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# Implementing early mobilisation in the intensive care unit: An integrative review

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ABSTRACT

*Background:* The intensive care unit provides complex care for critically ill patients. Consequently, due to the nature of critical illness and the therapies administered in intensive care, patients are often on prolonged periods of bed rest with limited mobility. It has been recognised that mobilising critically ill patients is beneficial to patients' recovery, however implementing early mobility as a standard of care remains challenging in practice.
*Objectives:* To identify the key factors that underpin successful implementation and sustainability of early mobilisation in adult intensive care units.
*Design:* Integrative Review.
*Data source:* A systematic search strategy guided by SPICE framework (Setting, Perspective, Intervention, Comparison, Evaluation) was used to formulate the research question, identify study inclusion and exclusion criteria, and guide the database search strategy. Computerised databases were searched from August–September 2016. Quality improvement articles that identified project implementation of early mobilisation of mechanically ventilated adult intensive care patients were included.
*Review methods:* After screening the articles, extracting project data and completing summary tables, critical appraisal of the quality improvement projects was completed using the Quality Improvement Minimum Quality Criteria Set. A modified version of the Cochrane Effective Practice and Organisation of Care taxonomy was used to synthesise the multifaceted implementation strategies the projects utilised to help bring about changes in clinician behaviour.
*Results:* Thirteen articles, reflecting 12 projects meeting the inclusion criteria were included in the final analysis. Eleven projects were conducted in the United States, and one in the United Kingdom. Quality scores ranged from 6 to 15. A formal framework to guide the quality improvement process was used in 9 projects. The three most frequently used groups of implementation strategies were educational meetings, clinical practice guidelines and tailored interventions. Managing the change process through strong leadership, designing strategies and interventions to overcome barriers to implementation, multidisciplinary team collaboration and data collection and feedback underpinned successful and sustainable early mobility practice change.
*Conclusion:* The use of a quality improvement appraisal tool can help identify high quality projects when planning a similar mobility program. Even though projects were conducted in a variety of intensive care unit settings, and implementation frameworks and strategies varied, all began with strong leadership commitment to early mobilisation. This along with using the quality improvement process and multidisciplinary team approach ensured success and sustainability of mobilising ventilated patients.

**What is already known about this topic?**

- Early mobilisation of ventilated intensive care patients is safe, feasible, and improves patient outcomes, however its implementation can be challenging.
- Early mobilisation of ventilated intensive care patients is an emerging strategy which may help to explain why its prevalence is low.
- Quality improvement projects are designed to improve a performance gap, and bring about positive changes in health care processes.

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**What this paper adds**

- Successful early mobilisation involves multifaceted implementation strategies.
- Strong leaders who lead the change management process, and designing strategies to overcome barriers to early mobilisation support staff in their efforts.
- Multidisciplinary collaboration and providing data feedback to staff are important factors to facilitate early mobilisation.

## 1. Introduction

In the last few decades, advances in intensive care and mechanical ventilation have improved the survival rates of critically ill patients (Engel et al., 2013a; Needham et al., 2010). Traditionally, it was rare to mobilise ventilated intensive care unit (ICU) patients, but now there is mounting evidence on the benefits of early mobilisation including shorter duration of delirium, more ventilator free days, and shorter ICU and hospital length of stay (Schweickert et al., 2009; Li et al., 2013; Adler and Malone, 2012). Yet, there are many barriers to implementing early mobilisation in the ICU (Dubb et al., 2016). In the context of ventilated ICU patients, this integrated review sought to better understand the strategies for supporting the implementation of early mobilisation, which was defined as active patient participation in physical activity that produces physiological benefits; such as sitting at the bedside, standing beside the bed, stand transferring to a chair, and assisted or independent ambulation (Castro-Avila et al., 2015; Li et al., 2013).

## 2. Background

ICU patients who are intubated and mechanically ventilated are generally managed with sedation, and their mobility restricted (Hodgson et al., 2014; King, 2012), receiving only passive movement from routine standard nursing practice and regular repositioning (Makic et al., 2014). Prolonged bed rest, sedation, and immobility can cause many complications, such as depression, delirium, muscle wasting, and profound muscle weakness (Truong et al., 2009; Zomorodi et al., 2012). Furthermore, some of these ICU survivors will experience significant disabling side effects, regardless of their admitting diagnosis (Engel et al., 2013a). Consequently, poor quality of life, severe weakness, self-care deficits, hospital readmission, and death have been reported up to five years post discharge from ICU (Adler and Malone, 2012; Hill et al., 2016).

In the past, mechanically ventilated patients have been deemed medically unstable, and have not been considered appropriate for early physical activity (Engel et al., 2013a). However, these assumptions have been challenged by recent research that demonstrates early mobility interventions are feasible, safe, and beneficial (Pohlman et al., 2010; Li et al., 2013; Bailey et al., 2007) in improving patients' cognitive, neuromuscular and psychiatric functioning (Parker et al., 2013). Furthermore, an early mobility program can reduce hospital costs by decreasing the duration of mechanical ventilation, ICU and hospital length of stay, and hospital readmissions (Lord et al., 2013; Schweickert et al., 2009; Li et al., 2013; Adler and Malone, 2012).

Translating research to clinical practice can be challenging, especially in the complex ICU environment, resulting in a gap between evidence and practice (Elliott et al., 2014; Needham, 2010). Previous research has identified several potential reasons why early mobilisation does not occur, including patient sedation practices, safety concerns, presence of invasive lines and tubes, inadequate knowledge of the benefits of early mobility, and unit culture (Needham and Korupolu, 2010; Dubb et al., 2016). While several ICUs in the United States have identified barriers to early mobilisation, and using them to develop strategies to implement and embed this practice into routine care (Bakhru et al., 2015), limited data of the practice patterns in other countries is available. One point prevalence mobilisation audit of 38 Australia and New Zealand ICUs showed that out of the 498 patients included in the study, no mechanically ventilated patients sat out of bed or mobilised on the day of the study (Berney et al., 2013). Since this study was undertaken there has been more of a focus on early mobilisation, however the extent to which it is currently occurring in countries such as Australia is unknown.

The introduction of new evidence into clinical practice can be challenging especially when: 1) complex changes to clinical routine are needed; 2) there is a change in organisation of care; and 3) collaboration among the multidisciplinary team is required (Grol et al., 2007). The quality improvement (QI) process has been one approach used to facilitate incorporating new evidence into practice (Ohtake et al., 2013). QI aims to achieve measurable improvements in processes of care, and examines how interventions can be delivered reliability and consistently (Perla et al., 2013). The review of published QI projects can be used to determine effective strategies for implementation within various settings, and what elements may need to be adapted, rather than adopting or replicating the QI project itself (Ovretveit, 2011).

