Improving Clinical Practice in Intensive Care: Implementation of an evidence based protocol for bowel management

Submitted By

Serena Knowles
RN BN(Hons) (ACU) GradDipInfM (UTS) GradCertClinNsg (ACU)

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School of Nursing, Midwifery and Paramedicine
Faculty of Health Sciences

Australian Catholic University
Research Services
PO Box 968,
North Sydney, NSW 2059

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STATEMENT OF AUTHORSHIP

This thesis contains no material published elsewhere or extracted in whole or in part from a thesis by which I have qualified for or been awarded another degree or diploma.

No parts of this thesis have been submitted towards the award of any other degree or diploma in any other tertiary institution.

No other person's work has been used without due acknowledgment in the main text of the thesis.

All research procedures reported in the thesis received the approval of the relevant Ethics Committee.

The extent of collaboration in study one is detailed in the relevant chapter, and permission to present data in the thesis is presented in the Appendices.

The candidate received assistance with statistical analysis and interpretation in the form of guidance and advice. All statistical manipulation of the data was conducted by the candidate.

Name Serena Knowles

Signature _____

Date _____

STATEMENT OF DEDICATION

To my family and friends who have supported me along this journey.

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LIST OF ABBREVIATIONS

Abbreviation/acronym	Full name
Att	attitude
BI	behaviour intention
BMP	bowel management protocol
CNC	clinical nurse consultant
CNE	clinical nurse educator
EBP	evidence based practice
ETT	endotracheal tube
HDU	high dependency unit
ICCMU	Intensive Care Co-ordination and Monitoring Unit (NSW)
ICU	intensive care unit
JFICM	Joint Faculty of Intensive Care Medicine
LOS	length of stay
NSW	New South Wales
NUM	nurse unit manager
PBC	perceived behavioural control
PBCC	perceived behavioural control – controllability
PBCE	perceived behavioural control – self-efficacy
SN	subjective norm
TPB	theory of planned behaviour
TRA	theory of reasoned action
VAP	ventilator associated pneumonia

ABSTRACT

There are numerous practice areas within the intensive care environment that are important for ensuring quality of care and evidence based practice. Complications associated with poor bowel management for critically ill patients include, increased ventilation times and length of stay. Bowel management protocols can improve patient outcomes by prompting clinicians and standardising care. Evidence-based implementation strategies are more likely to increase the update of guidelines or protocols into practice than merely providing copies to clinicians. Theories can broaden the understandings of clinician behaviour change interventions. The theory of planned behaviour explains the influences of attitude and beliefs on behaviour intention.

The overall aim of the research reported in this thesis was to investigate the use of an evidence-based implementation strategy to effect clinician behaviour change and to improve a neglected area of clinical practice in the intensive care environment. The research comprised of two linked studies and three data collection phases. Study one used a telephone survey to describe the current guidelines and practices in Intensive Care Units (ICUs) within New South Wales (NSW) for eleven practice areas and aimed to identify an area of neglected practice for the focus of the remainder of the research. Results from study one found that the use of guidelines and informal routine procedures for the eleven practice areas within NSW ICUs was variable. Bowel management was identified by participants as a neglected area of practice within their units (n=28, 86%).

The aim of study two was to evaluate the effect of a targeted implementation strategy to introduce a bowel management protocol into intensive care on patient outcomes; clinician practices; clinician knowledge, attitudes, beliefs and behaviour intentions. Two data collection phases were employed in study two; a staff survey and a retrospective medical record audit.

The theory of planned behaviour informed the staff survey. Items to measure the TPB constructs were composed according to the manual on constructing questionnaires based on the TPB by Francis et al (Francis et al., 2004a). Validity of the theory of planned behaviour questionnaire items for use to evaluate the behaviour of interest, bowel management practices, was demonstrated.

Development of a bowel management protocol and targeted implementation strategy was informed by previous protocols and the relevant evidence based literature. The developed multifaceted implementation strategy included education sessions, a printed fact sheet and reminders.

Following implementation of the bowel management protocol, the staff survey in study two determined that nursing and medical staffs' knowledge regarding bowel management improved (overall mean knowledge scores pre-implementation = 17.64, post implementation = 19.25). However, this increase in knowledge did not translate into more positive attitudes or beliefs related to bowel management for intensive care patients. Clinicians' behaviour intentions toward three bowel management practices did not increase after the implementation strategy. There was no significant improvement in clinician practices or patient outcomes, namely the incidence of constipation and diarrhoea detected in the medical record audit following the implementation strategy did not decrease.

The overall research aims, questions and significance are presented in the first chapter and the relevant literature is discussed in the second chapter. The thesis presents the specific aims, methods and results of the two linked studies inside manuscripts that have been either published, accepted for publication or under editorial review. The final chapter synthesises the results from the two linked studies and provides a discussion in the context of previous research.

