Title page

“An interprofessional team approach to early mobilisation of critically ill adults: An integrative review”

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CRediT Author contribution

\textbf{Sasithorn Mukpradab}: conceptualisation, methodology, formal analysis, resources, investigation, data curation, writing-original draft, writing-review & editing, visualisation, project administration

\textbf{Marion Mitchell}: conceptualisation, methodology, validation, writing-review & editing and supervision.

\textbf{Andrea Marshall}: conceptualisation, methodology, validation, writing-review & editing and supervision.
An Interprofessional Team Approach to Early Mobilisation of Critically Ill Adults: An Integrative Review

Abstract

Background: Early mobilisation is beneficial to minimise complications and promote the recovery and physical function of critically ill adult patients. An interprofessional team approach may assist in early mobilisation of these patients; however, adopting this approach may be challenging and optimal strategies to support early mobilisation are unknown. Understanding specific implementation strategies is required to effectively support its implementation in the critically ill adult patient population.

Objective: To synthesise and critically analyse the literature on interprofessional team approaches to early mobilisation in critically ill adult patients.

Design: An integrative review

Methods: The methodology of this integrative review was guided by Whittemore and Knafl’s approach. A literature search of online databases including Cumulative Index to Nursing and Allied Health Literature, Excerpta Medica database, Medical Literature Analysis and Retrieval System Online, Physiotherapy Evidence Database, and PubMed was conducted on 13 April 2020 and updated on 2 August 2021. No date limits were applied. Backward citation searching of included articles was used to identify additional articles. Articles were screened by title and abstract following pre-specified inclusion and exclusion criteria, and then by full text using the same criteria. Data describing an interprofessional team approach to early mobilisation were extracted into a specifically designed form. Quality appraisal was undertaken using the Quality Improvement Minimum Quality Criteria Set for quality improvement studies and the Joanna Briggs Institute’s critical appraisal tools was used for cohort studies, retrospective studies, and randomised controlled trials. A narrative synthesis was conducted to integrate and summarise the findings.
Results: Thirty-seven studies were included. All studies described team compositions, roles, and responsibilities. Multiple strategies were used to support the implementation of a team approach to early mobilisation, most of which included the use of instruction tools, team meetings/rounds, staff education, and knowledge sharing, and safety criteria. Improving patient’s readiness to perform early mobilisation using clinical interventions was also described in 17 studies. Crucial factors that can help or hinder the implementation of an interprofessional team approach to early mobilisation were identified including organisational structure, staff attitudes and staff abilities.

Conclusions: An interprofessional team approach to early mobilisation may be a useful strategy to improve early mobilisation practice; however, team compositions, roles, and responsibilities to support its implementation in individual setting is recommended. Multiple strategies and clinical interventions should be used to overcome barriers for implementing an interprofessional team approach to early mobilisation in critically ill adult patients.

Registration number: This review was registered into PROSPERO International prospective register of systematic review (CRD42020179943).

Tweetable abstract

Use of an interprofessional team approach to improve early mobilisation practice in adult critically ill patients.

Contribution of the paper

What is already known about the topic:

- Early mobilisation can help minimise the development of complications and promote recovery of physical function in critically ill adult patients.
- Consistent implementation of early mobilisation in critical care settings is lacking.
- An interprofessional team approach may be a useful strategy to facilitate early mobilisation in critically ill adult patients.
What this paper adds:

- Multiple strategies may be useful to effectively implement an interprofessional team approach to early mobilisation.

- Team composition and professional roles and responsibilities are context dependent and important to support implementation and adherence to an interprofessional team approach to early mobilisation.

- Identification of barriers and enablers is necessary to select targeted interventions to implement an interprofessional team approach to early mobilisation.

**Keywords:** Critical care; Critical illness; Critically ill patients; Early mobilisation; Intensive care units; Interprofessional team approach; Physical exercise; Team collaboration.
1. Background

Early mobilisation is beneficial to minimise complications and promote the recovery of physical function of critically ill adult patients (Anekwe et al., 2020; Eggmann et al., 2018; Hickmann et al., 2018; Zhang et al., 2019). Although there is no agreed definition of early mobilisation, it is generally asserted that its practice is initiated to recover functional ability within 24 hours of intensive care unit (ICU) admission (Hickmann et al., 2016) or within 48 to 72 hours of commencing mechanical ventilation (Ding et al., 2019). Although, the promotion of early mobilisation has been recommended for recovering functional capacity, it may not be practised because of patient-related factors and/or staffing and resource limitations in critical care settings (Bakhru et al., 2016; Castro-Avila et al., 2015; Dubb et al., 2016; Hodgson et al., 2018; Sibilla et al., 2020). Several strategies to overcome these barriers have been identified including providing staff education, identifying an early mobilisation leader, adding a physiotherapist to the team, accessing appropriate equipment, and the use of guidelines or protocols (Dubb et al., 2016). Unfortunately, these strategies alone have not resulted in consistent and sustainable early mobilisation practice as it still lacks interprofessional team collaboration to improve the process of decision making for promoting its practice. Consequently, interprofessional team collaboration could potentially improve the process of decision making for the promotion of early mobilisation practice in critically ill adult patients (Conceição et al., 2017; Dubb et al., 2016; Hodgson et al., 2018; Hodgson et al., 2014; Parry et al., 2018; Phelan et al., 2018).

