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Quality Improvement Article

Early mobilisation in intensive care during renal replacement therapy: A quality improvement project

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ABSTRACT

Objective: To improve mobility for patients undergoing renal replacement therapy within intensive care.
Design: A quality improvement study utilising a step-wise mobility protocol within a before-and-after audit design.
Setting: Twenty-four bed Trauma/Surgical intensive care unit within a level one trauma and academic centre.
Main outcome: Improvement of compliance to the mobility plan following introduction of a step-wise mobility protocol.
Results: A total of fifty-six renal replacement therapy patients were measured on a randomly selected day each week during the nine month before-and-after protocol audit period. Before introducing the protocol, compliance to mobility was 12.5%, compared to 62.5% after the protocol was introduced. There were no identified negative outcomes, such as catheter loss, filter loss or bleeding, associated with mobilising these patients following implementation of the protocol.
Conclusion: The use of a step-wise mobility protocol was effective and safe strategy to increase mobility in the renal replacement therapy patient population.

Implications for clinical practice

- Initiation of a step-wise mobility protocol improves mobility compliance for critically ill patients.
- Renal replacement therapy patients can be safely and effectively mobilised in the intensive care unit.
- A step-wise approach can be successfully developed using an interdisciplinary approach.

Introduction

In 2016, the Comprehensive Unit-based Safety Program (CUSP) team within the Trauma/Surgical Intensive Care Unit (ICU) identified a downward trend in patient mobility. Upon examination only 72% of ICU patients were mobilised according to provider orders. Variations of mobility were noted within patients receiving renal replacement therapy (RRT), as these patients were previously ordered on bed rest if receiving RRT. In 2017, efforts began to improve the provision of mobility to patients receiving this therapy on the unit.

Background

In the last decade the literature has become saturated with advocates for early mobility in critically ill patients, concluding that the practice of "active, passive, and combined progressive mobilisations can be safely initiated in the ICUs" (Cameron et al., 2015, p. 664). The benefits of early mobility have demonstrated an overwhelming improvement in quality of life and functional ability, as well as decreased mechanical ventilation days, ICU and hospital length of stay and the cost of hospitalisation (Adler and

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Malone, 2012). Implementing a step-wise, progressive mobility protocol in the ICU can demonstrate an increase in mobility from 6.2% to 20.2% in some instances (Drolet et al., 2013). de Queiroz et al. (2018) supports the benefits of active mobilisation for critically ill populations, however, states that current randomised controlled trials lack explicit description of exercise therapies, which contribute to the difficulty for ICU's to initiate a change in practice. Despite the promotion of early mobility with many patients in the ICU, several populations are regularly excluded from mobility studies due to haemodynamic instability or intensive therapies, such as RRT, extracorporeal membrane oxygenation and intra-aortic balloon pump, even though they are the most likely to experience prolonged immobility. A gap exists within clinical practice regarding the mobilisation of patients in the ICU undergoing intensive therapies, such as RRT.

Only a few studies have been published regarding safe bedside mobilisation of the RRT population. The largest study to date was performed at the University of Michigan, in which continuous renal replacement therapy (CRRT) patients were mobilised per a step-wise protocol that encouraged bedside staff to "ASK", or measure "Appropriateness, Secured Site, and Kinks/Pressures" prior to mobilisation (Talley et al., 2013). A New Zealand study implemented an early mobility protocol for CRRT patients and reported that mobilisation was not only safe but also improved filter life of the therapy (Wang et al., 2014). Toonstra et al. (2016) identified from a physical therapist's perspective that early mobilisation for CRRT patients was safely completed with activities, such as bed exercises, sitting at the edge of bed, chair transfer, and standing. An additional study by Lee et al. (2016) confirmed that active mobilisation could be performed in CRRT patients without significant haemodynamic change. Although few, these studies have set the foundation for safely mobilising RRT patients utilising a step-wise approach or protocol.

Aims

The specific aims of this study included:

1. Within the study period, the use of a step-wise mobility protocol will increase mobility of the RRT population by 50%.
2. The step-wise mobility protocol will not be associated with any negative outcomes (catheter loss, filter loss, bleeding) after implementation.

Methods

This quality improvement (QI) project utilised a before-and-after audit design to evaluate the effectiveness of a step-wise mobility protocol. Data were collected during the months of March and April 2017 and compared to data collected during the months of October and November 2017.

