



# Behavior Change Strategies used to Implement Early Mobility Programs in the Intensive Care Unit: A Systematic Review

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## **Abstract**

The aim of the study was to identify and categorize behavior change strategies used when implementing early mobility in the ICU. Search strategies incorporated a combination of controlled vocabulary and text words for intensive care units, health personnel, and mobility. Inclusion criteria included (a) publication in a peer-reviewed journal (b) description of interventions to improve early mobility implementation in at least one adult ICU setting (c) reporting of ICU-specific data on early mobility outcomes. Exclusion criteria: studies (a) not available in English (b) in pediatric settings. Interventions used to facilitate early mobility behavior change were extracted utilizing the 9 strategies described in the Behavior Change Wheel (BCW) (Michie et al., 2011). Each article was appraised using the Modified Downs and Black checklist for measuring study quality of healthcare interventions (Downs & Black, 1998). Additional data recorded included: level of evidence, study design, professionals participating in intervention. Frequency of strategies utilized: education (89%), enablement (84%), training (63%), restriction (57%), persuasion (42%), environmental restructuring (42%), modeling (42%), incentivisation (31%), coercion (0%). Interventions most utilized for behavior change focused on positive reinforcement such as education, enablement and training while interventions used the least on the BCW were incentivisation and coercion. Review of behavior change strategies utilized by others can assist in the creation of programs designed to implement and improve early mobility in the intensive care unit.

## Background

Early mobility in the Intensive Care Unit (ICU) has been shown to reduce mortality, Post-Intensive Care Syndrome (PICS), hospital length of stay, and hospital-associated healthcare costs (Adler & Malone, 2012; Ely, 2017; Honiden & Connors, 2015; Rawal, Yadav, & Kumar, 2017). Early Mobility in the ICU is key in preventing and reducing physical, emotional, and cognitive deficits that can manifest into PICS, affecting up to 25% of critical care survivors (Adler & Malone, 2012; Cameron, et al., 2015; Ely, 2017; Rawal et al., 2017; Siebens, Aronow, Edwards, & Ghasemi, 2000). Despite evidence supporting the importance of early mobility in the ICU, as many as 55% of hospitals do not have structured ICU early mobility practices in place (Bakhru, Wiebe, McWilliams, Spuhler, & Schweickert, 2015).

The benefits of early mobility are well understood, however, the practice of early mobility is underutilized, with 45% of hospital's reporting a system of mobility practice within their ICUs (Bakhru et al., 2015). The gap between research and practice can be bridged with behavior change strategies when the methods of achieving change are described by authors (Michie & Johnston, 2012). Current early mobility research often focuses solely on patient outcome statistics while lacking a description of how change was achieved. Behavior change theory seeks to utilize the most effective interventions and approaches to achieve desired behaviors (Michie et al. 2011). Of the ICUs that did not have early mobility programs in place, 78% reported that their institution was considering implementation, but various barriers prevented execution (Bakhru et al., 2015). Studies have been conducted to identify perceived barriers for the implementation of early mobility procedures, barriers include staff and patient perceptions of safety, availability of staff, concerns over patient severity of illness and

stability, use of sedation and resulting delirium, in addition to time limitations and task prioritization (Bakhru et al., 2015; Dubb et al., 2016; Jolley, Regan-Baggs, Dickson, & Hough, 2014; Leditschke, Green, Irvine, Bissett, & Mitchell, 2012).

Researchers have identified the culture of a critical care unit as either a barrier or facilitator of early mobility practices (Bakhru et al., 2015). In this systematic review, we sought to identify behavior change strategies that were implemented to facilitate culture change. We defined “culture” as the specific combination of clinician attitudes, physical environmental factors, and institutional systems that contribute to ICU operations and management (Honiden & Connors, 2015). Several researchers have highlighted how the attitudes and beliefs of interdisciplinary ICU staff limit the implementation and sustainability of early mobility protocols.

Dubb’s systematic review identified 28 distinct barriers to early mobility implementation. Of the studies, 60% reported barriers related to ICU culture, which included inadequate staff knowledge, low staff morale, and attitudes that did not reflect early mobility as a priority (Dubb et al., 2016). Another study examining ICU clinician attitudes of early mobility practice found that despite acknowledgement of patient benefits, 21% of physicians and 18% of nurses still questioned the safety of such practices (Jolley et al., 2014). These studies provide valuable insight into why attempts to implement early mobility protocols without including behavior change strategies, may not have been successful.

