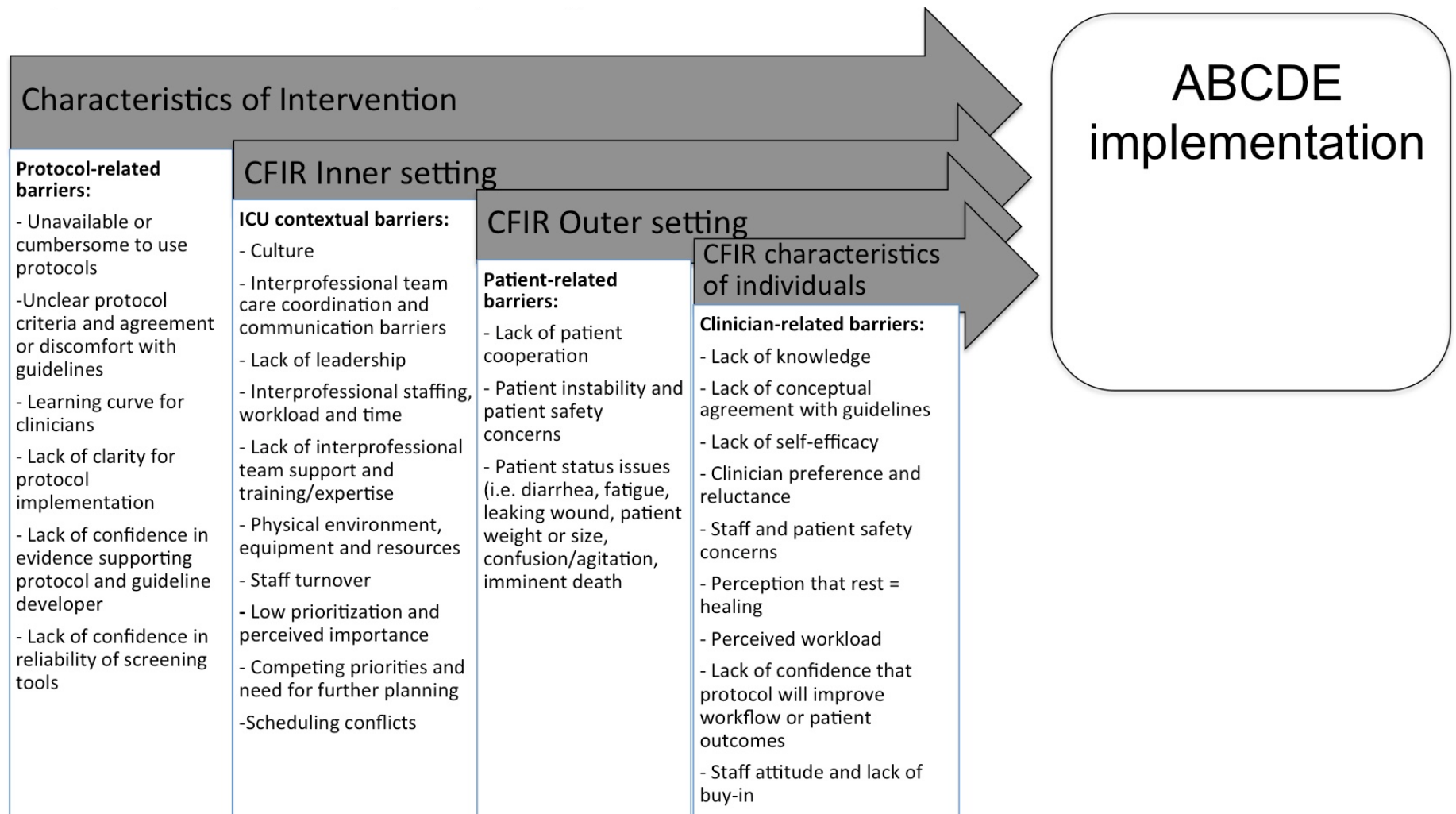


e-Appendix 1.**PubMed Search strategy keywords:**

("Intensive Care Units"[Mesh] OR "Intensive Care"[Mesh] OR ICU[tiab] OR ICUs[tiab] OR "intensive care"[tiab] OR "critical care"[tiab] OR "Critical Illness/rehabilitation"[MeSH] OR "Critical Illness/therapy"[MeSH]) AND (ABCDE[tiab] OR spontaneous awakening[tiab] OR ((awake*[tiab] OR wake*[tiab]) AND breath*[tiab]) OR breathing trials[tiab] OR breathing trial[tiab] OR awakening trial[tiab] OR awakening trials[tiab] OR spontaneous breathing[tiab] OR (sedation[tiab] AND (interruption[tiab] OR vacation[tiab]))) OR "Delirium"[Mesh] OR deliri*[tiab] OR "Early Ambulation"[Mesh] OR (early[tiab] AND (ambulation[tiab] OR mobilisation[tiab] OR mobility[tiab] OR mobilization[tiab] OR mobilizations[tiab] OR mobilized[tiab]))) OR exercise[tiab] OR exercises[tiab]) AND (barriers[tiab] OR barrier[tiab] OR issues[tiab] OR issue[tiab] OR problems[tiab] OR problem[tiab] OR hinder[tiab] OR hindered[tiab] OR hinders[tiab] OR perceptions[tiab] OR perception[tiab] OR behaviors[tiab] OR behavior[tiab] OR attitudes[tiab] OR attitude[tiab] OR facilitate[tiab] OR facilitates[tiab] OR facilitated[tiab] OR facilitator[tiab] OR facilitators[tiab] OR ease[tiab] OR easy[tiab] OR easier[tiab] OR difficult[tiab] OR difficulty[tiab] OR challenge[tiab] OR challenges[tiab] OR challenging[tiab]).

e-Figure 1. Barriers to ABCDE implementation categorized by the Consolidated Framework for Implementation Research (CFIR) as a guide.



e-Table 1. Included articles in this review		
AWAKENING, BREATHING COORDINATION, DELIRIUM AND EARLY MOBILITY (ABCDE) n=4		
<i>Study Design</i>	<i>Title</i>	<i>Author</i>
Qualitative	Rethinking critical care: decreasing sedation, increasing delirium monitoring and increasing patient mobility	Bassett et al., (2015)
