed.³⁸ However, the use of these guidelines could be affected by resource limitations such as limited availability of pediatric intensive care beds,³⁹ inadequate transport capabilities, as well as lack of trained personnel, medications, invasive monitoring, infusion pumps, ventilators, laboratory services, and radiology services. There are also differences in the spectrum of diseases encountered, such as dengue and malaria in the Southeast Asian countries, that require adaptation of guidelines for management of pediatric sepsis. Fluid management in a child with dengue shock should not be as aggressive as in septic shock and may also be different in patients with malaria.^{40,41} In the presence of these limitations, guidelines for management of severe sepsis in LRS have been proposed.⁴² These guidelines recommend the use of rapid cardiopulmonary assessment and greater use of physical examination and noninvasive monitoring to achieve therapeutic end points. The meticulous use of clinical therapeutic end points without high technology has shown a dramatic reduction in mortality in Vietnamese children with moderate dengue shock syndrome.³⁹ Caution is also needed in the use of invasive monitoring (such as central venous lines), as its use could contribute to an increased risk of health care-associated infections. The prevalence of health care-associated infections in limited-resource countries has been shown to be significant, varying from 9.0 to 91.7 per 1,000 patient-days.⁴³ The use of these devices without infection control systems and surveillance in limited-resource countries could increase mortality in critically ill children.⁴⁴

Advanced life support in many Southeast Asian countries is also incomplete due to a lack of resources. In many hospitals, there are no dedicated critical care units and a lack of supplies, laboratory, and radiology services. Importantly, in the majority, there is lack of well-trained and insufficient numbers of health care providers for these units. Where critical care units do exist, children are often cared for in units that cater to both pediatric and adult patients. In these units, the care of children may or may not be shared with the primary pediatricians. The lack of effective retrieval and transport services for ill children has led to a tendency toward small-sized intensive care units in both urban and district hospitals instead of a concentration of resources in regional centers. Current Pediatric Advanced Life Support guidelines, which are not evidence based, may not be entirely suitable for use in LRS. Alternative approaches to assessment and management for health care workers who care for severely ill children without the full complement of resources has been proposed to improve survival of critically ill children.⁴⁵

Continued Challenges and Potential Areas for Improvement

Health morbidity and mortality statistics for each country in the Southeast Asian region provide us with an overview of the current health status of children and indirectly reflect on the quality of care of ill children. However, there remains a scarcity of published literature on resource management, processes of care, and clinical outcomes. Although data on disease-specific conditions are available, little of it is actually published. Such data are important to provide locality-specific evidence required in the planning of services by health policy makers to improve outcomes for critically ill children. There is thus an urgent need to gather and publish such data for the Southeast Asian region. The availability of these data could also lead to improved surveillance and allow for the sharing of knowledge and practices within and between countries of this region. These efforts would allow regional collaboration in areas of patient care, training, organization, and research, as well as contribute to the development and implementation of international, evidence-based pediatric advanced life support guidelines.

Priority areas to improve quality of hospital care include the establishment of effective triage and emergency care services, comprehensive training of health care providers in the recognition, assessment, treatment and continued monitoring of critically ill children, and improvement in support services in LRS.⁴⁶ One of the recurring problems identified along the entire spectrum from prehospital emergency care to hospital care is the shortage of trained health care workers. Capacity building is vital to strengthen the health care system. This should include training of health care leadership in policy and management issues, coordination, and logistics, as well as in human resource management. Training of first-line health care providers would be more effective if performed "on-site" in the actual clinical environment rather than in a classroom. Continuous medical education should be strengthened. Pediatric advanced life support interventions need to be adapted to available resources to create sustainability. Introduction of intervention programs in Southeast Asian countries must consider the local culture, customs, and sensitivities to ensure that both the communities as well as the health care providers support these programs and work toward successful and sustainable implementation. Training should include motivation to translate knowledge into clinical practice and care delivery that would benefit patients. Issues of adequate remuneration, job satisfaction, morale, and professionalism need to be addressed. In addition to reviewing clinical cases, the function of visiting specialists to district hospitals could be expanded to include audit, organizational innovations, and teaching.²³ There is a need to systematically document the distribution of technical materials and to measure their efficacy and impact. Medical councils, which provide regulatory frameworks, have an important role to play in improving hospital care and should be engaged early in the process of program implementation.⁴⁷

International standards of hospital care and accreditation processes should be in place to ensure that optimal care is

delivered.²³ Surveillance of practice and outcome should go hand-in-hand with regular feedback. Auditing tools should be available and used to assess health practices. The auditing cycle of assessment, rapid feedback, change, and reassessment is essential for improvement. For this to be successful, commitment is required from ministries of health and professional bodies to ensure that these standards in care are achieved.

In recent years, more clinical research has been integrated with patient care in LRS.^{48,49} The combination of clinical care and research sponsored by developed countries has potential to cause ethical problems such as subordination of patient care in favor of scientific gains, therapeutic misconception, and inappropriate inducement.⁵⁰ There is also a risk that these LRS would not be able to sustain the level of health care services once the research is completed. Although research and its output are important for improvements in health systems, ethical principles need to be contextualized to the local setting before such research is performed.

Continued improvement in the care of the critically ill child requires commitment by all stakeholders, including governments, health care workers, and the community. Strengthening of health care systems and widespread educational interventions in the provision of high-quality pediatric care are vital to achieving better outcomes in critically ill children.

Conclusion

Much progress has been made to improve the survival of critically ill children in the Southeast Asian region, but there remains a significant disparity in the quality of newborn and child interventions among countries in this region as well as within individual countries. Various areas of care can be improved: training and improvement in pediatric-specific knowledge of health care workers, provision of adequate supplies and medications, establishment of support services, as well as setting of standards of care. The quality of intervention packages will depend on effective planning and implementation of these interventions across the continuum of care for the critically ill child. It will require a multidimensional approach with institutional leadership and commitment to resources, teamwork, collaboration, and expertise for it to be sustainable.

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