Research shows that performance of early mobility frequently involves many healthcare professionals including nurses, physicians, and therapists. Research on the professionals involved in early mobility implementation is sparse. As changes in early

mobility practice impact the workflow and prioritization of work for many disciplines, the involvement of different professionals in the implementation and planning phases is important.

Barriers related to culture are often systemic and challenging to change. However, successful implementation has resulted in long-term and sustainable improvement to early mobility practice (Dubb et al., 2016). The purpose of this systematic review was to examine behavior change strategies that influence the culture in ICUs regarding the implementation of sustainable early mobility practice. The researcher's identified which behavior change strategies are implemented most often in the literature. Secondary aims described the rigor within this body of research in addition to the proportion of key stakeholders who define interdisciplinary early mobility teams.

## **Methodology**

This systematic review adheres to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Guidelines (Liberati et al., 2009). The search strategy incorporated a combination of controlled vocabulary and text words for intensive care units, health personnel, and mobility. This search was performed on the following databases: MEDLINE (Ovid), the Cochrane Library (Wiley), Embase (Elsevier), and CINAHL with Full Text (EBSCOhost). Searches were limited to peer-reviewed studies. There were no restrictions on language or date of publication.

## **Inclusion Criteria**

Inclusion criteria included studies published in peer-reviewed journals that (a) describing an intervention to improve early mobility implementation, (b) conducted in at least one adult ICU setting, and (c) articles reporting ICU-specific data on early mobility outcomes. Exclusion criteria includes studies not published in English and describing ICU setting as pediatric focused. Inclusion criteria were applied to screen titles, then abstracts, and full-text. Titles were screened through an unblinded group process and all disagreements were resolved with group discussion. Abstract and subsequent full-text reviews were screened with the same inclusion criteria, but performed in in pairs with an even distribution of the included articles. Each pair reviewed in a blinded individual process, and any disagreements among pairs were discussed with the entire review team.

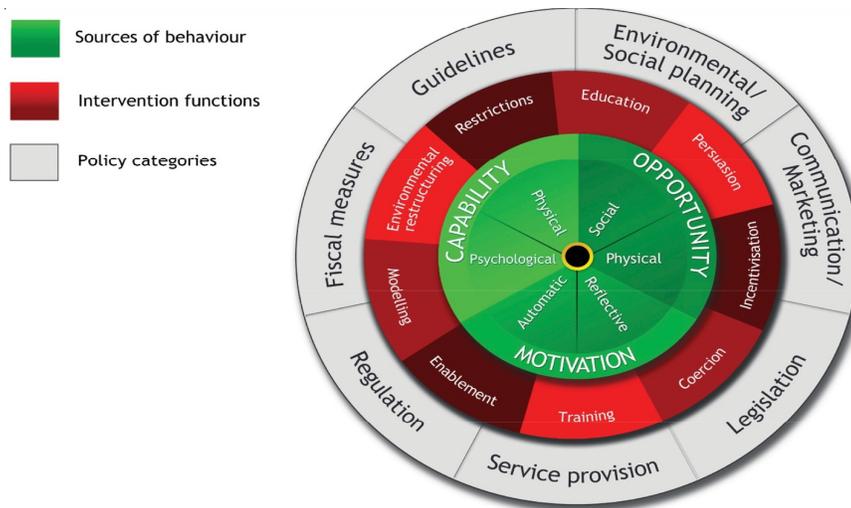
During full-text review, the aim was to identify, categorize, and describe behavior change strategies used with interdisciplinary personnel when implementing early mobility in the ICU. The interventions were categorized using the Behavior Change Wheel (BCW). The BCW is a framework for organizing and categorizing behavior patterns to facilitate the translation of research into practice (Michie et al., 2011). The BCW has been used in prior studies by healthcare institutions to implement behavioral interventions and track intervention success (Lydon et al., 2017; Michie et al., 2011; Munir et al., 2018).

The BCW is comprised of three rings, each representing a different layer of behavior change (Figure 1). The inner ring represents the three sources of behavior: capability, opportunity and motivation, each source of behavior is divided into two parts.

The nine intervention functions compose the middle ring, and the outer most ring is made of the policy categories. The segments of each ring intentionally overlap as multiple interventions are related to each source of behavior and policies may include multiple interventions. The nine behavior change interventions of the middle ring were used in this study to categorize behavior change strategies extracted from the included articles. The nine characteristics listed within this layer include education, coercion, enablement, modeling, training, restriction, persuasion, incentivization, and environmental restructuring (Michie et al., 2011). The definitions of each characteristic were developed by Michie et al. (2011), (Table 2).