Quantitative	Clinical nurse specialist as change agent	Reimers et al. (2014)
Mixed methods	Implementing the awakening and breathing coordination, delirium monitoring/management and early mobility bundle	Balas et al., (2013)
Mixed methods	Contextual issues influencing implementation and outcomes associated with an integrated approach to managing pain, agitation, and delirium	Carrothers et al. (2013)
AWAKENING (A) & DELIRIUM (D) n=1		
Mixed methods	A pilot study to test the feasibility of a nonpharmacologic intervention for the prevention of delirium in the medical intensive care unit	Foster et al. (2013)
AWAKENING (A) and EARLY MOBILITY (E) n=1		
Quantitative	Feasibility of physical and occupational therapy beginning from initiation of mechanical ventilation	Pohlman et al. (2010)
AWAKENING (A) n=11		
Qualitative	A brief report of student research: protocol versus nursing practice – sedation vacation in a surgical intensive care unit	Joseph-Belfort (2009)
Qualitative	Implementation challenges in the intensive care unit: The why, who and how of daily interruption of sedation	Miller et al., (2012a)
Qualitative	What stops us from following sedation recommendations in intensive care units? A multicentric qualitative study	Sneyers et al. (2014a)
Quantitative	Implementation of a nurse-driven sedation protocol in the ICU	Beck et al. (2008)
Quantitative	Perceived versus actual sedation practices in adult intensive care unit patients receiving mechanical ventilation	Gill et al. (2012)
Quantitative	Organisational characteristics associated with the use of daily interruption of sedation in US hospitals: a national study	Miller et al., (2012b)
Quantitative	Diverse attitudes to and understandings of spontaneous awakening trials: results from a statewide quality improvement collaborative	Miller et al., (2013)