Initiating clinician behaviour change in the intensive care setting appears to be difficult to achieve when implementing a bowel management protocol. The theory of planned behaviour can provide useful insight into the predictors of clinician behaviour intention

and a questionnaire based on the theory constructs can be used in the evaluation of behaviour change interventions.

1 INTRODUCTION

1.1 Background, significance and research rationale

The intensive care environment is technologically rich (Almerud, Alapack, Fridlund, & Ekebergh, 2008) with a fast pace of changes in interventions and treatments provided by clinicians. Critically ill patients are susceptible to complications due to factors such as their underlying illness or disease process and the treatments they receive in intensive care. Intensive care clinicians are required to ensure that their practice is up to date, informed by the latest evidence and address all areas of patient care. There are an ever increasing number of aspects of care that intensive care clinicians are required to address as part of practice, namely nutrition, analgesia, sedation, thromboembolic prevention, head of bed elevation, ulcer prophylaxis and glucose control (Vincent, 2004). Protocols, checklists and care bundles have been proposed as ways to prompt busy clinicians to deliver specific aspects of care with the aim of improving patient outcomes in intensive care (Pronovost et al., 2003; Pronovost et al., 2006; Vincent, 2005).

While protocols and guidelines offer a way to standardise care and prompt clinicians (Sinuff & Cook, 2003), simply providing copies of protocols to clinicians does not necessarily lead to a change in clinical practice. Therefore it has been strongly recommended that guidelines and protocols should be introduced into practice using evidence-based implementation strategies (Gagliardi & Brouwers, 2012).

It is well known there is a lag in the transfer of evidence or knowledge into clinical practice and it is now recognised that implementation strategies are more important than dissemination of evidence alone in initiating clinician behaviour change (Francke, Smit, de Veer, & Mistiaen, 2008; Gagliardi & Brouwers, 2012). In recent years, the introduction of practice change within intensive care has used multifaceted interventions (Levy et al., 2010; Marsteller et al., 2012; Pronovost et al., 2006).

However, there has been little evaluation to explain what aspect of these interventions is effective in changing clinician behaviour to lead to any improvements detected in patient outcomes (Black, Schorr, & Levy, 2012). There is a need for research into effective implementation strategies that can be used within the intensive care environment (Black et al., 2012).

Encouraging the uptake of evidence into practice is essentially concerned with bringing about change in clinicians' behaviour (Michie et al., 2005; Michie, van Stralen, & West, 2011). Therefore understanding what influences behaviour is an important component of bringing about change. French et al (2012) advocate the use of theories to frame investigations of behaviour change to provide greater understanding of the effects of interventions.

Ajzen's (1991) theory of planned behaviour (TPB) conceptualises the influences of attitudes, subjective norms, and perceived behavioural control on behaviour intention. It has been used to investigate health care professionals' adherence to guidelines and for process evaluation of behaviour change interventions (Francis, Johnston, Eccles, Grimshaw, & Kaner, 2004b; Godin, Belanger-Gravel, Eccles, & Grimshaw, 2008).

Practice should inform the research conducted in healthcare to ensure results are clinically relevant (Green, 2006). In this research, the selected practice for improvement (i.e. bowel management) was chosen following a review of the literature regarding current intensive care practices, and results of a state-wide survey investigating practices in ICUs in NSW, and in particular to determine neglected areas of clinical practice (study one of the thesis). Bowel management was identified as a neglected area of ICU clinical practice and, hence, was the practice area chosen as the focus for the remainder of this research.

Bowel management is often overlooked in intensive care (Marshall, 2005) and an area of practice with stigma attached (McPeake, Gilmour, & MacIntosh, 2011), yet critically ill patients are at increased risk of complications if bowel function is not properly managed (Asai, 2007; Gacouin et al., 2010; Mutlu, Mutlu, & Factor, 2001; Patanwala, Abarca,

Huckleberry, & Erstad, 2006; Wiesen, Van Gossum, & Preiser, 2006). The use of BMPs has been shown to reduce complications and improve patient outcomes in intensive care (Dorman et al., 2004; Ferrie & East, 2007; Hill et al., 1998; McKenna, Wallis, Brannelly, & Cawood, 2001; McPeake et al., 2011; Mostafa, Bhandari, Ritchie, Gratton, & Wenstone, 2003; Ring, 2011; Thorpe & Harrison, 2002), though previous studies have not always fully described or evaluated the implementation strategy or strategies.