The use of the BCW for this study was piloted in four trials to ensure inter-rater reliability and content validity with the research question. Based on BCW guidelines, descriptions of intervention functions were identified in each article and the frequency of all behavior strategies were recorded. One hundred percent of studies piloted demonstrated aspects of the BCW in their intervention descriptions, and all studies combined at least two intervention functions to implement an early mobility protocol.

Figure 1. The Behavior Change Wheel



(Copyright Michie; Michie et al., 2011)

## Secondary Outcomes

To rate the methodological rigor and potential bias of each included study, a modified version of the Downs and Black (1998) quality appraisal tool was utilized. The quality appraisal tool was designed to determine the methodological quality of both randomized and nonrandomized studies. Item 27 was omitted as it related to a study's power, and none of our included studies were powered randomized control trials. The level of evidence, and study designs were also recorded to qualify the research rigor and risk for bias (Downs & Black, 1998).

To describe the interdisciplinary nature of early mobility teams, categorical data on job roles and professional titles for those involved in the intervention were collected in a frequency table to describe the key stakeholders of early mobility teams (Table 1).

Each profession's unique contributions to early mobility should be considered in the planning and performance phases of early mobility implementation.

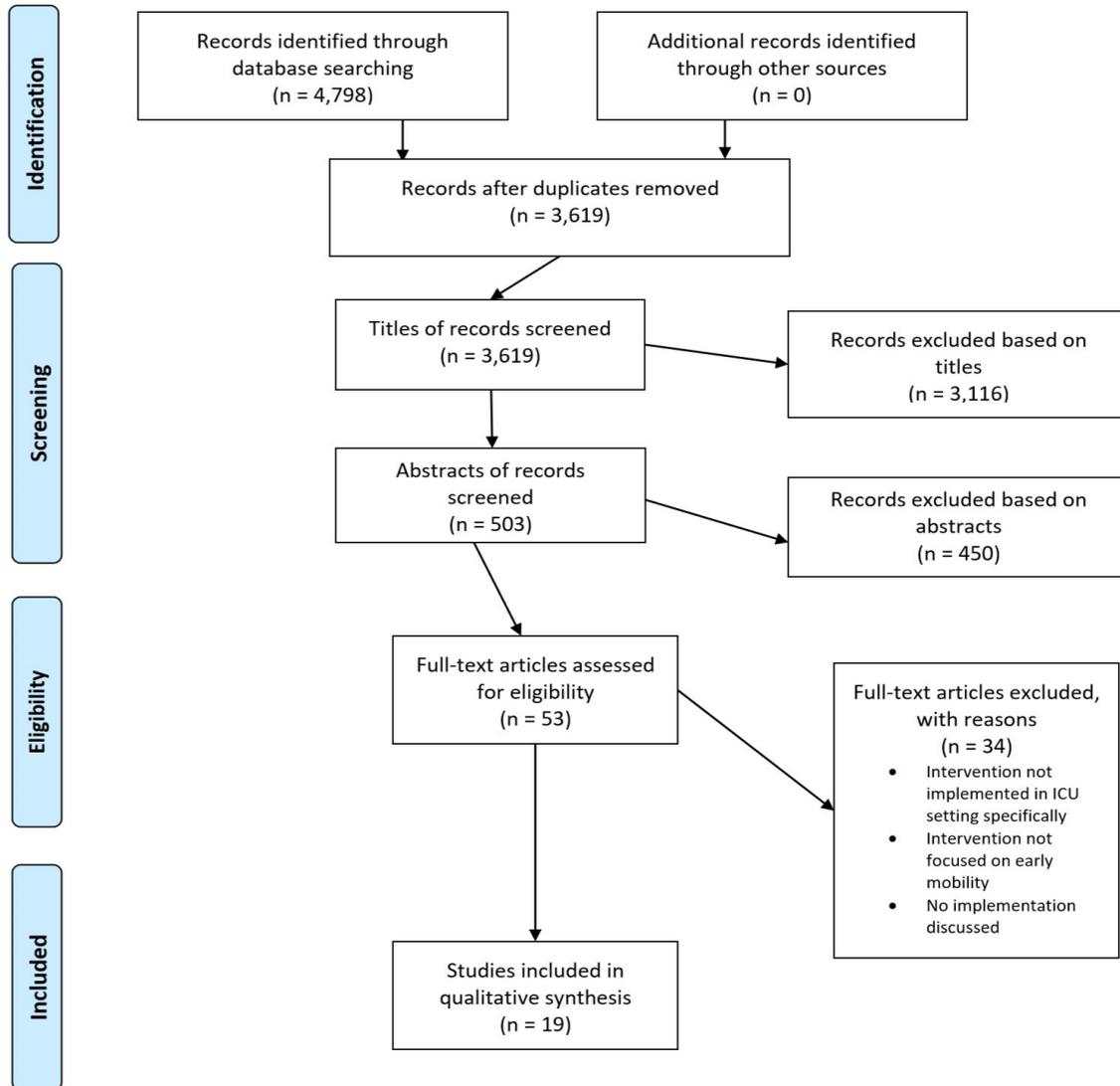
## **Results**

The initial database search yielded 3,619 articles with 19 meeting all inclusion criteria for review (Figure 2). Common reasons for full-text article exclusion included, behavior change interventions conducted outside the ICU, interventions not focused on early mobility practices, and the lack of relevant data related to behavior change intervention. Using Sackett's Levels of Evidence (1997), nine of the included studies qualified as level III, seven as level IV, and three as level V. Study designs included non-randomized observational designs, case reports, or expert opinions (Sackett, 1997). Most studies also lacked quantitative significance when using the modified Downs & Black (1998) appraisal tool. The average quality score of the studies reviewed was 12 out of 27 points on the Down & Black appraisal tool. The range of the studies quality was 6 to 18 points and a standard deviation of 3.0 points. The average score was 12 which falls within the crude summary data for the Downs & Black (1998) appraisal tool that primarily focuses on reviews of quantitative methodology.

Figure 2. PRISMA Inclusion Results



**PRISMA 2009 Flow Diagram**



From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit [www.prisma-statement.org](http://www.prisma-statement.org).

