Background

- Preventable patient harms are the third leading cause of death in the United States (Sapirstein, 2016). A large number of these cases occur in the Intensive Care Units (ICU), due to the severity of illness in this patient population. The number of complex interventions required to keep these patients healthy have potential to result in harms if clinicians are not careful in following care protocol.

- Ventilators and central line catheters, are frequently needed in this population, but have potentially harmful effects, including infection if not cared for properly.

- Systems engineering provides a way for these potential issues to be addressed in the ICU and for a design, which limits and hopefully eliminates potential for patient harm (Tropello, 2013).

- Project Emerge was established in 2012 in the SICU at Johns Hopkins with the assistance of the Applied Physics Lab (APL), in attempts to integrate a systems engineering approach in reducing patient harms.

Project Emerge is a tablet app in the patient room, which addresses several potential patient harms including central line infections, delirium, ICU acquired weakness, VTE, ventilator- associated events, loss of respect and failure to align medical goals. This app uses a clock formation, which displays important patient care information for clinicians in one place. If the nurse or doctor has not addressed the harm, the area for the harm will be red, notifying the clinician or nurse that treatments or assessments need to be given to that patient. This project uses a systems engineering approach, to incorporate patient centered care and safety in the Intensive care unit at Johns Hopkins. One specific area where there was a significant reduction in patient harm was ICU acquired weakness.

Methods

- Data has been collected on ICU patients regarding their mobility prior to hospital admission and after their stay in the SICU.

- Initially, barriers were evaluated surrounding patient mobility in the ICU. After these barriers were addressed, the team created objectives and ways they could create an environment where eligible patients were mobilized on a daily basis.

- The team created a screening tool to evaluate patient mobility. Rehab therapy, including physical therapists and occupational therapists were to meet with nurses to determine a HLM (highest level of mobility).

- The team met every morning to set a target for mobility of each patient and determined which team member would work with the patient, as well as what time they would be meeting with them (Sapirstein, 2016).

- When the team member had completed the patient session, the HLM would be entered and Emerge would be updated. For data collection, HLM for patients in their stay at the SICU was documented.

- Mobility prior to the patient’s stay in the SICU was documented from anesthesiology notes and nurse screening assessments.

Results

The data was collected and analyzed from patients baseline data, which included data prior to admission to the ICU and patient mobility was evaluated during and after the ICU stay.

- The amount of physical therapy (PT) mobility sessions with patients increased from 24% to 36% and occupational therapy mobility sessions increased from 12% to 18% (Figure 3).

- The team hit mobility target approximately half the time when working with patients.

- There was decrease in total number of patients who declined in mobility while in the ICU (Figure 4).

- Fisher’s exact test two tailed p-value 0.0106 for “declined” vs. “did not decline” in mobility function (Figure 4).

Future Directions

Future directions for systems engineering and the ICU include, the upcoming projects including the insulin pump and pressure ulcer prophylaxis projects. The results from this project indicate that systems engineering can improve the care of patients in the SICU and improve safety and quality of care. Improving medication administration and preventing skin breakdown in this population is another direction in improving patient care!

References


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