Quantitative	Current practices and barriers to impairing physicians' and nurses' adherence to analgo-sedation recommendations in the intensive care unit - a national survey	Sneyers et al. (2014b)
Quantitative	Perceived barriers to the use of sedation protocols and daily sedation interruption: a multidisciplinary survey	Tanios et al. (2009)
Mixed methods	Sedation management in Australian and New Zealand intensive care units: doctors' and nurses' practices and opinions	O'Connor et al. (2010)
Mixed methods	Predictors for daily interruption of sedation therapy by nurses: A prospective, multicenter study	Roberts et al. (2010)
DELIRIUM (D) n=10		
Qualitative	The experience of delirium care and clinical feasibility of the CAM-ICU in a Korean ICU	Jung et al. (2013)
Qualitative	Delirium assessment in intensive care units: practices and perceptions of Turkish nurses	Ozsaban et al. (2015)
Quantitative	Assessment of Delirium in the Intensive Care Unit: Nursing Practices and Perceptions	Devlin et al. (2008)
Quantitative	A questionnaire survey of critical care nurses' attitudes to delirium assessment before and after introduction of the CAM-ICU	Eastwood et al. (2012)
Quantitative	A survey of nurses' perceptions of the intensive care delirium screening checklist	Law et al. (2012)
Quantitative	Implementation of a validated delirium assessment tool in critically ill adults	Scott et al. (2013)
Quantitative	Attitudes, knowledge and practice concerning delirium: A survey among intensive care unit professionals	Trogrlic' et al. (2016)
Mixed methods	Nursing identification of delirium	Flagg et al. (2010)
Mixed methods	Limitations and practicalities of CAM-ICU implementation, a delirium scoring system, in a Dutch intensive care unit	Riekerk et al. (2009)
Mixed methods	Implementation of a delirium assessment tool in the ICU can influence haloperidol use	van den Boogaard et al. (2009)
EARLY MOBILITY (E) n=22		
Qualitative	Barriers and facilitators to early mobilization in intensive care: A qualitative study	Barber et al., (2014)
Qualitative	Integrating a multidisciplinary mobility programme into intensive care practice	Bassett et al. (2012)



Qualitative	Rehabilitation quality improvement in an intensive care unit setting: implementation of a quality improvement mode	Needham et al. (2010)
Qualitative	Staff perceived barriers and facilitators	Winkelman et al.
Qualitative	Rehabilitation therapy and outcomes in acute respiratory failure: an observational pilot project	Zanni et al. (2010)
Quantitative	An environmental scan for early mobilization practices in U.S. ICUs	Bakhru et al. (2015)
Quantitative	ICU structure variation and implications for early mobilization practices: An international survey	Bakhru et al. (2016)
Quantitative	Safety and feasibility of an exercise approach to rehabilitation across the continuum of care for survivors of critical illness	Berney et al. (2012)
Quantitative	Early mobilization in critically ill patients: patients' mobilization level depends on health care provider's profession	Garzon-Serrano et al. (2011)
Quantitative	Medical intensive care unit clinician attitudes and perceived barriers towards early mobilization of critically ill patients: a cross-sectional survey	Jolley et al. (2014)
Quantitative	What are the barriers to mobilizing intensive care patients?	Leditschke et al.,
Quantitative	Physical therapist practice in the intensive care unit: Results of a national survey	Malone et al. (2015)
Quantitative	Factors associated with timing of initiation of physical therapy in patients with acute lung injury	Mendez-Tellez et al., (2013)
Quantitative	Early mobilization of mechanically ventilated patients: a 1-day point-prevalence study in Germany	Nydahl et al. (2014)
Mixed methods	Rehabilitation within Scottish intensive care units: A national survey	Appleton et al., (2011)
Mixed methods	Early mobilization: Changing the mindset	Castro et al. (2015)
Mixed methods	Overcoming barriers to the mobilisation of patients in an intensive care unit	Dafoe et al. (2015)
Mixed methods	ICU early mobilization: from recommendation to implementation at three medical centers	Engel et al. (2013)
Mixed methods	Physical therapy-driven quality improvement to promote early mobility in the intensive care unit	Harris et al. (2014)
Mixed methods	Early mobilisation in intensive care units in Australia and Scotland: A prospective, observational cohort study examining mobilisation practices and barriers	Harrold et al. (2015)
Mixed methods	Mobilization of ventilated patients in the intensive care unit: An elicitation study using the theory of planned behavior	Holdsworth et al. (2015)
Mixed methods	Benchmarking rehabilitation practice in the intensive care unit	Knott et al. (2015)

e-Table 2. Identified barriers from the literature (n=107)