Recent published reviews on early mobilisation indicate that early mobilisation in ICU patients is safe and effective, and improve patient outcomes (Adler and Malone, 2012; Li et al., 2013; Azevedo and Gomes, 2015). However, because the focus of these reviews are patient outcomes, there is a gap in understanding implementation strategies that support early mobilisation. QI projects, which are often excluded in reviews, may provide this insight. With increasing evidence supporting early mobilisation in critically ill patients, it is important to both better understand the implementation process and critically appraise published QI reports to assess study quality (Hempel et al., 2015). This quality appraisal of QI projects is required because reports can be problematic with poor quality of measurement and interpretation of data (Portela et al., 2015).

Thus, the aim of this integrative review was to critically appraise QI projects and identify the key factors that underpinned implementation and sustainability of early mobility in adult ICU patients.

## 3. Methods

An integrative review methodology was used to systematically identify, search, analyse, synthesise, and summarise available QI projects. This method allows for the use of diverse study designs in order to provide a comprehensive understanding of a complex health intervention (Whittemore and Knafl, 2005).

### 3.1. Search methods

The SPICE framework (Setting, Perspective, Intervention, Comparison, Evaluation) (Booth, 2006) was used to formulate the research question, identify key words, inclusion and exclusion criteria; and guide the database search strategy (Table 1). A comprehensive online database search was conducted from August-September 2016 using Cumulative Index of Nursing and Allied Health Literature (CINAHL); Medline (via EBSCO Host). Guided by search terms previously used in systematic reviews of early mobilisation (Castro-Avila et al., 2015; Li et al., 2013); our search terms including intensive care unit or critical care or intensive care or ICU were combined with the Boolean operators 'and/or' with the following terms: mobility; mobili*; ambulation; walking; program; quality; quality improvement; intervention; initiative; protocol. Searches were performed without language restrictions or exclusion terms; and date limiters were not set in order to ensure we did not miss QI initiatives. Articles were included if they addressed QI projects on the implementation of early mobilisation in adult (age > 18 years old) intensive care unit patients; requiring mechanical ventilation with an artificial airway (endotracheal tube or tracheostomy). Articles were excluded if they identified hospital wards other then an intensive care; intensive care patients without an artificial

**Table 1**
Spice Framework.

| Focus | Concept | Question |
|---|---|---|
| Setting | Where the intervention will occur. | In adult intensive care units, |
| Perspective | Population affected by the intervention. | how can mechanically ventilated patients |
| Intervention | The service or planned action. | receive early mobilisation as a standard of care, |
| Comparison | Alternate service or action | as opposed to usual practice, |
| Evaluation | The measure of effect; what results? | with the implementation of practice change through a quality improvement initiative. |

Adapted from: Booth, (2006)

airway; and paediatric patients < 18 years of age.

### 3.2. Search outcomes

Following removal of duplicate articles, and screening of titles and abstracts specifically relating to the topic, the remaining full text articles were assessed for inclusion. One author (SP) conducted the search, and two authors (SP and WC) independently reviewed the titles and abstracts against the inclusion and exclusion criteria. Full text copies of all articles meeting the inclusion criteria were retrieved for further investigation. Two authors (SP and WC) determined the selection of included articles. Any disagreements were resolved by discussion. Additional articles were identified by hand searching bibliographies of included articles.

### 3.3. Data extraction and quality appraisal

Data extraction was independently completed by one author (SP) using a purposely designed data extraction form to meet the review aims (which reflects the data displayed in Tables 2–4), and checked by a second author (WC). Because the review focused on implementation, we specifically extracted data on the model, framework or theory of improvement that was used. Nilsen's (2015) categorisation of four types of frameworks including process models, determinant frameworks, classic theories, implementation theories and evaluation frameworks was used in this activity. Process models specify the phases in the process of implementing evidence into practice. Determinant frameworks focus on determinants hypothesised to influence implementation outcomes. Classic theories are those related to change or learning. Implementation theories have been specifically developed to understand and explain the implementation process and evaluation frameworks that provide a structure for evaluation of implementation projects.

To facilitate the unique features of QI specific publications, a critical appraisal instrument for minimum quality standard score for QI publications (Hempel et al., 2015) was used by one author (SP) and checked by another (WC). The QI Minimum Quality Criteria Set (QI-MQCS) is a structured critical appraisal instrument that covers 16 QI domains to assess feasibility, reliability, and validity (Hempel et al., 2015). It was developed to assess QI interventions and is underpinned by continuous QI methodology and has good psychometric properties (Hempel et al., 2015). It assesses whether a minimum standard of detail is provided in each of the 16 domains and helps to identify high quality QI projects (Hempel et al., 2015). Minimum standard score of met/not met is determined for each project in relation to the 16 domains, with the tool providing clear descriptions of what to consider and examples of when the criteria are met (Hempel et al., 2015). A quality score is obtained by adding up the number of 'items met', therefore quality scores range from 0 to 16. To date, cut-off scores for what may be considered low, medium or high quality have not yet been determined, however, increasing numbers of domains being met indicates increasing quality.

### 3.4. Data synthesis

A modified version of the Cochrane Effective Practice and Organisation of Care (EPOC) taxonomy's section on implementation strategies was used to synthesise the intervention strategies the projects utilised to help bring about changes in clinician behaviour (EPOC, 2015). The interventions targeted for behaviour change were analysed to identify common implementation strategies. Then using a meta-synthesis approach, these strategies were inductively analysed to develop themes using an iterative approach.

## 4. Findings

The selected search strategy yielded a total of 485 articles and a total of 13 articles were included (Fig. 1) with two articles reporting the same QI project (Needham and Korupolu, 2010; Needham et al., 2010). Of the 12 projects (Table 2), one was multi-site (Bassett et al., 2012), and the remaining 11 were all single site projects. One project was conducted in United Kingdom (McWilliams et al., 2015), with the remaining 11 projects conducted in the United States. The projects were conducted in different types of ICUs (e.g., cardiac, burns, trauma, medical, surgical, or mixed). Five of the projects identified nurse-to-patient ratio at 1:1 or 1:2 (Clark et al., 2012; Drolet et al., 2012; Harris and Shahid, 2014; McWilliams et al., 2015; Needham and Korupolu, 2010; Needham et al., 2010). One project included an intermediate care unit with a nurse-to-patient ratio of 1:4 (Drolet et al., 2012).