Context

This project was performed within a 24 bed Trauma/Surgical ICU of a level one trauma and academic medical centre within the southeast region of the United States. This facility serves as a tertiary hospital with 996 patient beds and six intensive care units which vary by patient population such as medical, neuromedicine, cardiothoracic. The ICU is staffed with fourteen to eighteen registered nurses based on patient acuity. Additionally, an intensivist team comprised of critical care physicians, nurse practitioners, physician assistants, and pharmacists rotate within this ICU. An interprofessional team consisting of respiratory, physical, occupational, and speech therapists, as well as dieticians visit the unit daily to provide care to patients.

An interprofessional CUSP team was created within this unit with the goal of improving quality and patient safety within the ICU. The CUSP team brought to light barriers to mobility for the intensive care RRT population. Barriers including the need for more staff assistance at the bedside and staff concern regarding patient haemodynamic instability or long-held beliefs regarding the safety of mobilising higher acuity patients. The need for standardisation of care became evident as discussions continued and a number of bedside team members stated they were unsure how to mobilise RRT patients safely as ordered.

Participant selection

Patients included in the measured RRT population had a diagnosis of either acute kidney injury or chronic kidney failure with orders for either intermittent haemodialysis (IHD), daily venovenous filtration (DVVH), or CRRT on the selected day of data collection. Patients were excluded from the QI project if the team was in the process of withdrawing care, the patient did not pass the Safety Screen in Fig. 1, or the patient was ordered to be transferred out of the ICU (an indication the patient was no longer critically ill). RRT patients who remained on the unit for longer than a week were excluded following their first mobility evaluation. The demographics of this patient population included young, middle, and older adults admitted to the Trauma/Surgical ICU requiring intensive care monitoring.

Intervention

In early 2017, the CUSP team began development of a protocol to improve mobility for the entire ICU, with specific attention to those receiving RRT. Evidence-based protocols are praised for their efficiency, improved documentation, presumed safety, coordination of multiple disciplines, as well as its standardisation of care (Rotter et al., 2012). The team selected a step-wise approach for the protocol format to overcome barriers to mobilisation, such as patient haemodynamic instability, inadequate staffing, care coordination, unclear expectations, and role clarification (Dubb et al., 2016). This step-wise protocol provides a spectrum of step by step mobilisation processes in which a patient must master one step to progress to the next. Each shift a 'Safety Screen' was performed to evaluate if a patient was to be included or excluded for mobility, depending on the patient's current clinical status. The protocol incorporates mobility techniques such as elevation of the head of bed, manual turning, rotation therapies, chair position, bedside dangling of extremities, and out of bed to chair and ambulation (Fig. 1).

Prior to the implementation of the protocol, a one-time order for mobility was written and seldom changed (e.g. bedrest). After the protocol, the interdisciplinary team developed an individualised daily mobility plan for each patient during morning rounds. The plan was communicated to all bedside staff and any change in condition that would influence the plan was reported to the team.

Depending on the type of dialysis therapy the patient received, the team could anticipate the mobility plan. Patients who received CRRT were mobilised within the room only, as the equipment could not be disconnected from the room. For those patients receiving IHD or DVVH, care was coordinated so that mobility could be performed before or after treatment and patients were able to mobilise both in and outside of the room.

Measures

The use of a step-wise protocol as the intervention was particularly useful in the RRT population as it considered the potential for frequent changes in patient condition and empowerment of