An interprofessional team approach to early mobilisation is defined as a group of more than one healthcare provider from multiple professions working together through collaborative processes to promote early mobilisation (Dean & Ballinger, 2012; Körner, 2010). The team approach to early mobilisation relies on collaboration to facilitate positive change in staff knowledge and skills (Chohan et al., 2018; Klein et al., 2018; Ratcliffe & Williams, 2019) and
promoting the mindset of staff to enact early mobilisation (Castro et al., 2015; Hunter et al., 2017). These collaborative processes may be helpful in positively changing the culture in ICUs, staff knowledge, staff attitudes, and staff behaviour towards early mobilisation (Czaplijski et al., 2014; Dean & Ballinger, 2012; Dubb et al., 2016; Hopkins et al., 2007; Körner, 2010). Consequently, an interprofessional team approach may be a useful strategy to sustainably improve early mobilisation practice in critically ill adult patients (Czaplijski et al., 2014; Dean & Ballinger, 2012; Dubb et al., 2016; Linke et al., 2020; Parry et al., 2017).

An interprofessional team approach supports enhanced team communication and collaboration while prioritising the safety of patients and staff during mobility exercises (Chohan et al., 2018; Klein et al., 2018; Linke et al., 2020; Ratcliffe & Williams, 2019). Adherence to an interprofessional collaborative approach to enabling early mobilisation was reported to be 90.2% in a feasibility randomised controlled trial (Sosnowski et al., 2018) and was effective at reducing the time to initiate early mobilisation after ICU admission in another study (2 days vs 3.5 days, \( p = .001 \)) (McWilliams et al., 2019). A significant increase in the percentage of patients mobilised (92% vs 73%, \( p = .003 \)) was also observed (McWilliams et al., 2019). Therefore, an interprofessional team approach to early mobilisation can facilitate to sustainably and successfully improve early mobilisation practice in critically ill adult patients (Czaplijski et al., 2014; Dubb et al., 2016; McWilliams et al., 2019; Parry et al., 2017; Parry et al., 2018; Phelan et al., 2018; Schaller et al., 2016).

Although an interprofessional team approach to early mobilisation may be beneficial for improving early mobilisation practice and patient outcomes, adopting this approach remains challenging in ICU settings (Bakhru et al., 2016; Castro-Avila et al., 2015; Chohan et al., 2018; Eakin et al., 2015; Hickmann et al., 2016; Linke et al., 2020). There is limited evidence on the optimal strategies to support the implementation of an interprofessional team approach to early mobilisation in critically ill adult patients. Specifically, what comprises optimum team
composition and discipline roles and responsibilities for this approach is also unclear (Czaplijski et al., 2014; Dean & Ballinger, 2012; Dubb et al., 2016; Linke et al., 2020; Parry et al., 2017). Consequently, an integrative review was conducted with the aim to address specific research questions including: (a) what are the team compositions and disciplinary roles and responsibilities when using an interprofessional team approach to early mobilisation in critically ill adult patients? (b) How is an interprofessional team approach to early mobilisation in critically ill adult patients enacted? and (c) what are the factors that help or hinder implementing an interprofessional team approach to early mobilisation?

2. Methods

An integrative review, guided by the process described by Whittemore and Knafl (2005), was selected to allow for inclusion of evidence from a combination of studies using different methodologies. This review was registered into PROSPERO (CRD42020179943).

2.1. Search methods

A literature search of online databases including Cumulative Index to Nursing and Allied Health Literature (CINAHL), Excerpta Medica Database (Embase), Medical Literature Analysis and Retrieval System Online (MEDLINE), Physiotherapy Evidence Database (PEDro), and PubMed was conducted on 13 April 2020 and updated on 2 August 2021. No date limits were applied. Backward citation searching of included articles was used to identify additional articles. The SPICE framework informed the systematic search strategy (Booth, 2006). Keywords and medical subject heading (MeSH) terms were combined with the Boolean operators “AND/OR” for a systematic search (Supplementary material file 1). These searches were limited to English language and adult patients.

2.2. Inclusion and exclusion criteria

Articles were included if they described an interprofessional team approach to early mobilisation for critically ill adult patients (≥18 years of age) and were delivered within 24-72
hours of ICU or critical care unit admission, or within 48-72 hours of mechanical ventilation. Articles were excluded if they reported on an interprofessional team approach to early mobilisation outside of an ICU or critical care unit, or where the study was reported in an abstract only.

2.3. Search screening and outcomes

The search and identification of included articles followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 flow diagram for updated systematic reviews (Page et al., 2021). After removal of duplicate articles, the first author used the inclusion and exclusion criteria to screen the articles by title and abstract. A full-text review of included articles was conducted using the same inclusion and exclusion criteria by the first author and assessed independently by the other two authors to identify the final articles included in this review.