Behavior change wheel intervention strategies utilized in more than half the reviewed articles were education enablement, training, and restriction. Coercion was not utilized in any of the reviewed articles (Table 3). The composition of the mobility team included 95% nursing, 95% physical therapy, 47% occupational therapy, and 42% physician as key stakeholders in their early mobilization programs (Table 1).

Table 1. Professional Stakeholders in Literature

Key Stakeholders	No. of Studies (%)
Registered Nurse	18 (95)
Physical Therapist	18 (95)
Occupational Therapist	9 (47)
Physician	8 (42)
Patient Care Technician/Critical Care Technician	3 (16)
Mobility Aide/Mobility Technician	2 (10.5)
Pulmonary/Respiratory Therapist	2 (10.5)
Physician Assistant	2 (10.5)
Cardiothoracic Surgeon	1 (5.3)
Certified Nursing Assistant	1 (5.3)
Critical Care Intensivist	1 (5.3)
Management/Administrators	1 (5.3)
Pharmacist	1 (5.3)
Physical Therapist Educator	1 (5.3)

*Note. Adapted from Michie et al. (2011), The behavior change wheel: A new method for characterizing and designing behavior change interventions*

All studies used a multi-modal approach, incorporating at least two strategies from the BCW. More specifically, one study utilized eight out of the nine behavior strategies (Bassett, Vollman, Brandwene, & Murray, 2012).

Table 2. Behavior Change Wheel: Intervention Function Definitions & Results

Intervention Functions	Definition	No. of Studies (%)
Education	Increasing knowledge or understanding	17 (89)
Enablement	Increasing means/reducing barriers to increase capability or opportunity	16 (84)
Training	Imparting skills	12 (63)
Restriction	Using rules to reduce the opportunity to engage in the target behavior (or to increase the target behavior by reducing the opportunity to engage in competing behaviors)	11 (57)
Persuasion	Using communication to induce positive or negative feelings or stimulate action	8 (42)
Environmental Restructuring	Changing the physical or social context	8 (42)
Modeling	Providing an example for people to aspire to or imitate	8 (42)
Incentivization	Creating expectation for reward	6 (31)
Coercion	Creating expectation of punishment or cost	0 (0)

More specifically, each study reported various strategies used to implement staff behavior change. Education included webinars and didactic lectures (Campbell, Fisher, Anderson, & Kreppel, 2015; Messer, Comer, & Forst, 2015). Enablement was

implemented through strategies which included automatic mobility orders, hiring new staff, and giving nurses the ability to order physical therapy or occupational therapy (Castro, Turcinovic, Platz, & Law, 2015; Drolet et al., 2013; Titsworth et al., 2012). Articles that highlighted training as one behavior included high-fidelity human simulation, in-service training, and outside experts contracted to train a core mobility team (Campbell et al., 2015; Needham et al., 2010).