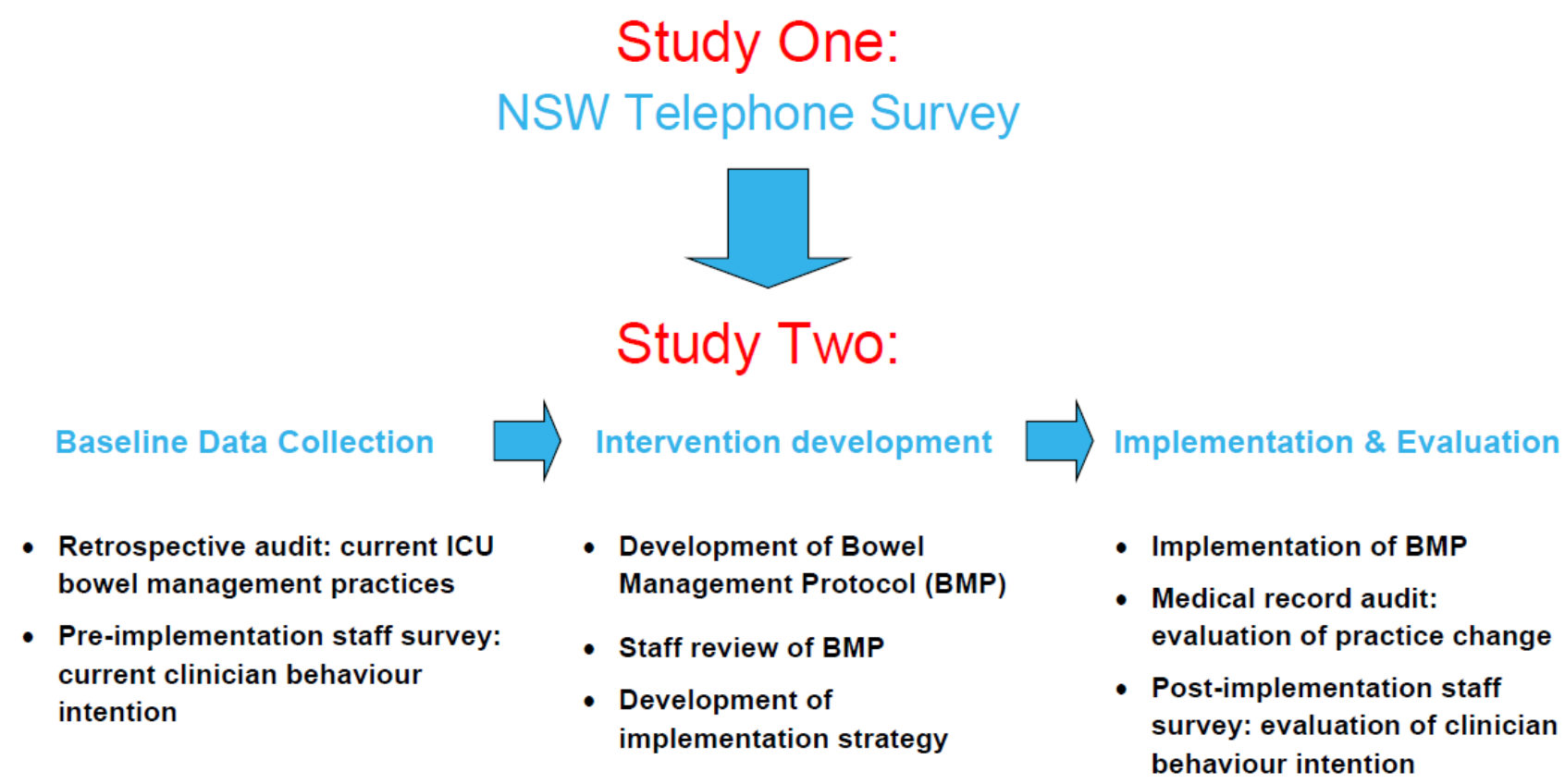
Evaluating effective implementation strategies to introduce BMPs into intensive care will provide valuable evidence for future improvements in this practice area. Using a theory based questionnaire to assess intensive care clinicians' knowledge, attitudes, beliefs and behaviour intentions prior to and post implementation of BMP in ICUs will provide further insight into the effectiveness of behaviour change strategies and the predictors of clinicians' behaviour intention.

1.2 Research aim, questions and methods

The aim of this research was to evaluate the effect of a protocol introduced using a targeted implementation strategy in changing clinicians' behaviour and improving patient outcomes in relation to a chosen practice area, namely bowel management, within the intensive care environment.

This research comprised of two linked studies, firstly, a survey of New South Wales (NSW) intensive care unit (ICU) guideline and protocol use and, secondly, a study of the development, implementation and evaluation of a bowel management protocol (BMP) using a targeted implementation strategy within three NSW ICUs. The two studies are presented in Figure 1.1 on page 4 and included: development of the BMP and implementation strategy, the pre and post implementation staff survey and the pre and post implementation medical record audit.