The use of a formal framework for establishing the QI process was identified in 9 of the 12 projects (Bassett et al., 2012; Castro et al., 2015; Clark et al., 2012; Dammeyer et al., 2013; Drolet et al., 2012; King, 2012; McWilliams et al., 2015; Messer et al., 2015; Needham and Korupolu, 2010; Needham et al., 2010). Of particular interest was that process models such as the PDSA (Plan, Do, Study, Act) (Taylor et al., 2013) cycle or the 4E model (Engage, Educate, Execute, Evaluate) (Needham and Korupolu, 2010) were used most frequently, in seven projects (Castro et al., 2015; Clark et al., 2012; Dammeyer et al., 2013; King, 2012; Drolet et al., 2012; McWilliams et al., 2015; Needham and Korupolu, 2010; Needham et al., 2010). Classic learning theories were used in two projects (Bassett et al., 2012; Messer et al., 2015). Three projects did not mention any formal guiding framework (Engel et al., 2013b; Harris and Shahid, 2014; Sigler et al., 2016).

Nine projects implemented a mobility protocol to provide a structured approach to patient activity (Bassett et al., 2012; Castro et al., 2015; Clark et al., 2012; Dammeyer et al., 2013; Drolet et al., 2012; King, 2012; McWilliams et al., 2015; Messer et al., 2015; Sigler et al., 2016). Of the nine projects, four specifically identified implementing a nurse driven mobility protocol (Dammeyer et al., 2013; Drolet et al., 2012; King, 2012; Messer et al., 2015). Five projects identified the changing of, or establishing of new employee positions to implement the mobility program (Clark et al., 2012; Engel et al., 2013b; McWilliams et al., 2015; Messer et al., 2015; Needham and Korupolu, 2010; Needham et al., 2010). While there was limited information about some aspects of the mobility programs like the mobilisation techniques and equipment used, and patient safety strategies to protect the patient's airway, when walking patients, three projects did mention

**Table 2**
Summary of the 13 quality improvement articles.

| Author/Year Country | Setting | [a]Model of improvement | Intervention | Implementation strategy | Sustainability strategy and spread | Data Collection | Results/Findings | [b]Quality score (no of domains met) |
|---|---|---|---|---|---|---|---|---|
| Bassett et al. (2012) USA | 13 ICU's, Trauma, mixed medical/ surgical, and cardiovascular<br>RN-to-patient ratios not reported | Customised framework adapted from Maslow's 4 stages of learning | Evidence based progressive mobility continuum | Face to face collaborative meeting, interactive coaching session.<br><br>Tool kit's provided with essential elements required to implement the initiative.<br>Collaborative monthly conference calls, one to address clinical strategies, the second to discuss operational and cultural challenges.<br>Team leaders assessed staff and provided tailored teaching; coaching or monitoring that built their competency.<br>Peer coaching 1:1 communications and small group teaching | Teams identified additional elements for sustainability and continued patient mobility improvement: integrating mobility into daily work, rounds, standard of care, patient care plans, removing bed rest references from order set, and documentation and integration of mobility in electronic records. Customise coaching to staff. | Retrospective chart abstraction on 130 patients with over 3000 concurrent direct observational data | The progressive mobility tool provided a daily structured assessment of current mobility status which also supported critical thinking process by the nurse and team to ensure safe and effective evaluation of the mobility level. A non-significant trend of decreasing ventilator days was identified. | 13 |
| Castro et al. (2015) USA | Surgical ICU<br><br>RN-to-patient ratios not reported | Plan-Do-Study-Act<br><br>Multimodal education including lecture, online education, just-in-time-education, and discussions | Progressive early mobility activity protocol | Survey questionnaire to assess staff's mindset toward early mobility. | The protocol was added to the orientation curriculum of nurses, surgical residents, and fellows in the SICU. The protocol has also been added to the SICU'S daily goal sheet. | Survey used 5 point likert scale to identify the association between time and change in mindset of staff | The overall survey results for 6 of the 7 statements showed a change in the mindset of SICU staff towards early mobilisation of ventilated patients. Staff's 'mindset' towards early mobilisation improved significantly. | 13 |
| Clark et al. (2012) USA | Trauma and burns ICU (TBICU)<br><br>RN-to-patient ratios 1:1 or 2:1 | Plan-Do-Check-Act | Mobility protocol | Nursing education–30 min instructional session and resource material at each nursing station.<br><br>Physical therapy education – training on respiratory care procedures, unplanned extubation procedures, analgesia and sedation management | Two full time physical therapist positions to support the program.<br><br>Daily physical therapist rounding with nurse manager. Documentation activities on bedside flow sheet.<br>Allocated more bedside chairs to the unit | Pre and post test data collected | The post-early mobility group's overall hospital LOS was 2.4 day shorter, which was statistically significant. There was also significant improvements in some complications.<br>There was no difference in mechanical ventilation days, TBICU days, mortality, or discharge disposition between the 2 groups. | 15 |
| Dammeyer et al. (2013) USA | Critical care medical unit | The Iowa Model for Evidence Based Practice | Nurse led mobility protocol | Reintroduction of the confusion assessment method for the ICU (CAM-ICU). | Clinical outcomes Ventilator days, ICU and hospital LOS and disposition home continue to be collects and evaluated monthly by the leadership team as a means to identify | Chart reviews. Predetermined outcomes for pilot reviewed at 6-months to evaluate the project | Authors noted significant differences in the two patient groups. There were improvements in physical therapy consultations, and in ventilator days, ICU and | 12 |

(*continued on next page*)