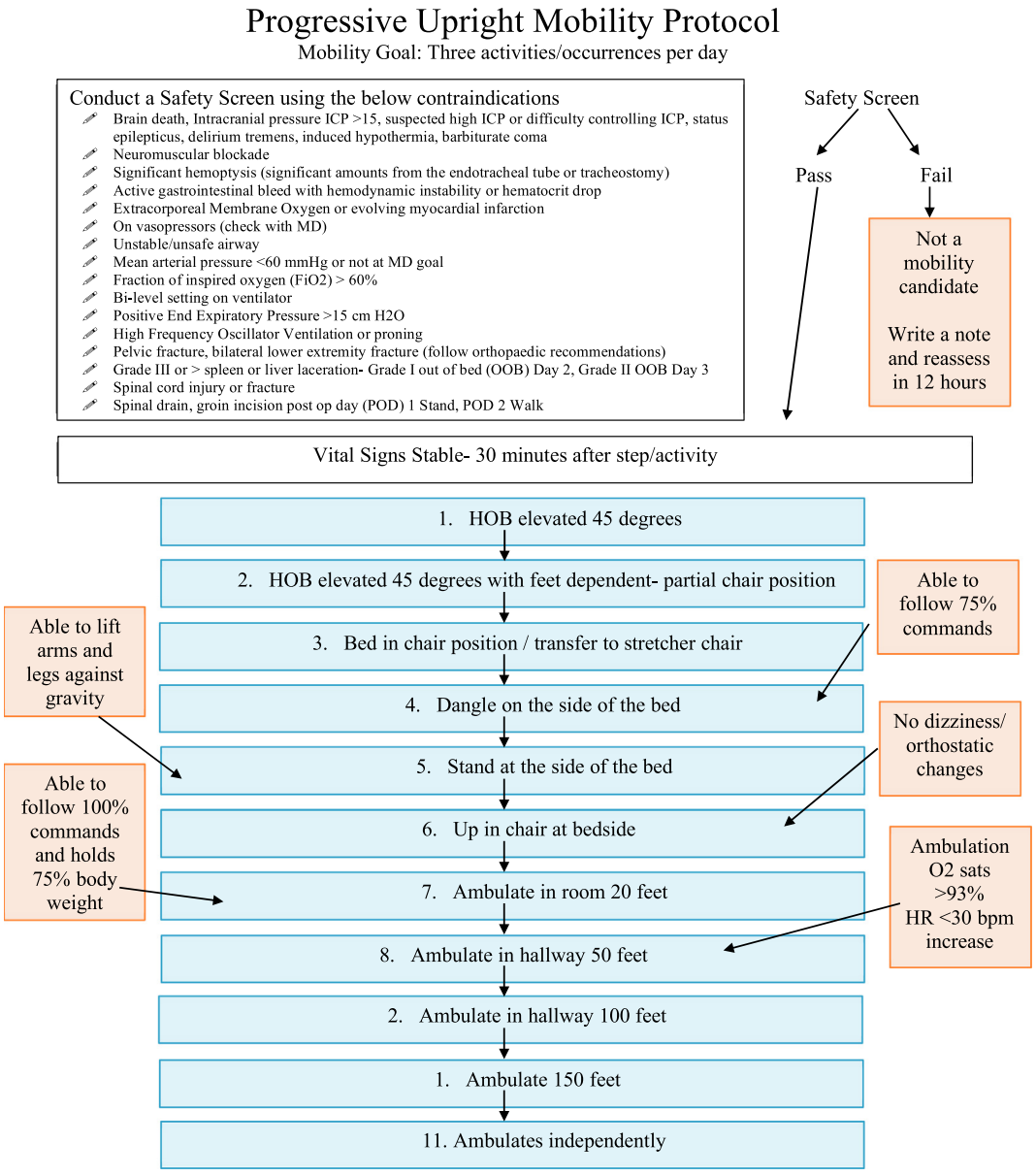

Fig. 1. Progressive upright mobility protocol.

the bedside staff to respond to those changes with increased or decreased mobilisation efforts. The simplified delineation of movements proved useful in RRT patients with multiple, fragile intravenous lines as well as potential flow issues created by mobilisation while dialysis was in progress. Patients were able to progress through the protocol using fine movements that would not stop or impede the provision of renal therapy. The detail provided by the protocol created an attainable goal for each individual patient. Additionally, direction for bedside staff on how to progress each patient over time streamlined the goals of care for each patient.

Preliminary data was taken within the months of March and April 2017. Education was provided during the month of May. Led by the CUSP team, this education occurred at weekly huddles and health care team meetings, in order to highlight the need for change as well as the intervention itself. Bedside staff was "checked off" as education was performed, and mobility discussions and documentation were incorporated into daily bedside staff report, provider rounds and weekly interprofessional patient care conferences. The protocol officially rolled out on 1st June 2017.

Ethical considerations

This project was determined to be a quality improvement project by the University of Florida "Quality Improvement Performance Registry (QIPR)", Project ID 295. Due to the nature and design of this project, institutional review board approval was not required.