Figure 1.1 Diagram of studies and phases of research



A number of research methods were employed to address the aims of the individual studies forming the research presented in this thesis. Quantitative data collection methods were predominantly used in this research as considered best fit to evaluate the effectiveness of a targeted implementation strategy. The corresponding questions, methods and justification for each study are presented below.

Study one of the research consisted of a telephone survey of ICUs and high dependency units (HDUs) in NSW to determine their current use of written guidelines or protocols and informal routine procedures or practices for nine practice areas. Results from study one informed the identification of an area of neglected practice as the focus for the remainder of the research.

The following research questions were addressed in study one.

1. What written formal protocols or guidelines are used within NSW ICUs and HDUs for nine practice areas?

2. What routine procedures or practices not formalised in a guideline or protocol occur within NSW ICUs and HDUs for nine practice areas?

3. What audit activities are conducted in relation to nine practice areas in NSW ICUs and HDUs?

4. What are the opinions of representatives of NSW ICUs and HDUs regarding nine practice areas?

The nine areas of practice were bowel management, enteral nutrition, parenteral nutrition, analgesia, sedation, thromboembolic prevention, head of bed elevation, ulcer prophylaxis and glucose control. This study was conducted in conjunction with the NSW Intensive Care Coordination and Monitoring Unit (ICCMU) and in addition to the nine areas of practice that were the initial focus of the candidates, the survey included two additional practice areas; ETT stabilisation, and tracheostomy tube stabilisation. Permission to present these results within the

thesis has been granted from Ms Kaye Rolls from ICCMU (see Appendix 3 on page 251)

The areas of clinical practice chosen for study one were informed by the current literature at the time of inception (May 2005) (Berenholtz, Dorman, Ngo, & Pronovost, 2002; Berenholtz et al., 2004; Pronovost et al., 2004; Resar et al., 2005; Vincent, 2004) or used in quality improvement initiatives such as the 5 Million Lives Campaign from the Institute for Healthcare Improvement (IHI) in the United States of America ("Institute for Healthcare Improvement: The 5 million lives campaign," 2006) and the Safer Systems – Saving Lives (SSSL) project in Australia ("Safer Systems - Saving Lives," n.d); for further discussion see pages 14 to 26 of the literature review chapter. In particular, the areas chosen were guided by the 'FAST HUG' mnemonic Vincent (2005) developed to prompt intensive care clinicians in the following areas of practice: Feeding, Analgesia, Sedation, Thromboembolic prevention, Head of bed elevation, Ulcer prophylaxis, Glucose control.

Guidelines can be effective tools to translate evidence into practice (Burgers, Grol, & Eccles, 2004), however, the absence of a guideline or protocol does not necessarily mean there are no routine practices in place. Practices within ICU are often built into processes of care without being formalised in written guidelines or protocols (Wikström & Larsson, 2003), therefore the informal routine procedures or practices for the eleven practice areas was also investigated in study one. Prior to this research, no study investigating guidelines or protocol use within NSW ICUs had been undertaken.

Study one data were collected by telephone survey and analysed using descriptive and inferential statistics. Results from study one identified that respondents viewed bowel management as an area of care that was neglected within their units, and as the area of intensive care practice they were least satisfied with; consequently, bowel management become the focus for further research.

Study two aimed to evaluate the effect of a newly developed BMP and use of a targeted implementation strategy on clinicians' knowledge, attitudes, beliefs and behaviour intentions; patient outcomes; and clinicians' practices in three Sydney metropolitan ICUs. Two data collection methods were used: a staff survey and a retrospective medical record audit.

The following research questions were addressed in the staff survey:

1. Do questionnaire items based on the theory of planned behaviour conform to the theory constructs?

2. Do questionnaire items form construct scales that have valid internal consistency to measure attitudes, subjective norms, perceived behavioural control and behaviour intention related to three bowel management practices?

3. Does targeted implementation of a bowel management protocol in intensive care have an effect on clinicians' knowledge, attitudes, subjective norms, perceived behavioural control, behaviour intention and self-reported past behaviour scores related to three bowel management practices?

4. What are clinicians' perceptions of roles and responsibilities in relation to three bowel management practices?

5. What are the predictors of clinicians' behaviour intentions in relation to three bowel management practices?

There were a limited number of BMPs available within the literature or obtained as a result of a direct request from ICUs who participated in study one, therefore a new BMP was developed which is outlined in full in Chapter six. A multidisciplinary team, comprising of nurses, a doctor, a pharmacist and a dietician were convened to review the process of protocol development. A targeted evidence-based implementation strategy consisting of education sessions (Grimshaw et al., 2004b), printed educational material in the form of a fact sheet

(Berenholtz et al., 2004), and reminders in the form of advertising, flowchart stamp, and paper reminders (Grimshaw & Eccles, 2004; Grimshaw et al., 2004b; National Health and Medical Research Council (Australia), 2000) to introduce the BMP into practice within the study ICUs was developed.