**Table 2** (*continued*)

| Author/Year Country | Setting | [a]Model of improvement | Intervention | Implementation strategy | Sustainability strategy and spread | Data Collection | Results/Findings | [b]Quality score (no of domains met) |
|---|---|---|---|---|---|---|---|---|
| | | | | | barriers to sustaining the innovation. Based on collected data the project proceeded beyond the initial 6 month pilot | | hospital LOS, but no tests for statistical significance were presented. | |
| | RN-to-patient ratios not reported | | | Sedation guidelines were reviewed. | | | Simultaneously to mobility, a restraint reduction program and a sedation guideline on the use of less benzodiazepines was implemented, they showed a decrease in the use of restraints and is remaining at 120 patient days per 1000 patient days per month. | |
| | | | | Case studies presented in videos. | | | The number of consults increased 80% and therapy sessions increased by 110% | |
| | | | | 1:1 education on delirium and the CAM-ICU. Change champions were identified to act as educators, leaders and promoters of the change process. Physician champion identified (medical intensivist). | | | | |
| Drolet et al. (2012) USA | Medical/SurgicalICU and Intermediate Care Unit | Plan-Do-Check-Act | Nurse-driven mobility protocol | Tailored education sessions for each discipline. | Protocol implementation Ventilator weaning order set Protocol for pain management. | Pre and post test data collected | The pre-implementation period 6.2% (12 of 193) of the ICU patients and 15.5% (54 of 349) of the IMCU patients ambulated within 72 h of hospital admission. | 14 |
| | ICU RN-to-patient −ratio1:2<br>Intermediate care RN-to-patient ratio 1:4 | | | Time sensitive self-directed learning packets to be completed within a month<br>Posters placed on participating units as reminders of the study. Nurses and patient care technician's education included; verbal presentations by the advanced practice nurses and physical therapists at unit staff meetings. | Hospital wide implementation approved by Medical executive committee | | Following implementation, 20.2% (86 of 426) of the ICU patients and 71.8% (257 of 358) of the IMCU patients ambulated within 72 h of admission, reportedly, a statistically significant improvement from the pre data. | |
| Engel et al. (2013b) USA | Medical/Surgical | Not indicated | Patients meeting criteria will have timely physical therapy referral. | Established a collaborative ICU early mobilisation group; barriers were examined, and safety guidelines and inclusion and exclusion criteria were developed. Representative from each profession was responsible for providing the information regarding their individual roles in the collaborative process via staff meetings and email notices. | A full time physical therapist was added to the ICU for 8 h per day, 5 days per week. The benefits identified convinced the staff to continue to early mobilisation beyond the project pilot period | Pre and post data collected | The results showed that the number of patients receiving physical therapy while in the ICU increased from 179 to 294 (but no tests for statistical significance were stated), and the number of days to referral decreased significantly from 3 to 1. | 14 |
| | ICU | | Activity orders as tolerated and bed rest as an exception. | | | | Functional improvements in the patients walking distance. | |

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**Table 2** (*continued*)

| Author/Year Country | Setting | [a]Model of improvement | Intervention | Implementation strategy | Sustainability strategy and spread | Data Collection | Results/Findings | [b]Quality score (no of domains met) |
|---|---|---|---|---|---|---|---|---|
| | RN-to-patient ratios not reported | | The physical therapist will coordinate daily with the RN to find an optimal time for mobility sessions | | | | Decreased length of ICU stay from 6 days to 4 days, and hospital stay decreased from 14 days to 12 days.<br>There was a significant improvement from 43% to 50% in the number of patients ambulating. | |
| Harris and Shahid (2014) USA | Medical-Surgical ICU, and Cardiac ICU<br>RN-to-patient ratio 1:1 or 1:2 | Not indicated | Chart reviews by physical therapy | Shared educational meetings, sessions and discussions.<br><br>Lead physical therapist identified as champion to advocate for early mobilisation at the critical care quality meetings and interdisciplinary rounds | Department policy changed to stop patients being put on automatic hold. | Post implementation chart review | Physical therapy evaluations performed in the first year of intervention totalled 364, and increased to 542 during the second year of intervention but no tests for statistical significance were stated. | 10 |
| King (2012) USA | ICU not reported RN-to-patient ratios not reported | Rosswurm and Larrabee's 6 step model for evidence-based practice | Progressive mobility activity protocol | Two RN's were identified as Education was provided hospital wide to stakeholders.<br>The education included early progressive mobility studies and evidence based studies and early progressive mobility interventions, and a review of complications of immobility and deconditioning.<br>Continuing education presentations, flyers, bulletins boards, and team meetings were used to disseminate information.<br>For staff unable to attend, a PowerPoint presentation with narration on compact disks and DVD's with handouts, post-test, and evaluation was available.<br>A daily progressive mobility record was developed | The PMAP will be added to the ICU standing orders and a daily rounding tool. | Retrospective audit of 30 patient charts | A pilot study will be used be used to determine the result of the protocol, the feasibility data, costs, and feedback from the stakeholders. | 6 |
| McWilliams et al. (2015) United Kingdom | Mixed dependency critical care unit<br><br>RN-to-patient ratio for ICU (level 3) 1:1, for High Dependency Unit (level 2) 1:2 | 4Es model of QI | Early and structured mobility protocol | Individual bedside training and clinical meetings.<br><br>Wall charts with patient specific goals and plans were used to provide the team with a visible prompt.<br>Weekly multidisciplinary rehabilitation meetings discussed barriers, progress, and solutions throughout the QI period | A new specialist physiotherapist post was created. A physiotherapy sub-team was created with the focus on early rehabilitation. | Pre and post data collected | Critical care LOS decreased significantly from 16.9 days to 14.4 days with an associated significant reduction in ventilator days 11.7 days vs 9.3 days.<br>No significant difference in sedation day or critical care mortality.<br><br>In-hospital mortality decreased from 39% pre- QI vs 28% post-QI. | 14 |

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**Table 2** (*continued*)