2.4. Data extraction, evaluation, and synthesis

Data were extracted into a specially designed data extraction form in Microsoft Excel (Microsoft Excel, 2013). The data extraction form included details for the author/s, year, country, study objective, research design, participants, sample size, setting, inclusion and exclusion criteria, intervention/s, team composition, disciplines’ roles and responsibilities, implementation strategies, barriers and facilitators. Data extraction was initially conducted by the first author and checked and discussed for accuracy by all authors.

To assess study quality, the Quality Improvement Minimum Quality Criteria Set (QI-MQCS) was used to assess quality improvement studies (Hempel et al., 2015). Joanna Briggs Institute’s critical appraisal tools were used by the first author to assess randomised controlled trials, cohort, and retrospective studies (JBI, 2017) with the results checked by the other two authors. A decision was made to include all studies, regardless of the outcome of quality assessment as long as they described team compositions, disciplinary roles and
responsibilities, enactment of and barriers to an interprofessional team approach to early mobilisation in critically ill adult patients.

A narrative synthesis was undertaken where the extracted data were synthesised, integrated, and summarised through using consensus among the researcher team. In analysing the data, the research team met to determine the categories and group the data together among the included studies. The results were presented in tables to determine differences and similarities among the included studies (Dixon-Woods et al., 2005).

3. Results

3.1. Global distributions of studies and quality appraisal

Following the search strategy, thirty-seven articles were included in this integrative review (Figure 1). Of the included 37 articles, most were quality improvement studies (n=16), followed by cohort studies (n=10), retrospective studies (n=8) and randomised controlled trials (n=3). The sample sizes ranged from 8 to 2,849 participants. The randomised controlled trials have a range of sample sizes from 15 to 104 participants. Twenty-six studies were conducted in the United States of America (Boehm, 2017; Booth et al., 2016; Bounds et al., 2016; Castro et al., 2015; Clark et al., 2013; Corcoran et al., 2017; Drolet et al., 2013; Engel et al., 2013; Falkenstein et al., 2020; Harris & Shahid, 2014; Hester et al., 2017; Hopkins et al., 2016; Hsieh et al., 2019; Hunter et al., 2017; Klein et al., 2015; Klein et al., 2018; Linke et al., 2020; Mah et al., 2013; Mayer et al., 2020; Moyer et al., 2017; Ragland et al., 2019; Sigler et al., 2016; Smith & Grami, 2016; Weeks et al., 2017; Witcher et al., 2015; Young et al., 2019). Six studies were conducted in European countries including three studies in the United Kingdom (Bounds et al., 2016; McGarrigle & Caunt, 2016; McWilliams et al., 2019), two studies in Italy (Chiarici et al., 2019; Negro et al., 2018) and one study in Belgium (Hickmann et al., 2016). Two studies were conducted in both the United States of America and Europe (Austria and Germany).
(Schaller et al., 2016; Schaller et al., 2019), two studies were conducted in Korea (Ko et al., 2015; Lee et al., 2015) and one study was conducted in Australia (Sosnowski et al., 2018).

Figure 1. The integrative review flow diagram.

All studies met more than half of the criteria of their respective quality of appraisal tools (Supplementary material file 2). For quality improvement studies, the quality score ranged from 11 to 14 out of a potential 16. Over half of these quality improvement studies failed to report on the information about an extended intervention period (sustainability) and a replication of the intervention in other settings (spread) (Hempel et al., 2015). Five were completed prior to the current reporting criteria and did not report adherence/fidelity, organisational readiness, and penetration/reach (Clark et al., 2013; Drolet et al., 2013; Engel et al., 2013; Harris & Shahid, 2014; Mah et al., 2013). Five cohort studies (Boehm, 2017; Chiarici et al., 2019; Hsieh et al., 2019; Negro et al., 2018; Young et al., 2019) and six retrospective studies (Bounds et al., 2016; Ko et al., 2015; Linke et al., 2020; McGarrigle & Caunt, 2016; Weeks et al., 2017; Witcher et al., 2015) did not comment on strategies to manage confounding factors. In addition, all three randomised controlled trials studies were limited owing to a lack
of blinding to treatment allocation which may introduce bias in reporting the result of treatment effects (Schaller et al., 2016; Schaller et al., 2019; Sosnowski et al., 2018). It is acknowledged that blinding is problematic with an intervention such as early mobilisation.

3.2 Team compositions and discipline roles and responsibilities

Team compositions and disciplinary roles and responsibilities varied across the 37 studies and depended on available staff in the local settings (Table 1). The number of healthcare providers included in teams was not reported in most studies, although for six studies at least three healthcare providers were noted (Harris & Shahid, 2014; Hester et al., 2017; Hickmann et al., 2016; McWilliams et al., 2019; Negro et al., 2018; Witcher et al., 2015). Healthcare providers most commonly included in the team included nurses (n=36, 97.3%), physiotherapists (n=32, 86.5%), physicians (n=28, 75.7%), respiratory therapists (n=18, 48.6%), occupational therapists (n=13, 35.1%), pharmacists (n=8, 21.6%), technicians (n=3, 8.3%), nursing assistants (n=3, 8.3%), and advance practice providers (n=3, 8.3%).