### **Discussion**

The purpose of this study was to identify current behavior strategies among research regarding early mobility in the intensive care unit. Many prior researchers have identified the importance of early mobility in order to improve long-term patient outcomes. Although these prior findings have helped advanced therapy practices in the intensive care it is also recognized that many hospital intensive care units struggle with sustainable implementation of early mobility practice (Adler & Malone, 2012; Bakhru et al., 2015; Ely, 2017; Honiden & Connors, 2015; Leditschke et al., 2012; Rawal et al., 2017). The findings of this systematic review may guide development and improvement of early mobility programs that focus on changing the behaviors of healthcare personnel.

All the included studies used a minimum of two intervention behavior strategies to implement mobility. There is no evidence to suggest that using more behavioral strategies leads to more successful implementation of early mobility. Numerous researchers have found that using multiple behavior change interventions did not indicate success, but that targeted behavior change interventions did (Dombrowski et al., 2012; Taylor et al., 2012). Utilization of behavior change strategies that address

practice needs can provide the largest impact for early mobility implementation. Providing education to health care staff regarding the benefits of early mobility should not be the solo intervention to improve behavior change toward early mobility in the intensive care unit. A staff that understands the benefits of early mobility, but does not have the necessary resources or policies to support early mobility, may benefit from more specific behavior strategies to address environmental restructuring or enablement ensure successful early mobility use long-term. Education, and enablement were the most frequently used strategies (Appendix A). Though definitions and execution strategies varied, all reviewed studies included some measure of formal education, training or modelling, which provided specific methods to promote behavior change related to early mobility within intensive care units. All studies included in the review used intervention strategies that could be categorized by the BCW, and were tailored to the specific health care institution and staff where early mobility was being implemented. Each institution used different methods and combination of the behavior strategies.

From the review, the researchers were able to identify and categorize behavior interventions that may guide practitioners on ways to establish and sustain early mobility in the intensive care units within hospitals. By categorizing and identifying behaviors we were able to identify behavior characteristics that were essential to have for developing a program that aims to improve early mobility with patient's having critical illnesses.

While the majority of studies used a multimodal approach to behavior change in the ICU, many behavior interventions were not adequately described. Basset and

colleagues (2012) successfully implemented an early mobility protocol in the ICU, however challenges were still encountered such as staffing demands and lack of hospital resources, staff fear of patient safety, family and patient perceptions of bedrest, and mixed messages from physicians. This research suggests that all of these challenges could be targeted through staff and patient education and staff training identified with characteristics described in the BWC.

When considering early mobility among a health care team, 47% of studies included occupational therapists as a key stakeholder within the intensive care unit. As one of the only hospital spending category where additional spending had a statistically significant association with lower readmission rates, occupational therapists have a distinct opportunity to demonstrate their value in ICU settings (Rogers, Bai, Lavin, & Anderson, 2017). Occupational therapists are trained to consider the holistic well-being of clientele and are in the unique position to emphasize outcomes to the interprofessional critical care team. Given these prior findings occupational therapists are equipped to lead the endeavor to implement early mobility within ICUs throughout the United States. The findings of this article provide examples of behaviors strategies that can be supported by occupational therapists to establish and sustain early mobility and activity within the intensive care unit.

There are several limitations of this systematic review. Reporting the usage of behavior change interventions does not indicate the success or failure of individual intervention types. A consequence of the inclusion criteria requiring a description of the interventions used, excluded most of the experimental studies located by our search. Studies that used strong quantitative measures often did not meet the inclusion criteria

because they did not explicitly describe interventions used to change staff behavior, instead focusing on functional patient improvements like ambulation distance, ventilator-free days and length of admission. This review required inclusion criteria of studies that described how ICUs were implementing early mobility practice in their hospitals. Randomized control trials with outcomes related to the efficacy of early mobility practices frequently did not elaborate on this in their intervention methods or training elements.

To present the interventions in accessible categories, the use of the BCW as a classification tool was both necessary and a potential limitation. All interventions listed in the included studies were limited to one of the nine categories available in the BCW. This simplifies interventions into definitions provided by the BCW that may not encompass the researchers' full intent. Further, the authors' interpretations of the BCW were discussed and consensus was made among all group members.