Data collection

To explain the downward trend in patient mobility noted in the previous year, the authors retrospectively reviewed the patients

during that timeframe to determine if any themes were present. The CUSP team discovered RRT patients were not routinely mobilised, largely due to an automatic order of "bedrest" for these patients, or due to the intense nature of the therapy. An excel spreadsheet was utilised to collect deidentified data for each patient reviewed, before and after the step-wise mobility protocol to measure compliance. This data collection sheet was stored on a double password protected encrypted server within the hospital computer system. Individual orders, which delineated the type and amount of mobility, were compared to the type and amount each patient was mobilised that day via documentation by bedside nurse. The measurement of mobility compliance was defined as the measurement of patients who achieved or exceeded the order for mobility on that given day. This process was performed for the before protocol period, March and April 2017 and repeated after project implementation for the after-protocol period, October and November 2017.

Data analysis

For analysis, the study utilised descriptive statistics in the form of frequencies and percentages each month of data collection. Mobility compliance was calculated by averaging the mobility compliance from each week of the month. A basic percentage difference formula, in which the difference between two months was calculated, divided by the original month, and then multiplied by 100 to create a percentage. As individualised mobility regimens were created daily, this measurement approach was deemed to be most appropriate when attempting to measure success or failure for each individual patient.

Results

A total of 360 intensive care patients, including 56 RRT were evaluated for mobility compliance with 180 patients (31 RRT) in the before protocol period and 180 patients (25 RRT) in the after-protocol period. In the months the before the protocol, RRT patient mobility measured at approximately 12.5% (n = 2) and 20.75% (n = 3), with a before protocol average mobility of 16.4% (Table 1). An improvement in RRT mobility compliance to 75% was noted in May 2017, likely due to the influence of bedside staff protocol and mobility education. After the initiation of the protocol in June 2017, re-education was again performed in the months of July and August due to the arrival of new residents and fellows to the ICU. Orientation to the unit based initiative was also provided to the bedside staff of all new hires. The authors chose to remove the May, June, July and August 2017 data from the analysis, to eliminate bias. Within the after-protocol period, RRT patient mobility increased to 70.75% (n = 9) and 62.5% (n = 8), for an after-protocol average mobility of 66.8% (Table 1). After the implementation of the protocol, there was an overall increase in RRT patient mobility by 400% (Table 2) when comparing the before and after-protocol period (see Fig. 2), meeting our aim of 50% improvement within the study period.

Discussion

The use of a step-wise mobility protocol had a positive impact on improving the mobility compliance within the RRT population within the ICU, as it provided explicit instructions on how these critically ill patients could safely be mobilised based on individual conditions. Step by step instructions helped to meet the need for specific mobilisation instructions mentioned by de Queiroz et al. (2018) and superseded the minimal safety screening detailed in the "ASK" protocol by Talley et al. (2013). The steps within the protocol are consistent with those found to be effective in the physical therapist perspective study by Toonstra et al. (2016) and were adapted per the expertise of bedside ICU staff. Collaboration of these previous studies was instrumental in creating a reproducible format for future studies to adopt into practice. The protocol represented in Fig. 1 is easily duplicable for all types of ICUs and can be adapted to specific unit-based population and therapies.

Similar to this study, other ICUs have also found a positive influence with the use of a step-wise mobility protocol, with Drolet et al. (2013) reporting an increase in mobility from 6.2% to 20.2%. The step-wise mobility protocol was not associated with any safety events, as was previously endorsed by the as Lee et al. (2016) in the active mobilisation of critically ill patients.

In comparison to available literature, this evaluation of a step-wise mobility protocol had many unique qualities. The project surveyed critically ill patients receiving all three types of RRT, whereas other studies only assessed patients receiving CRRT. In doing so, patients were accounted for all types of critical illness instead of just those who were indicated for CRRT. This was performed using an interdisciplinary approach while other projects were typically based from either a physical therapist or bedside nursing perspec-

Table 1
Mobility compliance within the pre and post protocol periods.

	Pre Protocol (n = 31)		Post Protocol (n = 25)	
Month	March (n = 16)	April (n = 15)	October (n = 13)	November (n = 12)
RRT Mobility	12.5%	20.75%	70.75%	62.5%
Average Mobility	16.4%		66.8%	

Table 2
Comparison of mobility protocol compliance.