In terms of disciplinary roles and responsibilities, they broadly consisted of assessing patients’ readiness for mobilisation, discussion amongst team members barriers to mobilisation, early mobilisation plans and goals, and recording mobility levels and adverse events. Seven studies identified a team leader to initiate early mobilisation. Nurses were identified as the team leader of early mobilisation in six studies (Hester et al., 2017; Klein et al., 2015; Moyer et al., 2017; Negro et al., 2018; Smith & Grami, 2016; Young et al., 2019); one study identified the physiotherapist as the team leader (Harris & Shahid, 2014). The diversity of staffing models influenced team composition and disciplinary roles and responsibilities. For example, a respiratory therapist was responsible for facilitating the delivery of oxygenation support during mobilisation in three included studies (Engel et al., 2013; Ko et al., 2015; Weeks et al., 2017).
### Table 1

**Team compositions and disciplinary roles and responsibilities described in the interprofessional team approach to early mobilisation**

<table>
<thead>
<tr>
<th>Team composition</th>
<th>Number of studies</th>
<th>An early mobilisation leader</th>
<th>Assess patient’s readiness &amp; physical status</th>
<th>Discuss barriers &amp; provide feedback during team meeting</th>
<th>Provide education to staff</th>
<th>Consult physiotherapist</th>
<th>Design &amp; update plan &amp; goals with team</th>
<th>Prepare patients &amp; support team for early mobilisation</th>
<th>Team collaboration to provide early mobilisation</th>
<th>Record mobility levels &amp; adverse events</th>
<th>Provide early mobilisation education to family</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse</td>
<td>36 (97.3%)</td>
<td>6 (16.7%)</td>
<td>25 (69.4%)</td>
<td>13 (35.1%)</td>
<td>12 (33.3%)</td>
<td>6 (16.7%)</td>
<td>18 (50.0%)</td>
<td>4 (11.1%)</td>
<td>30 (83.3%)</td>
<td>18 (48.6%)</td>
<td>x</td>
</tr>
<tr>
<td>Physiotherapist</td>
<td>32 (86.5%)</td>
<td>1 (2.8%)</td>
<td>19 (52.8%)</td>
<td>19 (51.4%)</td>
<td>16 (44.4%)</td>
<td>3 (8.3%)</td>
<td>18 (50.0%)</td>
<td>4 (11.1%)</td>
<td>26 (72.2%)</td>
<td>11 (30.6%)</td>
<td>x</td>
</tr>
<tr>
<td>Physician</td>
<td>28 (75.7%)</td>
<td>x</td>
<td>14 (38.9%)</td>
<td>10 (27.8%)</td>
<td>7 (19.4%)</td>
<td>5 (13.9%)</td>
<td>12 (33.3%)</td>
<td>1 (2.8%)</td>
<td>4 (11.1%)</td>
<td>4 (11.1%)</td>
<td>x</td>
</tr>
<tr>
<td>Respiratory therapist</td>
<td>18 (48.6%)</td>
<td>x</td>
<td>9 (25.0%)</td>
<td>8 (21.6%)</td>
<td>5 (13.9%)</td>
<td>2 (5.6%)</td>
<td>9 (25.0%)</td>
<td>5 (13.9%)</td>
<td>9 (25.0%)</td>
<td>1 (2.8%)</td>
<td>x</td>
</tr>
<tr>
<td>Occupational therapist</td>
<td>13 (35.1%)</td>
<td>x</td>
<td>5 (13.9%)</td>
<td>6 (16.2%)</td>
<td>3 (8.3%)</td>
<td>x</td>
<td>6 (16.7%)</td>
<td>3 (8.3%)</td>
<td>10 (27.8%)</td>
<td>4 (11.1%)</td>
<td>1 (2.8%)</td>
</tr>
<tr>
<td>Pharmacist</td>
<td>8 (21.6%)</td>
<td>x</td>
<td>2 (5.6%)</td>
<td>2 (5.6%)</td>
<td>1 (2.8%)</td>
<td>x</td>
<td>1 (2.8%)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Nursing assistant</td>
<td>3 (8.3%)</td>
<td>x</td>
<td>1 (2.8%)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>2 (5.6%)</td>
<td>3 (8.3%)</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Advanced practice providers</td>
<td>3 (8.3%)</td>
<td>x</td>
<td>2 (5.6%)</td>
<td>x</td>
<td>1 (2.8%)</td>
<td>3 (8.3%)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Technicians</td>
<td>3 (8.3%)</td>
<td>x</td>
<td>2 (5.6%)</td>
<td>x</td>
<td>1 (2.8%)</td>
<td>3 (8.3%)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Other professions</td>
<td>6 (16.7%)</td>
<td>x</td>
<td>2 (5.6%)</td>
<td>6 (16.7%)</td>
<td>5 (13.9%)</td>
<td>1 (2.8%)</td>
<td>5 (13.9%)</td>
<td>x</td>
<td>1 (2.8%)</td>
<td>1 (2.8%)</td>
<td>x</td>
</tr>
</tbody>
</table>
3.3 The implementation strategies

Ten strategies to implement early mobilisation were identified (Table 2). Multiple strategies were commonly used, and their incorporation varied across the study settings. There were three strategies that were commonly enacted in more than half of the studies. These three strategies included: (1) using instruction tools including, protocols, mobilisation programs, bundles, or algorithms, (2) a team meeting or team round to share knowledge, provide staff education and staff feedback, develop the plan and goals, and review the progress, and (3) using a safety criteria to identify patient readiness.