| Author/Year Country | Setting | [a]Model of improvement | Intervention | Implementation strategy | Sustainability strategy and spread | Data Collection | Results/Findings | [b]Quality score (no of domains met) |
|---|---|---|---|---|---|---|---|---|
| Messer et al. (2015) (USA) | Medical-Surgical<br>ICU<br>RN-to-patient ratios not reported | Knowles Adult Learning Theory and Kirt Lewin's Theory of Change | Implementation of a progressive mobility protocol | Educational classes for staff nurses<br>Interactive didactic educational sessions focusing on: evidence-based benefits and barriers to mobility, and adverse effects of immobility.<br>Presentation by Physical therapy educator and Physical therapist to address:<br>-range of motion exercises, dangling, patient transferring, and the use of assistive devices | The original educational and protocol was implemented in 2012. Several changes to the education and protocol have been made. The education used in the project continues to be used for new ICU nurses during orientation in the med-surg ICU and 4 other ICU's in the hospital. Two full time employee positions have been created to improve mobility of patients in the units. The protocol is also used at four other ICU's within the hospital | Pre and post chart review and pre-test and post-test survey | Scores after the educational session were significantly higher than scores before the intervention (pre-test scores 25–88%, post-test scores 50–100%). Overall dangling increased significantly, however there was no significant increase in ambulation or transferring to a chair. | 14 |
| [c]Needham and Korupolu (2010) USA | Medical ICU<br>ICU<br>RN-to-patient −ratio1:2 | 4Es model of QI | Standardising care, the use of independent check lists<br>New sedation protocol. | Summaries of important research were disseminated via the MICU newsletter, posters, bulletin boards, and invited guest speakers.<br>Specific educational barriers were addressed.<br>Large group training sessions were held with the respiratory therapists.<br>Five presentations for the MICU physicians. | Funding of a comprehensive critical care physical medicine and rehabilitation program post QI project.<br>Funding provided for additional staff.<br>Four other ICU's at John Hopkins hospitals used the foundation created from the QI project. | Performance measures collected and used on an ongoing bases after the evaluation phase | The performance measures demonstrated that the extensive planning in changing culture to facilitate early mobility is safe, feasible, and beneficial.<br>Significant improvements were seen in patient mobility and in medical ICU patients' ICU and hospital LOS decreasing significantly. | 14 |
| [c] Needham et al. (2010) USA | Medical ICU<br>ICU<br>RN-to-patient −ratio1:2 | 4Es model of QI | Modification of the admission activity level default orders from bed rest to as tolerated.<br>Creation of a new sedation protocol. | Project leader established for QI project. Champions from each discipline identified. Small group meetings and presentations.<br>Evidence summarised and disseminated via newsletters, posters and presentations. | Funding of a new critical care physical medicine and rehabilitation program.<br>New sedation protocol.<br>Delirium evaluation implemented as routine nursing assessment (several ICU's in 2 of their hospitals).<br>Changing staffing level to include:<br>-full time physical therapist<br>-occupational therapist<br>-part time rehab assistant | Pre and post data performance Measures collected | Sedation, delirium and medication outcomes − Significantly fewer patients receiving benzodiazepines and significantly fewer were deeply sedated or were delirious.<br>Physical medicine and rehabilitation outcomes.<br>-Significantly more patients received physical or occupational therapy and significantly more increased their functional mobility during these treatments.<br>Hospital Data − There was significant decreases in the average MICU and average hospital LOS. | 15 |
| Sigler et al. (2016) USA | Medical ICU | Not indicated | Eight-step mobility protocol | Eight-step progressive mobility protocol was designed; education for physical therapy/ occupational therapy department | The project will continue on a long term basis | Retrospective chart reviews from the patients who ambulated | No complications or adverse events occurred during the mobility sessions. | 11 |

(*continued on next page*)

**Table 2** (*continued*)

| Author/Year Country | Setting | [a]Model of improvement | Intervention | Implementation strategy | Sustainability strategy and spread | Data Collection | Results/Findings | [b]Quality score (no of domains met) |
|---|---|---|---|---|---|---|---|---|
| | | | | Physicians addressed analgesia and sedation practices; sedation minimization was implemented into daily rounds | | while supported by mechanical ventilation | | |
| | RN-to-patient ratios not reported | | | Nursing education during staff meetings | | | Average ICU LOS decreased from 4.8 days to 4.1 days (but no tests for statistical significance were reported). | |

Abbreviations: No, Number, CAM-ICU: Confusion assessment method for ICU, ICU: Intensive Care Unit, IMCU: Adult intermediate care unit, LOS, length of stay, MICU: Medical Intensive Care Unit, QI: Quality improvement, RN: Registered Nurse, SICU: Surgical Intensive Care Unit.

[a] Reflects the model, framework or theory that was used to guide the project.

[b] Quality Improvement Minimum Quality Criteria Set (QI-MQCS) score (possible range 0–16).

[c] Publications reporting on the same project.

**Table 3**
Critical appraisal of the 13 quality improvement articles.

| Author | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 | D9 | D10 | D11 | D12 | D13 | D14 | D15 | D16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bassett et al. (2012) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | | ✓ |
| Castro et al. (2015) | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| Clark et al. (2012) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Dammeyer et al. (2013) | ✓ | ✓ | ✓ | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | ✓ |
| Drolet et al. (2012) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | ✓ | ✓ | ✓ |
| Engel et al. (2013b) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Harris and Shahid (2014) | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | | ✓ | | ✓ | | |
| King (2012) | ✓ | | ✓ | | ✓ | | | ✓ | | | | ✓ | | ✓ | | |
| McWilliams et al. (2015) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Messer et al. (2015) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | ✓ | ✓ | ✓ |
| Needham and Korupolu (2010) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Needham et al. (2010) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Sigler et al. (2016) | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | | ✓ | | ✓ | ✓ | |

Domain:
1. Organizational Motivation.
2. Intervention Rationale.
3. Intervention Description.
4. Organizational Characteristics.
5. Implementation.
6. Study Design.
7. Comparator.
8. Data Source.
9. Timing.
10. Adherence/Fidelity.
11. Health Outcomes.
12. Organizational Readiness.
13. Penetration/Reach.
14. Sustainability.
15. Spread.
16. Limitation.

these issues. For example, Engels et al. (2013b) commented on the use of resuscitation bags and transport ventilators, whereas Needham et al. (2010) stated they also used transport ventilators and Needham and Korupolu (2010) specifically noted the physical or occupational therapist was responsible for securing devices such as the patients' airways.

Critical appraisal of the QI publications using the minimum quality criteria of the QI-MQCS ranged from projects with scores of six to those with scores of 15 out of the 16 domains (Table 3). All 13 articles met the criteria for domain 1 (organisational motivation), domain 3 (intervention description), domain 5 (implementation), domain 8 (data source), domain 12 (organisational readiness), and domain 14 (sustainability), whereas none met the criteria for domain 13 (penetration/reach). That is, no authors reported on the number of facilities eligible to participate, only reporting on the units that did participate. All QI projects identified utilising multifaceted implementation strategies. Table 4 presents the synthesised findings using the EPOC framework. The five most frequently used strategies include: educational meetings, clinical practice guidelines, tailored interventions, educational materials, and continuous quality improvement. The least used strategies included: educational games, communities of practice, and clinical incident reporting (Table 4).

### 4.1. Meta-synthesis

The general findings from the QI projects indicate that the organisations were able to implement early mobilisation within their intensive care unit, and there was a variety of evidence in the papers to indicate the sustained practice post project implementation. Given the complex nature of QI initiatives, key attributes for successful implementation were identified inductively from the data. Key attributes can be further interpreted to identify four themes: managing the change process through strong leadership, designing strategies and interventions to overcome barriers to implementation, multidisciplinary team collaboration, and data collection and feedback systems.

#### 4.1.1. Managing the change process through strong leadership

Managing the change process through strong leadership, the first theme, was evident in all projects reviewed. All study authors identified the involvement and commitment of project leaders, however the composition of the leadership teams varied across projects. Furthermore, local champions such as physicians, nurses, and physical therapists were identified to provide support for the change process, however, the composition of champions also varied across projects. That is, project leaders and local champions were drawn from different professional groups within ICU. Project leaders used current research to build a case for changing practice, determining optimal practice, and in some projects adapting existing guidelines and standards for local use. The project leaders effectively communicated the reason to change practice, what was expected from staff during the change, and how their work would be impacted upon with the change.