RRT Mobility Compliance Rates			
Month	% of Mobility	Change of Mobility from Month to Month e.g. [(March − April)/April] × 100	Comparison of starting mobility (March) and each month evaluated e.g. [(November − March)/March × 100]
March	12.5	–	–
April	20.75	66%	66%
October	70.75	240%	466%
November	62.5	−11.7%	400%

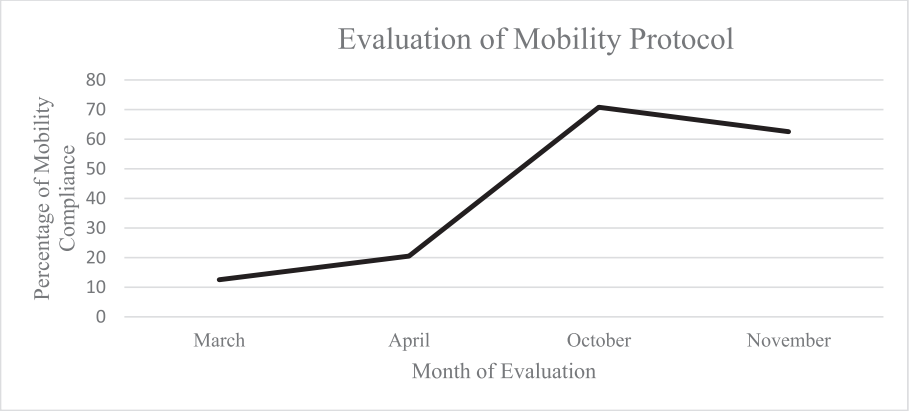

Fig. 2. Graphical representation of RRT mobility in the pre and post protocol periods.

tive. By involving the whole team, individual patient mobility could be discussed from the many perspectives of care. Development of a daily mobility goal by the interprofessional team served as a positive influence in the promotion of safety while providing individual mobility therapy requirements. No safety events were noted following protocol roll out on June 1, 2017, such as catheter loss, filter loss, or bleeding. At present time, the medical ICU is working to initiate this protocol within their unit. Implementing this change has been delayed due to changes within ICU administration, as well as delay of approval from all of the participating bedside teams within the individual unit CUSP.

Limitations

The project was a retrospective design, performed in a single unit, with a small cohort of RRT patients (n = 56), with a short 2-month before and after the protocol period. Additionally, in September 2017 a DVVH trial was concomitantly started on the ICU amidst the step-wise mobility QI project. DVVH serves as an "in between" of IHD and CRRT, as it consists of a longer time of dialysis, approximately 5–8 h. A possible association exists with the introduction of this therapy and increased mobility, as the time interval in between treatments allows for a gentler dialysis in regard to haemodynamics, with an increased opportunity for mobility when therapy is no longer active.

No Statistical Process Control (SPC) was used to evaluate the study's findings and decreases the confidence in the results. The absence of a statistical analysis confounds the results and contributes to the potential of reporting bias. Additionally, though the unit of measurement was determined by the CUSP team to be best in eliminating a "one size fits all" mobility order for each patient, the unit of measure is limited as it indirectly measures mobility by surveying the percentage of success or failure in complying with individual mobility orders.

Recommendations for future study would include collection of patient demographic data, outcome data (e.g., length of stay, catheter life), a larger sample size within various ICU units and an analysis of specific types of RRT. Furthermore, a comparison of patients who are mobilised during RRT and those who remain on bedrest could further support our project's findings; this would further support the principle of early mobility within the RRT populations, with the aim of improving patient outcomes.

Conclusions

This quality improvement project demonstrates that the use of a step-wise mobility protocol can improve compliance to mobility orders for patients who historically have not been mobilised or were thought difficult to mobilise. This is a small contribution to the process of enhancing the standard of care and the current process must undergo further evaluation to confidently promote a change of practice.

Results identified in this study can serve as a foundation for larger, more in-depth studies on the use of mobility in the ICU RRT patient population, as it bridges a gap in clinical knowledge previously unreported. This study was the first of its kind to mobilise patients receiving all three types of RRT within the ICU. The Trauma/Surgical ICU in which the project was performed has continued to implement this protocol following the after-protocol period with regular evaluations of the protocol at the monthly CUSP meeting. Next steps for this protocol include duplicating the trial to other RRT patients within other ICU and centre types; this is a subject of future research.

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Conflicts of interest

None

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.iccn.2018.12.005.

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