Studies that provided rich description of patient outcomes lacked description of implementation description, while studies with rich implementation description often lacked comparable descriptions of patient outcomes. Additionally, the wide range of patient outcomes measured prevented comparison between studies (i.e. days mobilized, ventilator-free days, distance ambulated). More research is needed to assess long-term effectiveness of behavior change interventions for early mobility implementation. The possibility of a meta-analysis, or comparison of success to identify the behavior change strategies that lead to the greatest improvement in patient outcomes may be a future research opportunity. Additionally, more research is needed

on the role of healthcare policy and accessibility of behavior or educational resources for healthcare personnel.

### **Conclusion**

This systematic review serves as a resource for ICU health care professionals interested in understanding current culture in the ICU as well as opportunity to change the culture to promote early mobility implementation. By thoroughly reviewing the 19 included studies, the researchers determined that application of behavior change strategies for early mobility implementation is a unique experience within the ICU culture. Creating a behavior change plan to implement or improve early mobility in an ICU should begin with an assessment of current strengths, weaknesses and barriers to early mobility performance in that ICU.

The outcomes provide a baseline for future research to focus on combinations of behavioral interventions to identify the most effective behaviors needed to develop and sustain long term early mobility success. The most commonly utilized strategies were education and enablement from the review. It is important for health care stakeholders to examine their own health care institution to ensure the behavior change strategies met the needs of their culture. There is a need for occupational therapists to conduct further research to understand which behavioral interventions are most effective for implementing behavior change and sustaining early mobility practices as well as identification of their role in driving change for early mobility and activity.

## Appendix A.

Study	Level of Evidence	Intervention
Bassett, Vollman, Brandwene, & Murray, 2012	III	<ul style="list-style-type: none"> <li>● Education - Evidence based didactic lectures in meetings</li> <li>● Persuasion - Original “business case” buy-in from execs, doctors, therapists, support staff</li> <li>● Enablement -Monthly conference calls to discuss clinical strategies and culture challenges</li> <li>● Enablement - Steering committee</li> <li>● Persuasion - Emotional story from patient who benefited</li> <li>● Incentivisation - Incentives like candy</li> <li>● Training - 1:1 “how to” training</li> <li>● Education - Computer modules</li> <li>● Restriction - Universal protocol</li> <li>● Environmental Restructuring - Visual of protocol at bedside</li> <li>● Modeling - Role models who champion early mobility</li> <li>● Enablement - Tool-box given for implementation</li> </ul>
Bruce & Forry, 2018	V	<ul style="list-style-type: none"> <li>● Modeling - Designated mobility champion</li> <li>● Environmental Restructuring - Nurses prepare room for mobility team to come in</li> </ul>
Campbell, Fisher, Anderson, & Kreppel, 2015	III	<ul style="list-style-type: none"> <li>● Education/Persuasion - Webinars by Institute of Healthcare Improvement on importance of early mobility and evidence, team communication</li> <li>● Incentivization - “Mobility is Medicine” buttons, “Feet to the floor” cookies</li> <li>● Training - High fidelity human simulation training</li> <li>● Training - In-service training</li> <li>● Restriction - Specific mobility protocol</li> <li>● Environmental Restructuring - Resource documents, flowcharts in electronic medical records</li> <li>● Enablement - Supported by unit to engage</li> </ul>
Castro, Turcinovic, Platz, & Law, 2015	III	<ul style="list-style-type: none"> <li>● Education - Multimodal education</li> <li>● Restriction - Mobilization protocol</li> <li>● Enablement - Operational changes</li> <li>● Enablement - Hired two new PTs</li> <li>● Enablement - New oral tracheal securement devices, walkers with intravenous pole and oxygen tank carrier to decrease barriers</li> </ul>
Chavez et al., 2015	V	<ul style="list-style-type: none"> <li>● Education - Poster presentation, staff meetings</li> <li>● incentivization - Reinforced successes</li> <li>● Enablement - Financial support for additional staff and equipment needed</li> <li>● Enablement - Nurse assigned to identify barriers and create solutions</li> <li>● Enablement - Cardiothoracic surgeon discussed surgeon role through importance of neck cannulation vs femoral so mobility is possible</li> <li>● Enablement - Critical care intensivist discussed importance of setting tone for early mobility</li> </ul>