The staff survey in study two, was designed to investigate the effect of the BMP and a targeted-implementation strategy on ICU clinicians' knowledge, attitudes, beliefs and behaviour intentions related to three bowel management practices: performing a bowel function assessment, performing a per rectum examination, and prescribing or nurse initiating the administration of Microlax enema. These three bowel management practices were specifically detailed in the developed BMP and are common behaviours ICU clinicians would perform. The self-administered questionnaire was distributed to nursing and medical staff before and after implementation of the developed BMP.

The theoretical framework of Ajzen's (1991) Theory of Planned Behaviour (TPB) was chosen for study two and guided the construction of questionnaire items. The TPB explains the influences of attitudes and beliefs on behaviour intention and has previously been used to investigate healthcare professionals in relation to numerous practice areas (Godin et al., 2008).

Questionnaire items were constructed according to the TPB (Francis et al., 2004a); a total of 14 items to measure attitudes, subjective norms, perceived behavioural control and behaviour intention were repeated for three behaviours. Factor analysis and internal consistency analysis were conducted on data from the pre-implementation survey to determine validity of the TPB questionnaire items and their conformity to the theory constructs.

Data from both the pre-implementation and post-implementation surveys were analysed using descriptive and inferential statistics to determine the effect of targeted implementation of the BMP on ICU clinicians' knowledge, attitudes, subjective norms, perceived behavioural control, behaviour intentions, past behaviour scores and role perceptions. The data analysis of the staff survey from

study two has been subdivided into three parts. Firstly, validity of questionnaire items designed to measure TPB constructs was determined. Secondly, the effect of the BMP and a targeted-implementation strategy on clinicians' knowledge, attitudes, subjective norms, perceived behavioural control, behaviour intentions and self-reported past behaviour scores to three bowel management practices was evaluated with a before and after staff survey. Finally, the predictors for clinician behaviour intentions related to three bowel management practices were determined.

The retrospective medical record audit in study two evaluated the effect of the BMP and a targeted implementation strategy on patient outcomes and clinician practices, in particular the incidence of constipation and diarrhoea for patients and clinicians' adherence to key elements of the BMP. Patient medical record audit was conducted before and after implementation of the developed BMP.

The research questions for the medical record audit of study two were:

1. Does targeted implementation of a bowel management protocol in intensive care have an effect on patient outcomes?

2. Does targeted implementation of a bowel management protocol in intensive care have an effect on clinician behaviour and clinical practice?

Data from the medical record audit in study two were analysed using descriptive and inferential statistics.

The studies, data collection phases and corresponding manuscript output for this research are presented in Table 1.1 on page 11. In the first manuscript the results from the telephone survey conducted in study one are reported. The construction and testing of the questionnaire used in the staff survey in study two is presented in the second manuscript. The impact of the targeted implementation strategy and BMP on clinicians' knowledge, attitudes, beliefs and behaviour intentions is reported in the third manuscript. While in the fourth and final manuscript the

results of the medical record audit evaluating the effect of the targeted implementation strategy and BMP on patient outcomes and clinician practices is presented.

Table 1.1 Overview of studies, data collection and manuscripts from the research presented in thesis

Study	Data collection phase	Manuscript/presentation title
Study One: Identification of ICU area for practice improvement	A telephone survey of NSW ICU guideline use	Patient care guidelines: A telephone survey of intensive care practices in New South Wales (Presented 2006: Australian and New Zealand Annual Scientific Meeting on Intensive Care; Published 2010 in: *Australian Critical Care*)
Study Two: Development, implementation and evaluation of a protocol for bowel management and targeted implementation strategy	Staff survey of clinicians' attitudes, beliefs and behaviour intentions related to bowel management for intensive care patients conducted pre and five months post-implementation	Clinicians' attitudes, beliefs and behaviour intentions related to bowel management for intensive care patients: construction and testing of an instrument using the Theory of Planned Behaviour (Submitted 2013 to: *Research in Nursing and Health*) Knowledge, attitudes, beliefs and behaviour intentions for three bowel management practices in intensive care: effects of a targeted protocol implementation for nursing and medical staff (Published 2015: *BMC Nursing*) Predictors of intensive care clinicians' behaviour intention for three bowel management practices (Presented 2013: Australian and New Zealand Annual Scientific Meeting on Intensive Care)
	Retrospective medical record audit of patient outcomes and clinician practice change conducted pre and one month post-implementation	Evaluation of the implementation of a bowel management protocol in Intensive care: Effect on clinician practices and patient outcomes (Published 2014: *Journal of Clinical Nursing*)

1.3 Thesis outline

The thesis comprises of seven chapters, commencing with an introduction leading into a detailed literature review, four manuscripts (one published, one accepted for publication, and two under editorial review), and a discussion and conclusion chapter. An introduction to the thesis outlining the background and research rationale, and describing the two studies and corresponding data collection phases of the research has been presented in this chapter. The literature review chapter provides a comprehensive discussion of the literature pertaining to intensive care evidence-based practice, bowel management for critically ill patients, clinician behaviour change theories, the theory of planned behaviour, and evidence based implementation strategies. It includes identification of relevant research to inform the research presented in this thesis. Some of this literature is also reviewed in the introduction section of each manuscript hence, by necessity, there may be some duplication.