Belief that performing SATs is hard work	Interprofessional communication	Lack of staffing, equipment and resources
Care coordination challenges	Lack of acceptance of bundle	Lack of support from interprofessional team
Clarification of protocol criteria	Lack of applicability to practice population	Lack of support from leadership and physicians
Clinician preference for care	Lack of awareness (Inability to correctly acknowledge guidelines existence)	Logistics (middle managers, leaders and local referents, IT, checklists, reminders, educational materials)
Clinician preference for more autonomy than protocol offers	Lack of clinician acceptance to protocol	Method ambiguity (lack of clarity on how to complete steps)
Clinician staffing & workload	Lack of conceptual agreement with guidelines	No shared understanding about why DIS should be done or who should be excluded from DIS
Communication	Lack of confidence in ability to complete protocol or ability to use protocol	Organizational characteristics (culture, teamwork, communication)
Compatibility of guideline characteristics (consistency of guideline with clinician values, norms, needs)	Lack of confidence that executive recommendation will succeed in improving nursing workflow or working preferences	Organizational constraints
Cost	Lack of confidence that executing recommendation will achieve beneficial patient outcomes	Patient cooperation or patient refusal
Culture	Lack of consensus on goals of DIS	Patient/family consent process
Difficult to use protocols	Lack of effective project leadership	Perceived pain and discomfort
Documentation deficiencies	Lack of equipment and resources	Perceived reluctance to follow protocols
Exception ambiguity (lack of clarity on when executing has no advantage or is contraindicated)	Lack of familiarity (inability to correctly answer questions about guidelines content)	Perception that protocol offered no benefit to patients
Expectation ambiguity (lack of clarity on expected standards or norms regarding compliance)	Lack of feedback on performance	Physical environment
Expectation of nurse	Lack of knowledge about protocol, contraindications	Physiological patient issues (deep sedation, agitated, contraindications for bundle)
Fear of compromised patient safety	Lack of knowledge re: goals of DIS	Poor outcomes expectancy



Fear of oversimplification & limitation of clinical judgment	Lack of knowledge related to training, purpose of bundle and its impact	Poor strength of evidence & poor confidence in guideline developer
Feeling it is unethical not to sedate ICU patients; perceived harm	Lack of leadership	Previous execution associated with negative outcomes
Inconsistent support and orders from physicians	Lack of leadership driving safety culture	Protocol cumbersome to use or difficult to use
Inertia/lack of motivation to change practice	Lack of management support for infrastructure needed	Protocol development is lengthy
Insufficient funding and equipment	Lack of patient cooperation	Protocol not appropriate for select patients
Insufficient knowledge	Lack of physician referrals	Protocols not accessible
Interprofessional care coordination barriers	Lack of self-efficacy	Reduced autonomy and/or self-respect
Resistance to change	Responsibility ambiguity (lack of clarity as to who is responsible)	Sleep promotion
Task ambiguity (lack of info about what tasks have been completed vs. incomplete)	Task characteristics	Staff safety concerns
Time constraints	Tool not available	Treatment related adverse events
Trialability – possibility for clinician to test guideline with relative ease	Unavailability of interprofessional staff	Unit culture
Work load	Perception that rest equals healing	Competing priorities
Lack of buy-in	Patient weight or size	Poor nurse-physician collaboration
Uncomfortable with guideline used	Need for further planning	Fear of patient off sedation
Thinking that perfect protocols needed to start	Challenge maintaining engagement of rounding physicians	Lack of prioritization of challenges to align necessary improvement resources
Staff turnover	Staff attitude	Safety of tubes, catheters, lines and wires
Imminent death	Lower prioritization, value and perceived importance	Patient issues (diarrhea, fatigue, leaking wound)
PT expertise/inadequate training	Confusion/agitation	Lack of consultation criteria
Belief that delirium is not preventable	Scheduling conflicts (patient off unit, dialysis, procedure, transfer to ward)	Lack of trust or confidence in reliability of screening tools
Low uniformity with guidelines	Low satisfaction with physician management	