Dafoe, Chapman, Edwards, & Stiller, 2015	IV	<ul style="list-style-type: none"> <li>● Education - Focused on improving education, communication, and leadership to promote EM.</li> <li>● Education - Provided education on importance and safety effectiveness of EM.</li> <li>● Education - Education sessions via presentations, online learning modules, ICU nursing newsletters, and nursing updates.</li> <li>● Enablement - Created default activity level of mobilization.</li> <li>● Enablement - Incorporated EM into documentation.</li> <li>● Education - Disseminated information of EM quality improvement via nursing newsletters</li> <li>● Persuasion - encouraged a positive proactive approach to increase frequency of mobilization</li> </ul>
Dammeyer et al., 2013	IV	<ul style="list-style-type: none"> <li>● Education - Followed an evidence-based model (Iowa model) for EM.</li> <li>● Education - Focus on multidisciplinary team</li> <li>● Modeling - Identify Change Champions for EM within each discipline</li> <li>● Enablement - Developed exclusion criteria for EM</li> <li>● Enablement - Established automatic PT consult</li> <li>● Environmental Restructuring - Full time PT designated to ICU</li> <li>● Training - training on skills for ICU and developed standard mobility approach (created levels to ensure safety checks).</li> <li>● Education - RN educated specifically on sedation management.</li> <li>● Environmental Restructuring - RN routine changed to incorporate daily rounds, adjust of SAT time, and promote increased patient sleep</li> <li>● Modeling - ABCDE approach incorporated into physician rounds.</li> </ul>
Drolet et al., 2013	III	<ul style="list-style-type: none"> <li>● Education - Mobility screening tool for exclusion criteria (based on Critical Care Physical Medicine and Rehabilitation program and JH)</li> <li>● Enablement - Protocol developed by RT for weaning of ventilator</li> <li>● Education - to RN and PT and staff: Verbal presentation, poster reminders, self-learning packets <ul style="list-style-type: none"> <li>○ On: exclusion criteria, mobility algorithm, gait belts</li> </ul> </li> <li>● Education - Education to RT: written and classroom. Educated on use of portable ventilator, ventilator weaning, sedation, and mobility protocols.</li> <li>● Environmental Restructuring - Creation of custom-designed walker and posters supporting EM practices</li> <li>● Training - Training to PTs on use of custom-designed walker and intravenous pole and specific handling for critical care and ventilated patients.</li> <li>● Enablement - EM protocol changed to mandatory for all patients in adult ICU during pilot study</li> <li>● Enablement - Nurses given ability to order PT or OT</li> </ul>
Engel, Needham, Morris, & Gropper, 2013	IV	<ul style="list-style-type: none"> <li>● Wake Forest: <ul style="list-style-type: none"> <li>○ Training - Developed interdisciplinary EM committee</li> <li>○ Enablement - Strict eligibility protocol. ICU mobility team nurse screened all patients for eligibility</li> <li>○ Training - ICU mobility team rotated ICUs.</li> <li>○ Education - Collected data on delirium screening, medication dosing, PT consults, and frequency/type of mobility</li> </ul> </li> <li>● John Hopkins: <ul style="list-style-type: none"> <li>○ Restriction - Change in routine sedation practice to “as-needed”</li> <li>○ Enablement - QI coordinator assessed patient readiness for EM through screening protocol</li> <li>○ Training - Developed interdisciplinary EM committee</li> <li>○ Enablement - Hired 1 full time PT for EM purposes</li> <li>○ Restriction - Automatic activity level changed to “as</li> </ul> </li> </ul>