The following four chapters (three, four, five, and six) correspond to four manuscripts, one of which has been published, one is in press with the remaining two under editorial review. The methods and results from study one of the research are reported in the published manuscript presented as chapter three; a telephone survey of NSW ICU guidelines and practices. The manuscripts in chapters four and five report the results from two phases of data analysis for the staff survey conducted in study two; validation of TPB questionnaire items and clinicians' knowledge attitude, beliefs and behaviour intentions. Chapter five also includes additional results from the staff survey about predictors of clinician behaviour intention that have been presented at the 2013 Australian and New Zealand Annual Scientific Meeting on Intensive Care.

Detailed methods and results for the two studies of the research are presented in these four manuscripts and therefore the thesis does not contain separate methods and results chapters. Each manuscript is presented under the headings and in the referencing style stipulated by the corresponding journal with the corresponding reference list provided at the end of the chapter. A detailed explanation of the BMP and targeted-implementation

strategy used in study two of the research is provided in the manuscript presented as chapter six.

The results from each of the studies and phases of data collection presented in the manuscripts are brought together and compared with the relevant literature in the discussion and conclusion chapter (chapter seven). The strengths and limitations of the research project are discussed. The implications for policy, clinical practice and recommendations for future research are presented. This final chapter finishes with a summary and conclusions for the research.

The research portfolio appendices presented at the end of the thesis provides information regarding the status of all manuscripts presented as part of the thesis including, signed author contributions, and conference presentations.

Ethical approval from both Australian Catholic University and St Vincent's Hospital Sydney Human Research Ethics Committees was received for all studies. Copies of the approvals can be found in Appendix 1 on page 246.

1.4 Summary

In this introductory chapter the background and rationale for the research has been provided. The studies and phases of data collection for the research, including the research questions and an overview of the methods employed has been outlined. The thesis structure, including four manuscripts presented as chapters has been detailed. The relevant literature will be discussed in the second chapter.

2 LITERATURE REVIEW

2.1 Introduction

The relevant literature supporting the research is discussed in the following chapter in term of both general healthcare and, where relevant, specifically to intensive care. It also includes descriptions of a national and an international quality improvement initiative specific to ICU. The main topic areas covered include clinical practice guidelines (CPGs) and protocols; bowel management; behaviour change theories; and evidence-based implementation strategies. Due to the paucity of literature related to bowel management in intensive care, the literature included in this review backdates to the 1980s. There are numerous studies in healthcare that have utilised the theory of planned behaviour (TPB), however very few within the intensive care; therefore selected examples of studies using the TPB are discussed. The literature included in this chapter was found by searching the relevant nursing, medical and healthcare databases (CINAHL, MEDLINE, EMBASE, The Cochrane Library and PubMed) and also by hand searching specific relevant journals (for example Implementation Science). Search terms used included; intensive care, bowel management, evidence-based, behaviour change, implementation strategies, theory. Initial literature searches were conducted between 2005 and 2010, with further searches conducted in 2012 to 2014. The chapter is concluded by highlighting the gaps in the relevant literature and providing support to the aims of the research.

2.2 Intensive care evidence-based practice

The term evidence based practice (EBP) has become synonymous with improving practices and patient outcomes. Sackett et al (1996) define EBP as 'the conscientious, explicit and judicious use of the current best evidence in making decisions about the care of individual patients'. In addition EBP involves critical appraisal of the evidence and integration of this evidence with clinician expertise (Straus & Sackett, 1998).

Application of EBP also takes into account patient preferences and relevant clinical, social or financial constraints to provide the best care to patients (Sackett et al., 1996). These definitions highlight the inherent interaction of clinicians with patients.

