

Meeting Best Practice Goals in the NeuroICU Using Telemedicine: Outcomes and Applications to Aneurysmal Subarachnoid Hemorrhage

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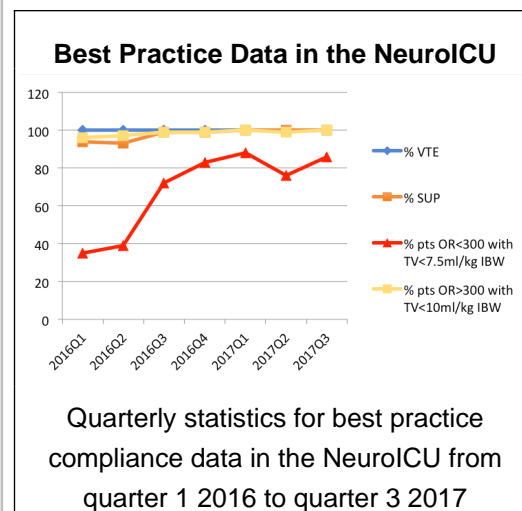


Introduction

Within the neurointensive care unit aneurysmal subarachnoid hemorrhage (aSAH) represents a major cause of morbidity and mortality, with up to 40% of deaths resulting from extra-cerebral organ failure (1). Recent literature has suggested that hospital-associated complications in aSAH patients is associated with variance in modifiable patient parameters including serum sodium, glucose, white blood cell count, volume status and duration of mechanical ventilation (2). Moreover, derangements in these variables are believed to contribute to secondary cerebral injury and development of vasospasm (3). An electronic ICU (eICU) contributes to improved patient outcomes through utilization of alerting systems designed to address variance in clinical parameters and detect early physiologic deterioration, allowing for early clinician intervention. An eICU system was implemented in our institution in 2016 with three main purposes: Off-site continuous monitoring through computerized surveillance of physiologic and laboratory data, standardization of care through implementation and oversight of best practice protocols, and intervention through bedside teleconferencing. We present our 18-month experience with aneurysmal subarachnoid hemorrhage (aSAH) patients.

Methods

Based on evidence based guidelines, best practice protocols for venous thromboembolism (VTE) prophylaxis, stress ulcer prophylaxis (SUP) and lung protective mechanical ventilation (ARDSnet-MV) were implemented beginning in Q1 2016. The eICU centrally monitors compliance with best practices and interacts with the Neuro-ICU bedside team at least twice daily to ensure compliance with each. Interdisciplinary rounding gets supported with summaries of all best practice issues to be incorporated into morning and afternoon bedside rounds. The multidisciplinary Neuro-ICU team received structured performance feedback sessions on best practices and other benchmark metrics every 3 months. The data for patients with the diagnosis of aSAH were analyzed.



Results

Data was collected between Q1 of 2016 and Q3 of 2017 (Figure). During this time period 94 patients were admitted to the neuro-ICU with a diagnosis of aSAH. In the aSAH subgroup, implementation of eICU support in the Neuro-ICU increased SUP compliance rates from 94% to 100%. Lung protective mechanical ventilation targeted two different patient populations based on oxygenation ratios (OR). For patients with OR of <300 we improved low tidal volume ventilation rates (<7.5mL/kg ideal body weight (IBW)) from 35% to 86%. For patients with OR>300 we improved tidal volume rates of <10ml/kg IBW from 96% to 100%. VTE prophylaxis compliance was maintained at 100%.

Conclusions

Preliminary data from the eICU program demonstrates marked improvement in best practice compliance with emphasis on VTE prophylaxis, SUP, and ARDSnet-MV. Future eICU protocols will continually track additional modifiable parameters associated with morbidity in aSAH including serum sodium, glucose, white blood cell count, volume status, and duration of mechanical ventilation. We propose that use of telemedicine in the neurointensive care unit will contribute to improved outcomes in our unique patient population and may allow for the development of a protocolized approach to management of these modifiable parameters in aSAH patients.

Learning Objectives

By the conclusion of this session, participants should be able to: 1) define telemedicine, 2) identify the utility of telemedicine in the critical care setting, 3) understand the need for continuous monitoring of physiologic parameters in aneurysmal subarachnoid hemorrhage patients, 4) describe the utility of telemedicine/eICU in managing aneurysmal subarachnoid hemorrhage

References

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3. Al-Mufti F, et al. Emerging markers of early brain injury and delayed cerebral ischemia in aneurysmal subarachnoid hemorrhage. *World Neurosurgery.* 2017; 107: 148-159.