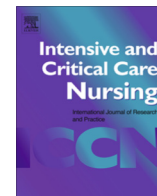




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Research article

Sustainability of a nurse-driven early progressive mobility protocol and patient clinical and psychological health outcomes and in a neurological intensive care unit

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ABSTRACT

Objectives: To determine sustainable impact of an early progressive mobility protocol on mobility level and clinical outcomes.

Design/Methods: Prospective, longitudinal, comparative study using three time points (pre-, immediate post-intervention and 12-month post-intervention sustainability). Analyses included comparative statistics and multivariable modelling. Data were collected by clinical nurses, from administrative databases. Psychological health data were collected using a valid, reliable tool.

Setting: Patients treated in a 22-bed Neurological Intensive Care Unit of a quaternary-care medical centre.

Outcome measures: Highest mobility level, length of stay, mortality, discharge disposition, quality metrics and psychological profile including depression, anxiety, and hostility.

Results: Amongst 260 pre-intervention, 377 post-implementation, and 480 twelve-month post-implementation patients (N = 1117) walking increased post-implementation and was sustained at the eight-month assessment, $p < .001$. After multivariable adjustment, unit and hospital length of stay and psychological distress were reduced compared to the pre-early mobility programmes (all $p < .001$). There were no differences in discharge disposition (i.e., home vs skilled nursing facility), mortality or quality metrics.

Conclusion: Ongoing implementation of an early mobility programme in a neurological intensive care environment led to sustained improvement in patients' level of mobility, length of unit and hospital stay, depression, anxiety and hostility levels.

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Implications for Clinical Practice

- An early progressive intensive care mobility programme is safe and effective in achieving a reduction in hospital length of stay and psychological distress.
- An out-of-bed mobility protocol is sustainable.
- When patients in an intensive care unit with neurological injuries are adherent to early mobility programme expectations, they may have improved psychological health.

Introduction

Improved physical function and survivability benefits can occur when applying an early progressive mobility (EPM) programme in intensive care unit (ICU) environments. Sustainability of mobility outcomes occurs when patient care includes a robust EPM programme. In systematic reviews and meta-analyses of early mobility-rehabilitation in ICUs, patients had an increased likelihood of being able to walk without assistance, and in some reports, authors found improved functional status, reduced length of stay (LOC) as well as other quality metrics and decreased duration of mechanical ventilation (Cameron et al., 2015; Castro-Avila et al., 2015; Hashem et al., 2016). In a randomised controlled study of 50 critically ill, mechanically ventilated adults, an active mobilisation programme led to greater activity, higher frequency of

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walking and other benefits (Hodgson et al., 2016). In pre- and post-implementation research designs, a medical intensive care unit walking programme led to improvement in quality metrics, such as fewer pressure ulcers, re-admissions and intensive care unit (ICU) LOS (Azuh et al., 2016). When critically ill adults receiving mechanical ventilation were included in a systematic review of safety criteria and feasibility, authors concluded that early mobilisation was safe and feasible (Hodgson et al., 2014).

The impact of EPM protocols in neurological intensive care units (Neuro ICU) is not well studied. In the pre-intervention (application of an EPM protocol) phase of this investigation, investigators prospectively measured mobility progression, clinical outcomes, and psychological health of 228 critically ill patients with neurological injury (Mulkey et al., 2014). Using an investigator-developed, 16-level progressive mobility case report form, 40% of patients did not progress out of bed and less than 10% reached walking status. In two investigations with similar EPM protocols applied to patients in a Neuro ICU, patients had higher levels of activity, fewer hospital-acquired infections and shorter hospital and ICU LOS, without increased falls or dislodgement of therapy devices (Klein et al., 2015; Titsworth et al., 2012). In another report, patients with intracerebral or subarachnoid haemorrhages who received an EM intervention had a two-to-three fold increase in the odds of walking greater than 15.24 m at Neuro ICU discharge (Rand and Darbinian, 2015). Only one report addressed the effects of sustained use of an EPM protocol over time (Hester et al., 2017); at two years they found lower Neuro ICU LOS, greater discharge to home, and a strong safety profile, such as no increase in inadvertent line removal. Although the clinical outcomes used to study the effects of initiating EPM interventions were valuable, previous studies did not study outcomes over time to learn if the delivery of EPM interventions were sustainable and remained valuable.