All 37 studies reported that an interprofessional team collaboratively worked to encourage patients to perform physical exercises by using programs (n=20), protocols (n=10), bundles (n=5) or algorithms (n=2). The physical exercise procedures mostly consisted of range of motion exercises (n=27), sitting on the edge of the bed (n=32), sitting out of bed (n=32), standing (n=32) and walking (n=35). Before promoting early mobilisation, 33 studies reported using team discussions to assess patients’ readiness and physical status against safety criteria at a daily morning team round.
Table 2

Implementation strategies enacted in an interprofessional team approach to early mobilisation.

<p>| Type of studies (N = 37) | Author (Year) | Use protocols/bundles/algorithms/program to help healthcare provider team for promoting early mobilisation | Use a team meeting or team round to share knowledge, provide education, develop plans and goals, provide staff feedback or suggestions, and review the implemented progress | Use a safety checklist to assess patient readiness and discuss this information with the team at a daily morning team round | Promote patient readiness by using clinical interventions, including sedation interruption, weaning a patient off a respirator, delirium prevention, and pain management | Make staff feel safe to promote early mobilisation by having the process to monitor vital signs and collaborate with healthcare provider team for preventing adverse events during early mobilisation | Support team communication by developing a mobilisation diary or documentati on tools to record the progress for monitoring the implementation of early mobilisation | Update and create an order-set to ensure timely consultation with physiotherapists or occupational therapists | Discuss with team to update the progress of early mobilisation and adapt strategies until the goals are achieved | Identify disciplines’ roles and responsibilities to promote early mobilisation | Address resource limitations which restrict implementat ion of early mobilisation |
|-------------------------|---------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Quality improvement studies (n=16) | Booth et al. (2016) | ✔️ | ✔️ | ✔️ | x | x | x | x | x | x | x | x |
| | Castro et al. (2015) | ✔️ | ✔️ | ✔️ | x | x | ✔️ | x | x | x | x | x |
| | Corcoran et al. (2017) | ✔️ | ✔️ | ✔️ | x | x | ✔️ | x | x | x | x | x |
| | Clark et al. (2013) | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | x | x | ✔️ | x | x |
| | Drolet et al. (2013) | ✔️ | ✔️ | ✔️ | x | x | x | x | x | ✔️ | x | x |
| | Engel et al. (2013) | ✔️ | ✔️ | ✔️ | ✔️ | x | x | x | x | x | ✔️ | x |
| | Falkenstein et al. (2020) | ✔️ | ✔️ | ✔️ | x | x | ✔️ | x | x | x | ✔️ | x |
| | Harris and Shahid (2014) | ✔️ | ✔️ | ✔️ | x | x | ✔️ | x | x | x | ✔️ | x |
| | Hopkins et al. (2016) | ✔️ | ✔️ | ✔️ | ✔️ | x | x | x | x | x | x | ✔️ |
| | Hunter et al. (2017) | ✔️ | ✔️ | ✔️ | ✔️ | x | ✔️ | x | x | x | x | ✔️ |
| | Mah et al. (2013) | ✔️ | ✔️ | ✔️ | ✔️ | x | ✔️ | x | x | x | x | x |
| | Mayer et al. (2020) | ✔️ | ✔️ | ✔️ | ✔️ | x | ✔️ | x | x | x | x | x |</p>
<table>
<thead>
<tr>
<th>Author (Year)</th>
<th>Use protocols/bundles/algorithms/program to help healthcare provider team for promoting early mobilisation</th>
<th>Use a team meeting or team round to share knowledge, provide education, develop plans and goals, provide staff feedback or suggestions, and review the implemented progress</th>
<th>Use a safety checklist to assess patient readiness and discuss this information with the team at a daily morning team round</th>
<th>Implement strategies</th>
<th>Support team communication by developing a mobilisation diary or documentation tools to record the progress for monitoring the implementation of early mobilisation</th>
<th>Update and create an order-set to ensure timely consultation with physiotherapists or occupational therapists</th>
<th>Discuss with team to update the progress of early mobilisation and adapt strategies until the goals are achieved</th>
<th>Identify disciplines’ roles and responsibilities to promote early mobilisation</th>
<th>Address resource limitations which restrict implementation of early mobilisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>McWilliams et al. (2015)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>✓</td>
<td>x</td>
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<td>McWilliams et al. (2019)</td>
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<td>✓</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Ragland et al. (2019)</td>
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<td>✓</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>✓</td>
<td>x</td>
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<td>Sigler et al. (2016)</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
<td>x</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Boehm et al. (2017)</td>
<td>✓</td>
<td>x</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
<td>✓</td>
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<td>Implementation strategies</td>
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<td>Use protocols/bundles/algorithms/program to help healthcare provider team for promoting early mobilisation</td>
<td>Use a team meeting or team round to share knowledge, provide education, develop plans and goals, provide staff feedback or suggestions, and review the implemented progress</td>
<td>Use a safety checklist to assess patient readiness and discuss this information with the team at a daily morning team round</td>
<td>Promote patient readiness by using clinical interventions, including sedation interruption, weaning a patient off a respirator, delirium prevention, and pain management</td>
<td>Make staff feel safe to promote early mobilisation by having the process to monitor vital signs and collaborate with healthcare provider team for preventing adverse events during early mobilisation</td>
<td>Support team communication by developing a mobilisation diary or documentation tools to record the progress for monitoring the implementation of early mobilisation</td>
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<td></td>
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<td>Total (n, %) (N=37)</td>
<td>37 (100.0%)</td>
<td>36 (97.3%)</td>
<td>33 (89.2%)</td>
<td>17 (45.9%)</td>
<td>12 (32.4%)</td>
<td>10 (27.8%)</td>
<td>7 (19.4%)</td>
<td>5 (13.9%)</td>
<td>4 (11.1%)</td>
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Thirty-six studies described how a team meeting or team round was designed to share knowledge, provide staff education, develop plans and goals, provide staff feedback, and review the progress of early mobilisation. In terms of staff education, the focus centred on the benefits of promoting early mobilisation on improving patient outcomes, enhancing patient readiness, using specialised equipment and how to use the instruction tools, including protocols, bundles or programs (Bounds et al., 2016; Clark et al., 2013; Corcoran et al., 2017; Engel et al., 2013; McGarrigle & Caunt, 2016; McWilliams et al., 2019; Sigler et al., 2016).

