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Neurologic illness in Zambia: A neurointensivist's experience

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ABSTRACT

Introduction: Management of critically ill patients in dedicated intensive care units (ICUs) is the standard of care in high income countries (HICs), but remains uncommon in low and middle-income countries (LMICs). We sought to determine the prevalence of neurologic disorders in the ICU of a LMIC and examine if resource appropriate specialized neurocritical care training could benefit these patients.

Methods: From February to March 2017, a trained neurocritical care intensivist recorded encounters in the sole ICU at the University Teaching Hospital (UTH) in Lusaka, Zambia. We stratified each patient by demographics, presence of primary or secondary neurologic deficit, comorbidities, and outcome.

Results: Of the 33 patients seen during this period, 26 (78.8%) had a neurologic deficit. An equal number of patients carried a primary neurologic diagnosis (13) versus a secondary neurologic diagnosis (13). Primary neurologic disorders included spinal cord injury/tumor/abscess, intracranial hemorrhage, Guillain-Barre syndrome, and traumatic brain injury.

Conclusions: Over three-quarters of critically ill patients in the observation period carried a neurologic diagnosis. Future research should aim to identify if resource appropriate neurocritical care training of frontline providers may lead to improved clinical outcomes.

1. Introduction

In high-income countries (HICs), the standard of care for critically ill patients requires dedicated management in a specialized intensive care unit comprised of staff, equipment, and protocols for optimal outcome. In the US, over two-thirds of the population are within 90 min transit time of a specialty neurocritical care center [1]. However, while these units can be found in many HICs, low-income countries (LICs) and low and middle-income countries (LMICs) contain few specialty centers providing this level of care. Most tertiary care medical centers in LICs/LMICs offer only general critical care services, rather than sub-specialization of intensive care. Due to resource limitations, a lack of specialized training exists for physicians managing critically ill, neurologically diseased patients.

To our knowledge, no study to date has systematically evaluated the prevalence of neurological disorders in ICUs in sub-Saharan Africa. If the burden of neurological disease is high, this helps to justify the need for neurocritical care training to frontline providers to improve patient outcomes.

2. Background

Many LICs and LMICs suffer from a lack of neurology-trained providers. In Africa, 70% of nations offer less than five neurologists for their citizens [2]. Twelve African countries have no full-time neurologist resulting in inadequate care for patients with neurological disease. The absence of neurologists in these countries becomes quite concerning when considering the 2015 World Health Organization Global Burden of Disease estimate that LICs and LMICs have higher disability as measured in disability adjusted life years (DALY) from neurologic illnesses relative to HICs, due to communicable neurologic disease and stroke [3]. These findings likely underestimate the true disease burden

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as the WHO excluded neurological dysfunction from traumatic brain injury and other categories of neurological disease due to the inability to aggregate supporting data [4].

Zambia, a Southern African LMIC [5] with a population of 16.2 million people, has three full-time neurologists, all located in the capital of Lusaka, where only 10% of the total Zambian population reside. The ratio of one neurologist for every five million citizens reveals a significant shortfall of care in Zambia when compared to HICs like the US with a ratio of one neurologist to every 25,000 citizens.

In addition to the deficiency in neurologic care, Zambia and its neighboring countries also lack resources to care for the critically ill. The main tertiary care center, University Teaching Hospital (UTH) in Lusaka, houses a 10-bed general intensive care unit, and 7-bed pediatric intensive care unit. UTH serves as the main critical care center for all of Zambia, with limited ICU capabilities in other parts of the country. Currently, these ICUs are operated by anesthesiology-trained faculty and house staff without any support from critical care specialists, or subspecialist intensivists with dedicated neurologic, cardiac, or pulmonary training.

More recently, UTH has been building up neurological services through collaborations with HIC institutions. As a result, current resources include computed tomography (CT), magnetic resonance imaging (MRI), electroencephalography (EEG), electromyography (EMG), and nerve conduction studies (NCS). However, CT and MRI services are limited due to the sheer volume of patients requiring these studies, the ability to transport patients between locations for studies, and the limited resources for the repair/maintenance of these units. While a cost sharing system is in place for neuroimaging and neurophysiological studies, such that patients pay for a portion of the studies based on level of income, reimbursement for some high cost services limit their use by the average patient, with greater than 60% of the Zambian population falling below the poverty line [6].

3. Methods

From February 28–March 26, 2017, a US-trained neurocritical care intensivist (MWB) provided clinical management in the Medical Intensive Care Unit at UTH. This unit accepts patients requiring mechanical ventilation, post-operative care advanced nursing care, or continuous-infusion medications with advanced hemodynamic monitoring. During the period of study, resources were limited to six mechanical ventilators, eight monitors, and four to six infusion pumps depending on surgical case volume.