#### 4.1.2. Designing strategies and interventions to overcome barriers to implementation

The second theme, designing strategies and interventions to overcome barriers to implementation was identified as the project teams used a combination of intervention strategies, such as embedding mobility into daily workflow, reviewing sedation practices, resourcing the project, and intervention strategies. The projects embedded early mobilisation into the daily workflow, which allowed sustained practice despite other competing priorities. All projects utilised a variety of systems to incorporate early mobilisation into the workflow such as removing bed rest options, the use of protocols or checklists, and bedside rounds. These systems incorporated tasked decision-making process and a standardised approach of care from all team members.

To manage the complex implementation of early mobility, sedation practices were addressed. Current sedation practices were viewed as a major barrier to early mobility. Thus, many of the projects reviewed

**Table 4**
Implementation Strategies.

| Intervention | Audit & Feedback | Clinical Incident Reporting | Communities of Practice | Continuous Quality Improvement | Educational games | Educational Materials | Educational Meetings | Educational Outreach | Clinical Practice Guidelines | Inter-professional Education | Local Opinion Leaders | Reminders | Tailored Interventions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bassett et al. (2012) | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ |
| Castro et al. (2015) | ✓ | | | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ |
| Clark et al. (2012) | | ✓ | | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ |
| Dammeyer et al. (2013) | ✓ | | | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ |
| Drolet et al. (2012) | ✓ | | | ✓ | | ✓ | ✓ | | ✓ | | | | |
| Engel et al. (2013b) | | ✓ | | | | ✓ | ✓ | | ✓ | | | | ✓ |
| Harris and Shahid (2014) | | | | | | ✓ | ✓ | | ✓ | ✓ | | | ✓ |
| King (2012) | | | | ✓ | | ✓ | ✓ | | ✓ | | ✓ | | ✓ |
| McWilliams et al. (2015) | ✓ | | | ✓ | | | ✓ | | ✓ | | | ✓ | ✓ |
| Messer et al. (2015) | ✓ | | | ✓ | | ✓ | ✓ | ✓ | ✓ | | ✓ | | ✓ |
| Needham and Korupolu (2010) | ✓ | | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Needham et al. (2010) | ✓ | | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ |
| Sigler et al. (2016) | | | | | | | ✓ | | ✓ | | | | ✓ |
| Total: | 8 | 2 | 1 | 10 | 1 | 11 | 13 | 3 | 13 | 7 | 8 | 3 | 12 |

This table has been modified from the EPOC Taxonomy of Interventions (EPOC, 2015)

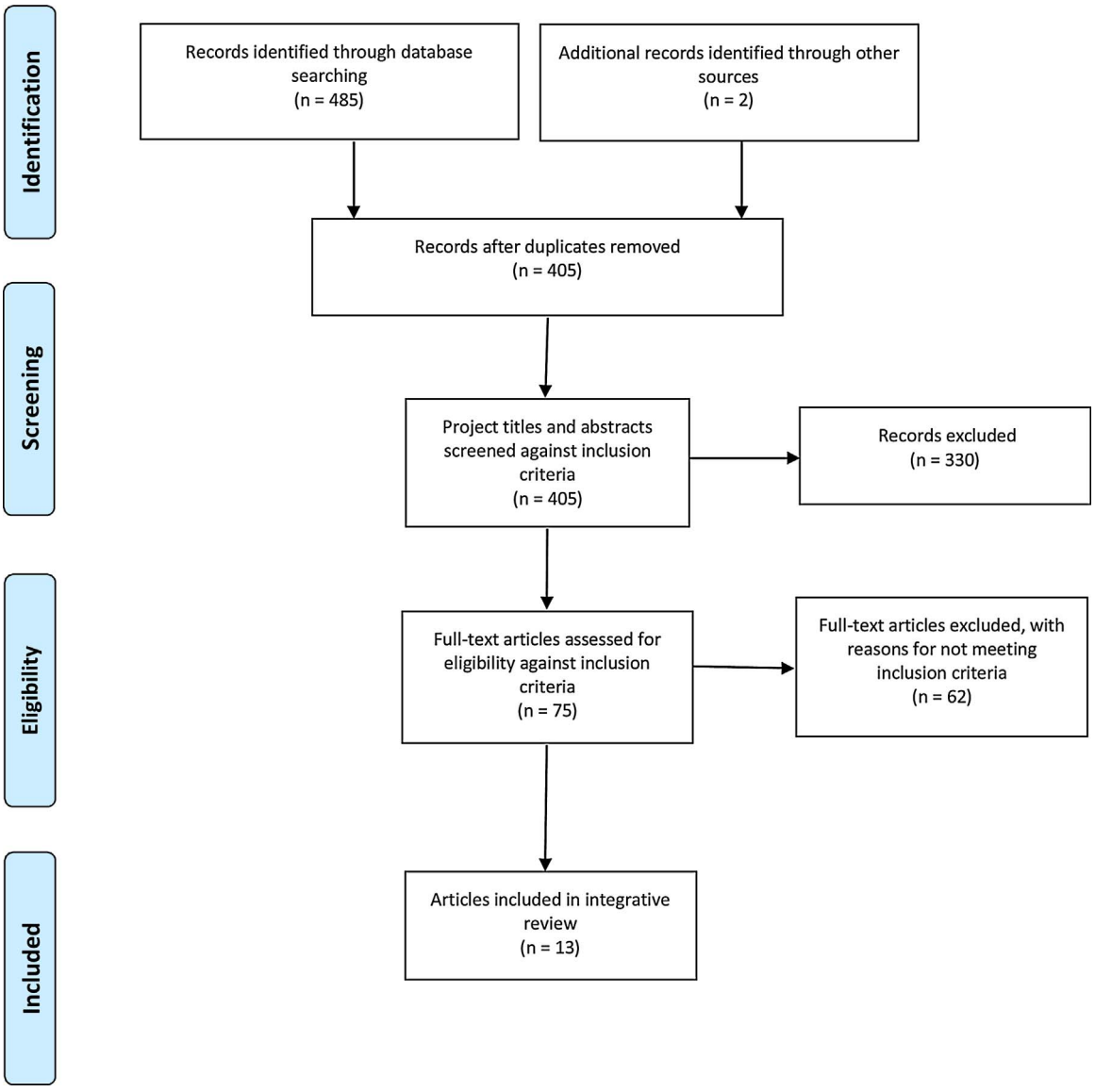


**Fig. 1.** PRISMA Flowchart Adapted From: Moher et al. (2009).

their sedation procedure and adopted goal-directed practices, which have been shown to facilitate patient participation, comfort and mobilisation.