Staff education occurred via a variety of different modes, consisting of online education (Castro et al., 2015), staff meetings (Falkenstein et al., 2020) or workshops (Negro et al., 2018). Knowledge and practical skills were also shared among the team through daily team rounds at the patients’ bedside (Hester et al., 2017; McWilliams et al., 2015).

Daily team rounds were also used to allow healthcare providers to share ideas for developing the individual patient’s plan and goal of early mobilisation. In this stage, the interprofessional team discussed ideas to make a decision to select the physical exercise procedures for the individual patient based on the patient’s readiness (Chiarici et al., 2019; Clark et al., 2013) and level of consciousness (Castro et al., 2015; Clark et al., 2013; Engel et al., 2013; Falkenstein et al., 2020; Hickmann et al., 2016; Mah et al., 2013; McWilliams et al., 2015). The team also discussed resource allocation to promote patient safety during mobilisation (Engel et al., 2013; Hunter et al., 2017; Mayer et al., 2020; Young et al., 2019).

Additionally, team meetings or team rounds were used to provide staff feedback and review the implemented progress for improving staff skills and collaboration processes for using an interprofessional team approach to early mobilisation. In this stage, healthcare providers would give feedback or suggestions to each other after implementing an interprofessional team approach to early mobilisation through daily or weekly team rounds or team meetings (Booth et al., 2016; Drolet et al., 2013; Falkenstein et al., 2020; Hester et al., 2016).
Barriers and the implemented progress were also reviewed and discussed at interprofessional team rounds, weekly team meetings or a monthly team meeting (Engel et al., 2013; McWilliams et al., 2015; Moyer et al., 2017; Schaller et al., 2016). The information of implemented progress and staff feedback focused on staffing issues or challenges (Castro et al., 2015; McGarrigle & Caunt, 2016).

Preparing patients in readiness for early mobilisation by using clinical interventions was reported in 17 studies. Most of these interventions involved team collaborations to consider reducing sedation or analgesia drugs (Boehm et al., 2017; Bounds et al., 2016; Clark et al., 2013; Drolet et al., 2013; Engel et al., 2013; Harris & Shahid, 2014; Hickmann et al., 2016; Hsieh et al., 2019; Hunter et al., 2017; Ko et al., 2015; Sigler et al., 2016; Smith & Grami, 2016; Sosnowski et al., 2018; Witcher et al., 2015). Others included discussions around weaning a patient off a respirator (Boehm et al., 2017; Bounds et al., 2016; Castro et al., 2015; Clark et al., 2013; Drolet et al., 2013; Sosnowski et al., 2018), delirium prevention (Engel et al., 2013; Weeks et al., 2017), and pain management (Boehm et al., 2017; Bounds et al., 2016; Harris & Shahid, 2014; Ko et al., 2015; Sigler et al., 2016; Sosnowski et al., 2018).

3.4 Barriers and enablers to an interprofessional team approach to early mobilisation

Organisational structure, staff attitudes, and staff abilities were identified as barriers and enablers to the implementation of an interprofessional team approach to early mobilisation. Organisational structure barriers included unavailable staff (n=13), limited resources or equipment (n=7), ICU practice norms (n=5), and a lack of early mobilisation orders (n=3).

Importantly, the implementation of an interprofessional team approach to early mobilisation was less successful when clear disciplines roles and responsibilities and team leaders were not identified (Hopkins et al., 2016; Ragland et al., 2019). An interprofessional team approach to early mobilisation was also influenced by low levels of staff knowledge and practical skill
negative staff attitudes, including challenges with implementation and staff workload (n=8), and poor communication among the interprofessional team (n=2) (Hunter et al., 2017; Ragland et al., 2019).