Aim

The primary purpose of this study was to examine sustainability of a nurse-driven early progressive mobility programme applied over a 22-month period by comparing levels of mobility over time. Secondary purposes were to examine if clinical outcomes and psychological health in the Neuro ICU differed over time between three groups (pre-intervention, immediate post-intervention and late post-intervention). Physical mobility between groups, as documented by nursing staff, was defined in 16 levels and subdivided into four milestones (see Fig. 1). Clinical outcomes studied were length of stay, 30-day mortality, discharge disposition and quality metrics that included deep vein thrombosis (DVT), ventilator associated pneumonia (VAP), blood stream infection (BSI), and hospital acquired pressure injury (HAPI). Psychological health outcomes studied were depression, anxiety and hostility.

Methods

This research was a prospective, longitudinal, non-equivalent, three-group comparative study that used consecutive samplings at three points in time. The institutional review board (IRB) approved this study (IRB 10-735). All patients with neurological injury admitted to the Neuro ICU participated in the nurse-driven EPM programme; patients who completed psychological profile questionnaires gave informed consent.

Setting and sample

The setting was a 22-bed Neuro ICU within a 1400 bed quaternary-care medical centre in Northeast Ohio; a quaternary

care medical centre provides advanced specialised health care and investigational treatments. The analysis of clinical outcomes involved a sample of all patients admitted to the Neuro ICU with neurological injury. Of patients included, psychological profile assessments were completed after verbal consent. Exclusion criteria for assessing depression, anxiety, and hostility included non-English speaking, confusion, delirium, combativeness, comatose state and inability to complete the questionnaire due to psychological history, discharged prior to being approached or deceased prior to the psychological health assessment.

Participant groups were consecutively assigned and each data collection period was four months in length. Group one represented the pre-intervention data collection period from July 2011 to November 2011, group two represented the post-intervention data collection period from May 2012 to August 2012, and group three represented the post intervention sustainability data collection period from May 2013 to September 2013. The waiting period between groups one and two was six months and allowed for implementation of the nurse-driven EPM programme. The waiting period between groups two and three was eight months and allowed for nurses to naturally carry out EPM algorithm behaviours without oversight or additional research staff. For each group, a minimum sample size was determined by power analysis. A minimum sample of 450 patients (150 per study group) was selected based on a 2009 change in Neuro ICU LOS, and based on the ability to detect a decrease in excess of 30% in Neuro ICU LOS with 80% power. Calculations assumed use of a Bonferroni-corrected significance level of 0.0167, and that Neuro ICU LOS would follow a lognormal distribution with coefficient of variation equal to 1.25.

Intervention

An investigator-created, nurse-driven EPM algorithm was implemented. As described in Klein et al. (2015), the protocol guided nurses' decisions with patient readiness criteria for mobilisation and identified stepwise mobility progression. The EPM algorithm instructed clinical nurses when to place a referral for patients to receive therapies from the rehabilitation team. Nurses and ordering clinicians evaluated patients' physiologic and behavioural safety for out-of-bed progressive mobilisation prior to a written order placed for this level of activity. After initiating the intervention, one non-nursing staff member was hired to encourage and support immediate algorithm uptake; however, the role was disestablished when data collection was initiated in the immediate post-intervention group. The principal investigator encouraged nurses to use the EPM protocol during the immediate (group two) post-intervention data collection period and thereafter, but did not direct use, to allow for real-world delivery of care. Neurointensivists and advanced practice providers assessed patient mobility readiness with clinical nurses every 12 hours and assured proper mobility orders were placed. Although mobility assessments occurred during all research time periods, providers had a heightened interest in facilitating mobility progression after the EPM algorithm was initiated. In groups two and three, mobility was facilitated with use of safe patient handling equipment (bed features and a portable lift) and the hospital's lift team. This hospital's lift team is specially trained to manually transport patients with specific techniques to assure patient and caregiver safety.

Outcomes and measurements

Sustainability of EPM was measured up to hospital day 13 for all three groups. The first 13 days of hospitalisation were selected for data collection based on 2009 Neuro ICU mean LOS upper limit of 95% CI, thus allowing for mobility assessment data collection for

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