Mobilisation of ICU patients is complex, challenging and requires additional resources including personnel and equipment. It was evident that some projects were better equipped than others to provide the resources for implementation. Adequate staffing levels were necessary for ensuring all eligible patients were safely mobilised. As such, project teams identified that they had additional physical therapy personnel to support the early mobility program. Either hiring new staff, or realigning existing staffing models achieved this. Purchasing of additional equipment to support patient mobility was also identified, but to a lesser extent.

Staff training differed across projects, with some studies identifying education targeting specific professional groups while others adapted a multidisciplinary educational approach. The timing of education varied across projects, with some reporting education was provided at the beginning of the initiative to change mobilisation practices, while others reported ongoing team education focusing on intervention progresses, and patient outcomes. Identifying perceived barriers to implementation and design targeted interventions to overcome the barriers were common strategies used in all QI projects. These barriers were simular across projects, however they were identified along different time frames during implementation. Reassessing barriers throughout project implementation was identified in a majority of projects.

#### *4.1.3. Multidisciplinary team collaboration*

The next theme, multidisciplinary team collaboration, was identified as early mobilisation required complex changes in clinical routines requiring timely and efficient collaboration and communication among disciplines. The collaboration amongst nurses, physical therapists, physicians, and respiratory therapists was essential to conduct safe and effective mobilisation. It was evident that most of the projects identified this need for multidisciplinary collaboration, however they managed this collaboration in various ways. For example, multidisciplinary meetings that promoted a collaborative approach was used as too was a shared partnership approach in coordinating mobilisation activities. Effective communication was also evident amongst both project team members, and multidisciplinary team members. Communication was essential for the team coordinating patient mobilisation while not interfering with other priorities.

#### 4.1.4. Data collection and feedback system

The fourth theme, data collection and feedback systems, was evident as data collection and reporting was timely, useful, and contributed to the sustainability of the projects by promoting staff support and multidisciplinary team engagement. Data collection design and collection procedure varied across projects, as well as the responsibility for data collection. All projects conducted baseline assessments, but the target measures differed. A majority of projects collected, measured and shared improvement data. The presentation of data in actionable and meaningful ways resulted in a greater understanding of the change process involved with the intervention, allowing course correction of potential problems that may arise, and revisions of further potential barriers. Dissemination of feedback was actively done via meetings, however the timings of dissemination between projects varied from weekly to monthly.

## 5. Discussion

This integrative review provides an overview of 12 QI projects, described in 13 articles that were systematically appraised and synthesised to identify key factors for successful implementation and sustainability of early mobilisation of ventilated ICU patients. While most projects were conducted in the US, they provide an invaluable resource when developing QI projects in other countries. Nilsen's categorisation of implementation frameworks identified three quarters of the projects used some theoretical basis but mostly process theories were used. The QI-MCQS quality appraisal tool was used to critically appraise and support the review of included QI projects. This was easy to use and essential in assessing the effectiveness and success of the improvement intervention identified in the projects.

The foundation of successful QI is strong leadership, teamwork and motivation (Curtis et al., 2006), which was evident in the projects we reviewed. Leadership came from a number of disciplines including physicians, nurses, and physical and occupational therapists with positive results irrespective of the leader's backgrounds. Despite the differences in disciplinary backgrounds of the leaders, mobilisation programs seem to address similar issues in relation to patient safety, sedation and other considerations. Perhaps the strong collaborations among various health professional groups in the ICU has facilitated the development of shared mental models for early mobilisation. Mental models have been described as the knowledge or understanding used to perform some task or activity (Mathieu et al., 2000). Teams with shared mental models have similar understandings and expectations of task to be undertaken, allowing them to predict the information needs and behaviours of other team members (Gillespie and Chaboyer, 2009). Thus, along with strong leadership, collaboration and teamwork may have influenced the success of the early mobilisation projects.

Individuals have a significant level of change readiness when they recognise that a problem needs to be addressed and hold a key belief that change is needed (Holt et al., 2010). In our review various techniques such as presenting summaries of research evidence, exploring problems with current mobilisation and sedation practices and addressing local barriers were used to help prepare staff for the change. Vakola (2013) further elaborates that individuals are more likely to engage in change if they feel ready to support the change, have the confidence in their ability to succeed in change, perceives the workgroup as supportive of the change initiative, and perceives the organisation as ready and capable to implement the change. Group readiness to change has been identified as a collective perspective and belief that change is needed, the group has the ability to cope with the change requirements and the organisation has the ability to effectively manage the changes (Vakola, 2013). Organisational readiness to change understands there is a discrepancy between the current practice and a more desirable practice, identifies a clear set of goals and objectives that is supported by a detailed implementation plan, including defining roles and system measures, and offers a supportive climate with both resources and leadership (Holt et al., 2010). The QI projects identified in this review addressed the readiness to change by undertaking ICU staff surveys to identify potential barriers and facilitators to project implementation. This allowed for planning towards successful implementation.

There is an interconnected relationship among individual readiness, group readiness and organisational readiness. That is, individual readiness to change is constantly influencing group readiness to change, which may affect the beliefs and perceptions of organisational readiness to change (Vakola, 2013). Considering the complexity of implementation of early mobilisation, individual, group, and organisational readiness is particularly relevant in the ICU setting as multidisciplinary teams work together to provide patient care, with some individuals working across the organisation.

The included projects were conducted in a variety of ICU settings (e.g. ICU, medical ICU, medical-surgical ICU, trauma and burns ICU). Universally, the programs were successfully implemented and sustained with different disciplines leading the programs. This demonstrates a key principle in enacting QI projects where changes are tailored to fit the local context. Organisational contextual factors have been highlighted as playing a significant role in QI initiative successes or failures, and accounts for the various success rates of the same improvements used at different locations (Brennan et al., 2012; Kaplan et al., 2011; Kringos et al., 2015; Harvey et al., 2014; Estabrooks et al., 2015). Contextual factors are dynamic in that they may constitute barriers to implementation in one setting and facilitate implementation in others (May et al., 2016).

Barriers may also exist during different levels of implementing the intervention (Ista et al., 2014). A recent study conducted by Dubb et al. (2016) identified 28 unique barriers to early mobilisation, and over 70 strategies to overcome these barriers. The researchers suggested it was important to make early mobility a high priority, utilise a multi-professional approach to implementation, and change ICU culture. Implementation strategies can be targeted towards addressing contextual factors such as organisational structure (location, size, specialisation, slack resources), and other related factors (leadership, culture, climate, social relations, power balance, and attitudes to risk taking) to increase the likelihood of uptake of the intervention (Kaplan et al., 2013; Brennan et al., 2012; Goodman et al., 2016; Ovretveit, 2011; Greenhalgh et al., 2004).