Over four weeks, all patient encounters were categorized by age, gender, diagnosis, neurological exam findings, HIV/TB status, and outcome (Table 1). A chief complaint was assigned for each patient admitted to the intensive care unit. If the admission resulted directly from neurologic insult, we categorized the patient as having a primary neurologic complaint. If other illness led to ICU admission, but the patient had comorbid neurologic disease, or neurologic insult secondary to their disease, we categorized them as having a secondary neurologic complaint. These included congenital disease which resulted in alteration from expected baseline, or neurologic insults resulting from general medical or surgical condition. Outcome was listed as either death or discharge from the ICU.

4. Results

Thirty-three patients received care in the ICU during the observation period, including 17 females and 16 males (Table 1). The median patient age was 28.4 (range 2–82) years old, and did not differ between males and females. Of note, 7/33 (21%) were children, aged 2–16 years. We identified 26 (79%) patients as having neurologic illness, with 13 (50%) categorized as primary neurologic disease and 13 (50%) as secondary. Encephalopathy from toxic/metabolic/infectious origin was the most common diagnosis (24%) of the patients with neurologic deficits, followed by head/spinal trauma (18%) and hypoxic-ischemic injury secondary to cardiac arrest (18%).

Thirteen (39%) patients died while in the ICU, and 19 (58%) were discharged from the ICU to the general ward service. At the time of this publication, one patient remained on the ICU service due to failure to wean from mechanical ventilation resulting from a high cervical lesion. Of those 13 deaths, all were due to cardiac or cardiopulmonary arrest.

Ten (30%) of the 33 ICU patients had HIV, with five on anti-retroviral therapy. Tuberculosis was diagnosed by laboratory testing in three (9%) patients, with clinical suspicion of in a fourth patient who died prior to testing.

5. Discussion

Over four weeks in Zambia, 79% of patients admitted to the ICU had neurologic disease. This is not a new trend, nor one limited to UTH. A retrospective review of cases in the then-new intensive care unit at UTH found traumatic brain injury as the most common cause of admission, transfer, and death [7].

The prevalence of neurologic injury also extends to other sub-Saharan African nations, with research aimed at classifying patients for prognosis and management. A series of 150 patients in Tanzania were retrospectively reviewed to determine the cause of coma and predictive value of the Glasgow Coma Scale for outcome, which was found to be easy to perform, but inconclusive to its utility in African hospitals [8]. Another 170-patient cohort from Tanzania encountered over a 16-month period stratified by cause of non-traumatic coma validated an algorithm for diagnosis and management which they note may be employed in 90% of African hospitals [9]. Assessment of 51 cases with intracranial hemorrhage admitted to a single university hospital ICU in Senegal between 2006 and 2007 revealed complication as a prognostic factor in mortality [10]. Most recently, an audit of over 5000 cases admitted to a rural Ugandan ICU to discern cause for admission and death found traumatic brain injury as a common case for admission (27.8%) and mortality (16.3% of TBI cases) [11].

Prior research cited the rising burden of neurologic illness in LICs and LMICs with limited resources to care for this population, specifically, questioning the role of the neurocritical care unit and intensivist in the developing world [12]. Given this substantial neurologic disease burden, dedicated training based on experiences with traumatic brain injury, status epilepticus, management of intracranial hemorrhage for these frontline intensivists may improve patient outcomes. Many of these skills such as maintenance of normothermia for certain disease processes, blood pressure goals for intracranial hemorrhage, and evaluation for signs of neurologic emergencies such as loss of brainstem reflexes, may easily be conveyed without the requirement of extensive training or expensive equipment.

While delivering training to local intensivists, the visiting neurointensivist also is exposed to an altogether different spectrum of neurocritical care cases resulting from endemic illnesses like HIV, TB, and Malaria. Compounded with the limitations in routine diagnostics and medications found in HICs, intensivists must return to a more hands-on model of care, from reliance on diagnostic fundamentals, to mixing continuous vasoactive infusions for patients in shock. Thus, the exchange in knowledge between intensivists from HIC training and LIC/LMIC training embodies a fundamental symbiotic relationship extending the knowledge base of both parties.

This exchange of knowledge allows for important neurocritical care research questions to be answered through observation and treatment of unique endemic diseases not present in many HICs. As an example, the frequency of presentation for bacterial and viral meningoencephalitis, as well as infectious mass lesions in LIC/LMIC settings allows for observation of these disease processes and recovery from treatment. Evaluating the epidemiology and recovery from these illnesses may allow for better preventative measures, thus reducing their worldwide prevalence.