4. Discussion

This integrative review of 37 studies were systematically appraised, synthesised, and critically analysed to identify team compositions, disciplinary roles and responsibilities, implementation strategies and factors for the support of successful implementation of an interprofessional team approach to early mobilisation in critically ill adult patients. The majority of studies reviewed were assessed as being at the lower level of evidence with only three of the 37 studies being randomised controlled trials (one was a feasibility study), consequently the strength of evidence is limited. Despite an interprofessional team approach to early mobilisation being used to improve patients’ physical functions, many studies failed to control for confounding factors. Also, there was a limitation in regard to the interventions sustainability and spread (Hempel et al., 2015; JBI, 2017). However, all included studies were methodologically appropriate to answer the research questions and mostly met the relevant criteria of quality appraisal tools (Hempel et al., 2015; JBI, 2017). All included studies also comprehensively described the interventions following the Template for Intervention Description and Replication (TIDieR) checklist, consisting of the reasons for promoting early mobilisation, materials, early mobilisation procedures, healthcare provider team, frequency and duration of early mobilisation, settings, and implementation strategies (Supplementary material file 3) (The EQUATOR Network, 2021). However, it was found that all included studies have limited information in the intervention description of tailoring and modifications with only nine studies of 37 studies that described intervention fidelity (Boehm et al., 2017; Booth et al., 2016; Chiarici et al., 2019; Hunter et al., 2017; Mayer et al., 2020; Negro et al., 2018; Ragland et al., 2019; Smith & Grami, 2016; Sosnowski et al., 2018). Consequently,
further research is needed to develop a more robust body of literature to extend what is known about an interprofessional team approach to early mobilisation in critically ill adult patients.

Although organisational structure, staff attitude and staff abilities were reported as key factors for an interprofessional team approach to early mobilisation, negative staff attitude and limited staff abilities were the most important factors cited as influencing the failure of this approach in this review. Boehm et al. (2017) further elaborated that implementing an interprofessional team approach to early mobilisation was unsuccessful when staff perceived that the promotion of early mobilisation was difficult, and that it increased staff workload. Negative staff attitude and a low level of staff knowledge and skills were noted to be significant barriers which can negatively impact implementation of interprofessional team collaboration in a range of healthcare settings (Anekwe et al., 2019). Also, low levels of staff knowledge and skills might result in poor communication among an interprofessional team to provide care to patients (Dubb et al., 2016; Gordon et al., 2014). Consequently, the range of factors which might influence implementation of an interprofessional team approach to early mobilisation are likely contextually specific, meaning that local barriers and facilitators should be identified before its introduction. The identification of local barriers and facilitators will also assist to inform the selection of strategies to support the development and implementation of an interprofessional team approach to early mobilisation in the specific critical care areas (Chohan et al., 2018; Czaplijski et al., 2014; Hickmann et al., 2016; Hopkins et al., 2016; Linke et al., 2020; Parry et al., 2018).

For all of the studies, multiple strategies (three or more) were used and these varied across studies and were associated with improvement in outcomes such as reduced time to early mobilisation, pressure injury, length of ventilation, and length of ICU and hospital stay. While a number of strategies might be required to address identified barriers and facilitators, it was difficult to know which was most effective. In a systematic review of 47 studies examining the
implementation of care bundles in ICU settings, it was similarly not possible to determine which strategies were most effective in helping the team to improve the quality of care (Borgert et al., 2015). Which strategies were most effective would have been influenced by the specific issues in the setting in which the work was undertaken (Borgert et al., 2015). Nevertheless, between one and seven strategies were used to support healthcare providers for successful implementation of the care bundles (Borgert et al., 2015). Providing education, reminders, and audit and feedback were noted as frequently used strategies to support an interprofessional team to provide the care bundles of central line, ventilator, and sepsis (Borgert et al., 2015). In addition, multiple strategies were also used to achieve a successful implementation of an interprofessional team approach to the care bundles of assessment, prevention and pain management, both spontaneous awakening and spontaneous breathing trials, choice of analgesia and sedation, assessment, prevention and delirium management, early mobility and exercise, and family engagement (ABCDEF) (Barnes-Daly et al., 2018). Barnes-Daly et al. (2018) further elaborated that using team meetings was an important strategy because it assisted healthcare providers to share information for team coaching, understanding specific barriers, finding the solutions, and developing patients’ plans to improve the collaboration practices.

Consequently, using multiple strategies appears to be beneficial to support the collaboration processes for implementing an interprofessional team approach to early mobilisation in the areas of critical care.

Providing staff education and sharing knowledge through team meetings or team rounds were noted as frequently used strategies to support an interprofessional team approach to early mobilisation in this integrative review. Similarly, providing education was frequently used to support interprofessional team collaboration for the aforementioned care bundles (Borgert et al., 2015). Multimodal education was provided to staff for a successful implementation of the ABCDEF bundle care because this strategy assisted healthcare providers
to understand the important components and how to collaboratively work with other disciplines
for providing the ABCDEF bundle care (Barnes-Daly et al., 2018). The multimodal education
on the ABCDEF bundle care was provided through conferences, lectures, workshops, or staff
meetings (Barnes-Daly et al., 2018). Importantly, providing staff education was reported as an
important strategy to provide an opportunity to positively change staff behaviour and practice
norms for the improvement of the quality of critical care by using the interprofessional team
collaboration (Barnes-Daly et al., 2018; Castro et al., 2015; Linke et al., 2020). Consequently,
providing education or sharing knowledge among the team could be a facilitator to improve
staff capacity for changing staff behaviour towards an interprofessional team approach to
deliver clinical interventions for promoting early mobilisation in the areas of critical care
(Barnes-Daly et al., 2018; Castro et al., 2015; Linke et al., 2020).