Implementation strategies are important, as they constitute the "how to" of changing practice (Proctor et al., 2013). It was interesting to note that while nine of the projects used some sort of model, theory or framework to guide implementation strategies, most (n = 8) were process models such as the PDSA. While two projects used learning theory, no projects used determinants frameworks, implementation theories or an evaluation framework. This, along with the predominant reliance on process models, may indicate a relative lack of understanding of the advances in contemporary implementation science. Using some of these other theories may result in novel, innovative and effective early mobilisation project in the future.

Researchers suggest that implementation strategies should be selected and tailored to local contextual needs (Powell et al., 2015). The different implementation strategies identified in the reviewed projects included multidisciplinary meetings, educational strategies as well as mixed interventions. However, the rationale for the inclusion of specific strategies was not clear in many of the reviewed papers, perhaps because of a lack of use of contemporary implementation theories to underpin the projects.

A recent Cochrane review concluded that interventions tailored to address identified barriers are more likely to improve professional practice than no intervention or the dissemination of guidelines alone (Baker et al., 2015). Furthermore, multifaceted and tailored strategies have been identified as more likely to be more effective then single strategies (Baker et al., 2015). Tailored strategies for project implementation consisted of a combination of interventions focusing on

the barriers and facilitators that influenced the organisation, professionals, and structure of care (Ista et al., 2014; Baker et al., 2015). The implementation interventions selected by the projects corresponded with the evidence-based interventions described by the EPOC taxonomy (EPOC, 2015), and appeared to have been both multifaceted and tailored. Hence, this may help to explain the success of these projects.

When planning and implementing interventions, two crucial considerations are sustainability, and penetration or reach. When preparing for the initial stages for change and at various stages of the project, it is essential that processes to support sustainability are established (Klopper-Kes et al., 2010). Project sustainability has been described as a key implementation outcome (Proctor et al., 2011), and one which was evident in the projects reviewed. All projects reviewed met the QI-MQCS criteria for sustainability, which makes us think the project leads were aware of the importance of addressing sustainability in the project planning phase, although this is just a proposition. While there is no 'magic bullet' to guarantee the benefits achieved, commitment and stability of project leadership with a strategy influences on long term program endurance (Weaver et al., 2015; Fleiszer et al., 2015). Yet, the notion of penetration or reach was not evident in any of the projects. Perhaps this is because most of the projects were single site and many hospitals only have a single ICU, thus early mobilisation was not viewed as relevant to other areas of the hospital.

## 6. Limitations

We acknowledge there are potential limitations of our review. First, while there are a number of review methodologies such as systematic and realist reviews (Pawson et al., 2005), we undertook an integrative review, following an established methodology. As such, the review findings are reflective of our methodology. Had we used other methodologies, we may have uncovered additional insights into early mobilisation. While a rigorous approach was applied to conducting this review, it is possible that relevant QI projects were not identified. Associated with this, there may have been other search terms we could have used that may have resulted in other projects being identified, however our search terms were guided by those used in previous reviews of early mobilisation. Identifying publications relevant to QI can be challenging due to the diversity of initiatives and inconsistent labelling of QI interventions (Hempel et al., 2011). There is also a possibility of selection bias as our results were limited to mechanically ventilated adult ICU patients, therefore we may have missed projects conducted in other high dependency units. The format and styles of the reporting were different across the projects making it difficult to compare projects. Finally, most of the QI papers report local, single site experiences with small samples, which can produce a high risk of bias. Therefore, the review results should be concluded with caution.

## 7. Recommendations for practice

A significant issue recognised in this review is that implementing early mobilisation in intensive care is challenging, and detailed knowledge of factors that may hinder or facilitate implementation is essential for success. While contextual factors varied across sites, such as variations in service delivery, access to resources, processes of care, patient population, and individual ICU culture, QI implementation of early patient mobilisation was successful. This exemplifies the importance of carefully considering the interventions that will be used to support the proposed change in practice, as was evident in the quality scores achieved by many of the projects reviewed. Yet, the use of a variety of implementation models or improvement frameworks (Nilsen, 2015) may lead to a better understanding of local contextual factors, which are important to address in the planning of early mobilisation interventions within an ICU. We identified that ICUs without dedicated staff to support patient mobilisation, may require staffing restructure. That is, where no respiratory therapist is part of the ICU team, alternative personnel, such as additional nurses may be needed to support the mobilisation process to ensure both timely and safe patient mobilisation. Similarly, adequate physical resources such as compact fully-mobile ventilators, walking support devises and adequate uncluttered space for mobilisation are essential.

Continuous assessment of processes throughout the project, such as conducting audits and feedback, may highlight where further strategies are needed. Collaboration and communication amongst health care professionals are essential for mobilising ICU patients. In the ICU environment, the daily multidisciplinary patient rounds offer an opportunity to include patient mobilisation discussion. We suggest that introducing more novel strategies to guide and promote early mobilisation could be incorporated elsewhere. For example, while only one project used a QI collaborative network, they are an increasingly common strategy for implementing practice change (Nembhard, 2009). While these networks offer several advantages, including sharing of resources between sites, and implementing systems that can be used for bench-marking and feedback, it is still necessary for project leaders to have an understanding of the specific features that drive change (Nadeem et al., 2013; Watson and Scales, 2013). In addition, it has been suggested that community of practice in critical care may help to facilitate practice change and address the gap between research evidence and clinical practice through multidisciplinary team collaborative efforts (Li et al., 2013). As compared to the more formal 'collaborative network', a community of practice is an informal structure consisting of professionals who share similar interests and practice experiences, and participate in the group's activities to build a sense of community (Ranmuthugala et al., 2010).

Lin and Ringdal (2013) propose that community of practice could be used as a novel way to facilitate learning and the exchange of information, or to continuously improve critical care clinical practice by combining the expertise of academics and clinicians within or across institutions.

## 8. Conclusion

Evaluating early mobility QI projects is difficult as these projects reflect multiple local contextual factors. However, the use of QI appraisal tools can help identify high quality publications when planning a similar mobility program. While implementation of early mobilisation as a standard of care can be complex and challenging, this integrative review has identified multiple QI projects that have successfully implemented and sustained early mobilisation within the ICU setting. Although the projects were conducted in a variety of ICU settings and implementation strategies utilised varied across projects, they all identified strong leadership support for early mobilisation. This along with the quality improvement process and multidisciplinary team approach ensured success and sustainability of mobilising ventilated patients.

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## Conflicts of interest

No conflicts of interest declared.

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