At the commencement of this research (May 2005), areas of intensive care practice where improvements were needed to ensure evidence-based care were highlighted in the then current literature (Berenholtz et al., 2002; Berenholtz et al., 2004; Dodek et al., 2004; Pronovost et al., 2004). Berenholtz et al (2002) conducted a systematic review to identify interventions that improved patient outcomes in ICU and consequently developed a list of potential quality indicators to improve care. Five of these quality indicators were based on systematic reviews of randomised controlled trials: appropriate use of blood transfusions, prevention of ventilator-associated pneumonia (VAP), appropriate sedation, appropriate peptic ulcer disease prophylaxis, and appropriate deep venous thrombosis prophylaxis. In a subsequent study designed to improve outcomes for ventilated patients, Berenholtz et al (2004) focused on four of these practice areas: prevention of ventilator pneumonia by head of bed elevation, appropriate sedation, appropriate peptic ulcer disease prophylaxis and deep venous thrombosis prophylaxis (Berenholtz et al., 2002; Berenholtz et al., 2004). Prior to their intervention, compliance with prevention of VAP was the lowest of the four processes at 30%, and was also determined to be the compliance with all four processes. Following their intervention, compliance with all four processes improved to 96% with an estimated prevention in 27 deaths per year. Dodek et al (2004) systematically reviewed the available evidence to reduce the incidence of VAP to develop a guideline and identified similar areas.

Five evidence-based interventions that are known to decrease mortality in intensive care were identified by Pronovost et al (2004); high versus low intensity of ICU physician staffing, activated Protein C, low dose steroid, intensive insulin therapy, lower tidal volume ventilation in acute lung injury. However, there is limited nursing input for all of these interventions.

Subsequently, EBP in ICU continued to focus on ventilator associated complications. Labeau et al (2007) identified ten interventions to prevent VAP with relevance to nursing practice while developing their questionnaire: use of oral endotracheal tubes (ETT), frequency of ventilator circuit changes, use of a heat and moisture exchanger, frequency of humidifier changes, use of a closed suction system, frequency of change in suction system, drainage of subglottic secretions, use of kinetic beds, use of semi-recumbent positioning, and chest physiotherapy.

Numerous practice areas of importance for critically ill patients were highlighted in this literature with a focus on the prevention of: VAP, deep venous thrombosis and peptic ulcers. In addition, there were quality improvement initiatives in both Australia and internationally that aimed to improve outcomes for intensive care patients by bundling care elements based on this emerging evidence.

The Institute for Healthcare Improvement (IHI) in the United States of America developed the 5 Million Lives Campaign ("Institute for Healthcare Improvement: The 5 million lives campaign," 2006). One of the 12 intervention bundles in the IHI's campaign was aimed at reducing VAP and embraced a number of the quality indicators presented by Berenholtz et al (Berenholtz et al., 2004). The VAP bundle prescribed care for head of bed elevation, sedation vacation (whereby patients were woken from sedation to assess readiness to extubate), peptic ulcer prophylaxis and deep vein thrombosis prophylaxis (Resar et al., 2005). From the 35 units that submitted full data regarding the IHI campaign, Resar et al (2005) determined that for those units with greater or equal to 95 % compliance with all elements of the VAP bundle there was a reduction in rates of VAP from 6.6 to 2.7 per 1000 ventilator days.

In Australia, Safer Systems – Saving Lives (SSSL) ("Safer Systems - Saving Lives," n.d) was a similar project to the 5 Million Lives Campaign, and included six key interventions to improve healthcare outcomes, including one focused on preventing ventilator associated complications. In the SSSL preventing ventilator-associated complications (VAC) intervention, single interventions for intensive care patients with emerging

evidence were combined into a 'bundled' care approach. Eight care components or practice areas made up the VAC intervention; daily assessment of readiness to extubate, deep venous thrombosis prophylaxis, peptic ulcer prophylaxis, skin integrity breakdown prevention, analgesia management, nutritional planning, bowel management and elevation of head of bed ("Safer Systems - Saving Lives," n.d). There is no published evaluation of the SSSL campaign.

Both the 5 Million Lives Campaign and the Safer Systems – Saving Lives campaign highlight the requirement to address numerous areas of practice for each patient in ICU during their admission. This was further highlighted by Vincent (2005), who proposed the 'FAST HUG' mnemonic to prompt ICU clinicians to consider seven key aspects of general care for all critically ill patients at least once a day; **F**eeding, **A**nalgesia, **S**edation, **T**hromboembolic prevention, **H**ead of bed elevation, **U**lcer prophylaxis and **G**lucose control. The mnemonic can be used in much the same way as a checklist by clinicians during the daily round and highlights a number of practice areas to be addressed for each critically ill patient, however it does not specifically highlight bowel management. Consequently, others have suggested extending Vincents' mnemonic to include other practice areas; FAST HUGS BID would include **S**pontaneous breathing trial, **B**owel regimen, **I**ndwelling catheter removal and **D**e-escalation of antibiotics (Vincent & Hatton, 2009).

Within the intensive care environment, the concept of 'bundled' care was promoted to improve the application of EBP by bringing together a number of evidence based practices (Fulbrook & Mooney, 2003). The 5 Million Live Campaign, SSSL project and Vincents' 'FAST HUG' mnemonic embraced the bundled approach to care. Checklists and audit forms are encouraged in both the 5 Million Lives Campaign and the SSSL project as a prompt for clinicians in the care they provide. Local adaptation of the evidence into protocols or guidelines was encouraged ("Institute for Healthcare Improvement: The 5 million lives campaign," 2006; "Safer Systems - Saving Lives," n.d).