Clinical interventions, consisting of a reduction of sedation or analgesia drugs, weaning
a patient off a respirator, delirium prevention, and pain management, were used to help an
interprofessional team improve the patient’s capacity to undertake early mobilisation in 17
included studies of this integrative review. Because of the difference in patient conditions,
Parry et al. (2018) suggested that a combination of clinical interventions is more useful than
a single intervention to enhance patient’s readiness to undertake early mobilisation. Importantly, an integration of delirium management, weaning a patient off a respirator, and
promoting early mobilisation within the ABCDEF bundle was reported to significantly
increase delirium-free and coma-free days for recovering physical functions in critically ill
patients (Barnes-Daly et al., 2017). Consequently, a combination of targeted interventions may
help healthcare providers to collaboratively work to prepare patients’ readiness for promoting
early mobilisation in the areas of critical care.

The identification of team compositions and discipline roles and responsibilities was
acknowledged as an important aspect that facilitated the team functioning to provide clinical
interventions for promoting early mobilisation (Bakhru et al., 2016; Bronstein, 2003; Dean & Ballinger, 2012; Parry et al., 2017). In this integrative review, team composition and discipline roles and responsibilities were identified to be dependent on the available staff and practice norm in the individual setting. Identified team composition and a dedicated team leader are imperative within each setting as they assume responsibility to promote staff behaviour to improve the practice of the early mobilisation (Bakhru et al., 2016; Barnes-Daly et al., 2017; Donovan et al., 2018; Linke et al., 2020). Expertise regarding specific procedures or interventions has been highlighted by Rosen et al., (2018) as important, through drawing on the expertise of pharmacists, physiotherapists, or occupational therapists. For example, a pharmacist can be integral in supporting the implementation of early mobilisation through their role in monitoring and adjusting the administration of sedative and analgesic drugs and optimising the patient’s ability to participate in early mobilisation activities (Bounds, 2016; Drolet et al., 2013; Witcher et al., 2015). Therefore, the identification of team compositions and disciplinary roles and responsibilities would depend on available staff or specialists who can be dedicated to support the promotion of early mobilisation in their local settings.

Nurses working at the bedside are responsible for care coordination and work collaboratively with other healthcare professionals in delivering optimal care in critically ill adult patients (Bakhru et al., 2016; Boltey et al., 2019; Costa et al., 2018). In the studies included in this review, nurses had significant involvement in the interprofessional team approach to early mobilisation in 36 included studies. In another study, Costa et al. (2018) found that approximately 60% to 80% of nurses collaborated with healthcare team in delirium assessment, early mobilisation, and weaning a patient off a respirator when implementing the care bundles of the awakening and breathing coordination of daily sedation and ventilator removal trials, delirium monitoring and management, and early mobility and exercise (ABCDE). Also, the involvement of nurses in the team could assist the healthcare team to
increase the practice of early mobilisation and ABCDE bundle because they can play a key role
to help the team promote the practice (Bakhru et al., 2016; Costa et al., 2018).

**Limitation and recommendation**

Although this integrative review provides information on the implementation of an
interprofessional team approach to early mobilisation, there are several limitations. First, there
was potential that some studies might have been overlooked despite using a comprehensive set
of keywords and MeSH terms and receiving assistance from specialised librarians. Second, the
full text of five studies could not be retrieved. Third, this study may have a language bias
because only English language searches were performed. Consequently, it is possible that there
is additional literature not included which may have been relevant to this review. Fourth, all
studies were quantitative studies; therefore, it might have limited information available to
promote an understanding of the most effective strategies, team compositions, roles and
responsibilities for implementing an interprofessional team approach to early mobilisation
across areas of critical care settings. Finally, although the interventions were comprehensively
described, some lacked information related to intervention fidelity, spread, and sustainability
(Hempel et al., 2015; JBI, 2017). Consequently, it might need further research to understand
intervention fidelity and support the sustainable implementation of an interprofessional team
approach to early mobilisation in adult critically ill patients across ICU and other areas of
critical care settings.

**6. Conclusions**

Early mobilisation is beneficial to minimise patient complications and promote the
recovery of physical function for critically ill adult patients. An interprofessional team
approach may be an important way to promote early mobilisation practice. However, this
approach is not commonly practised because of a range of context-specific issues which may
be unique to individual settings. Accordingly, these factors should be systematically identified
to ensure appropriate strategies are implemented to support collaboration and implementation of an interprofessional team approach to early mobilisation. Identifying team compositions and discipline roles and responsibilities, together with using multiple strategies and clinical interventions may facilitate healthcare providers to effectively and sustainably implement an interprofessional team approach to early mobilisation in critically ill adult patients across ICU or critical care settings.

7. Conflict of interests

No conflict of interests declared.

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9. References


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