Harris & Shahid, 2014	IV	<ul style="list-style-type: none"> <li>• Education - formal education to PT and RN staff</li> <li>• Enablement - Stopped placing holds when pt transferred to ICU</li> <li>• Environmental Restructuring/Modeling - Added lead PT to ICU</li> <li>• Persuasion - Added lead PT to multidisciplinary rounds and quality meetings to improve therapy buy-in</li> <li>• Education - Addressed perceived barriers by RNs and RTs</li> <li>• Training - Hands on continuing education courses</li> </ul>
Hassan, Rajamani, & Fitzsimons, 2017	IV	<ul style="list-style-type: none"> <li>• Education - Audio/visual/manual training program for RNs</li> <li>• Modeling - Creation of Champion Mobilizer title for RNs who frequent mobilize/assist with mobility</li> <li>• Environmental Restructuring - Pictures and reminder cards on computers</li> <li>• Persuasion - Reminders and motivational message cards</li> <li>• incentivization - Reward program for weekly/monthly top mobilizers</li> <li>• Training - Bedside training and competency for RN staff</li> </ul>
Hopkins, Spuhler, & Thomsen, 2007	V	<ul style="list-style-type: none"> <li>• Enablement - Standardization of sedation</li> <li>• Enablement - Standardization of therapy protocols for mobility (FiO2, command following, etc.)</li> <li>• Modeling - Experienced nurses training new nurses to RICU processes</li> <li>• Training - Staff cross-training course</li> <li>• Persuasion - Programs to establish urgency in staff</li> </ul>
Hunter et al., 2017	III	<ul style="list-style-type: none"> <li>• Education - RN mobility education session with pre/post test</li> <li>• Training - 10-week training course</li> <li>• Restriction - Creation/Implementation of mobility algorithm</li> <li>• Enablement - Daily mobility rounding to determine appropriate level of mobility for each patient</li> <li>• Modeling - Use of lead PT</li> </ul>
Mah, Staff, Fichandler, & Butler, 2013	III	<ul style="list-style-type: none"> <li>• Enablement - Increased staffing with one dedicated PT and one PTA</li> <li>• Education - PT rounded with the team to identify appropriate patients</li> <li>• Environmental Restructuring - Coordinated care between RN and PT</li> <li>• Restriction - Implemented a 5-Level mobility program, progressing patient along a well-defined continuum.</li> </ul>
Messer, Comer, & Forst, 2015	IV	<ul style="list-style-type: none"> <li>• Education - Didactic presentations to RNs on the evidence-based benefits of and barriers to early mobility. A pretest/posttest was administered to capture learning.</li> <li>• Training - Physical therapist provided presentation to RNs on range of motion exercises</li> <li>• Restriction - Tracked total number of daily mobility activities performed</li> <li>• Enablement - Use of another ICU manager to aid process</li> </ul>
Needham et al., 2010	III	<ul style="list-style-type: none"> <li>• Restriction - The interdisciplinary team used a 4 "E"s model (Engage, Educate, Execute &amp; Evaluate).</li> <li>• Persuasion - Implemented a marketing strategy to create awareness around new practice to increase mobility</li> <li>• Education - Provided education to ICU staff in meetings re: current research supporting early mobility.</li> <li>• Enablement/Training - Hired experts to train a core group in the mobilization of critically ill and ventilated patients.</li> <li>• Restriction - Created safety-related guidelines.</li> </ul>

Sigler et al., 2016	III	<ul style="list-style-type: none"> <li>● Education - Lectures at the beginning of each rotation on mechanical ventilation guidelines to minimize sedation and increase focus on analgesia where appropriate</li> <li>● Training - Reminders to minimize sedation implemented in daily rounds</li> <li>● Education - Pre-protocol - physicians met with every MICU nurse to explain goals of the EM project and encourage active participation</li> <li>● Restriction/Environmental Restructuring - Eight-step EM protocol hung on door of patient's room. Nursing highlighted the step each patient reached</li> <li>● Environmental Restructuring/Education - PT/OT leaders "actively involved" nurses, RTs, and physicians to improve understanding and trust for those involved in EM protocol</li> <li>● Environmental Restructuring/Enablement - Hospital purchased lifting equipment - PT/OT educated nurses on its use</li> </ul>
Titworth et al., 2012	III	<ul style="list-style-type: none"> <li>● Restriction - Mobility Task Force (admin, physicians, nurses, rehab, and quality management) did evidence review and developed mobility protocol</li> <li>● Enablement - Protocol was distributed to Neuro-ICU nursing leadership team for "duplication"</li> <li>● Enablement - Automatic mobility orders unless declined by physician</li> <li>● Enablement - Physician orders not required to progress to next step in protocol. However, physician could set max mobility limit</li> <li>● Restriction - All patients required to be out of bed for meals, bathing and toileting</li> <li>● Restriction/Enablement - Protocol included guidelines for PT/OT services, purchase new equipment, funding for mobility aides</li> <li>● Education/Training - Interdisciplinary education modules: mandatory written and video material with skills validation checklists</li> <li>● Education - Patient education brochures with EM guidelines distributed at pre-op and unit check-in</li> <li>● Incentivisation - Monthly updates distributed to each unit with infection rates and percentage compliance with EM protocol</li> <li>● Environmental Restructuring - Protocol slogan used for promotion throughout unit</li> </ul>
Zomorodi, Topley, & McAnaw, 2012	IV	<ul style="list-style-type: none"> <li>● Restriction - Specific protocol developed after evidence review</li> <li>● Education - SICU staff educated on protocol (education style not specified)</li> <li>● Restriction - Flowchart style protocol and decision tree</li> <li>● Restriction - Consultation with charge nurse everyday to determine eligible patients</li> <li>● Restriction - PT and attending physician determined activity level and protocol progression</li> </ul>

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*Permission granted from Michie, S. (May, 2019) for use of Behavior Change Wheel*

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