These examples from the literature and the quality improvement initiatives highlight the numerous areas of practice within intensive care that are considered important for patient outcomes and for which there was emerging evidence when this research commenced. However, this large number of practice areas can impact on clinicians' adherence to best practice in ICU. For example, Ilan et al (2007) investigated prescription to 11 best practices in ICU that included many of those reported above, and found it to be variable, showing that sicker patients were less likely to be prescribed best practice. They proposed a number of reasons for this evidence-practice gap in the most critically ill patients; including clinicians may focus more on resuscitation, and best practices are overlooked as 'mundane'.

2.3 Bowel management in the critically ill patient

Quantifying bowel motion and dysfunction, either constipation or diarrhoea, is difficult in the critically ill patient. Measuring stool weight, consistency and ease of passage, either exposes clinicians to potential risk through the necessary contact with body fluids or is highly subjective (Mostafa et al., 2003; Patanwala et al., 2006; Wald, 1999). In addition, such measures of bowel function are not easily obtained in sedated or unconscious patients or in the intensive care environment (Mostafa et al., 2003; Patanwala et al., 2006). Intensive care patients can not readily communicate regarding their bowel function or lack of, including ease of passage. In addition, measuring stool weight is not always practical in the ICU when bowel movements are not always contained in a manner that would allow weighing, such as within bedpans.

Using definitions of constipation from the general population, such as those using patient centred measures of straining and unproductive urges (Locke, Pemberton, & Phillips, 2000), are not easily determined or appropriate for critically ill patients (Patanwala et al., 2006; Ritchie, Burgess, Mostafa, & Wenstone, 2008). Consequently, defining constipation for critically ill patients centres on the frequency at which bowel movements occur. When determining time frames to define constipation for critically ill patients the time to stabilise patients and establish enteral feeding regimes must be

considered (Dorman et al., 2004; Hill et al., 1998; Mostafa et al., 2003; Patanwala et al., 2006; Ritchie et al., 2008). No bowel motion for three days (72 hours) is the most common timeframe used to define constipation for critically ill patients (Dorman et al., 2004; Hill et al., 1998; Mostafa et al., 2003; Ritchie et al., 2008), although a more conservative definition of no bowel motion within first four days of admission has been used (no bowel motion within 96 hours of admission) (Patanwala et al., 2006).

There is limited applicability of definition criteria for diarrhoea in the critically ill patient and a lack of consensus with definitions used by clinicians and within the literature. Often complex criteria are proposed, such as stool density measurement or descriptive scales, both of which may not be easily undertaken by clinicians or incorporated into their documentation practices within intensive care (Ferrie & East, 2007; Lebak, Bliss, Savik, & Patten-Marsh, 2003; Yassin & Wyncoll, 2005). Consistency and amount as well as frequency are used to define diarrhoea. However, often these are subjective or estimated measures used by clinicians that can lead to variations in defining and identifying the incidence of diarrhoea (Lebak et al., 2003; Sabol & Carlson, 2007). The impact of diarrhoea on skin integrity, wound contamination or clinician practice is highlighted in definitions that include these criteria. Diarrhoea is defined as 'clinically significant' due to the presence of one or more of these criteria (Ferrie & East, 2007).

The incidence of constipation and diarrhoea are commonly used to describe bowel dysfunction for critically ill patients. The different incidence rates for constipation and diarrhoea reported in the literature may in part be explained by the variations in defining bowel dysfunction used within the respective studies (Lebak et al., 2003; Wiesen et al., 2006).

During a multicentre, prospective, randomised, single-blind study of early jejunal feeding for critically ill patients Montejo et al (2002) found only a 5% (n=5) constipation rate for all patients enrolled. This is in contrast to the 16% (n=63) incidence of constipation described in a previous study of gastrointestinal complications for critically ill patients by the same author (Montejo, 1999). Both these studies defined constipation

to be the “need for treatment with laxatives or enemas according to the treating physician's criteria” and did not specifically state a length of time for which bowels were not opened. Others have reported much higher incidence rates of constipation, where timeframes to bowels open were used to define constipation. In a retrospective medical record audit, Patanwala et al (2006) reported 50% of patients (n=25) did not have bowels open within 96 hours of admission to ICU. In a prospective audit, Mostafa et al (2003) detected 83% of patients (n=40) experienced one or more episode of constipation during ICU admission, defined as bowels not open for 72 hours or greater. Constipation, defined as bowels not opened within 3 days, was reported for 58% of patients (n=15) prior to a BMP and decreased to 37% post protocol introduction (McPeake et al., 2011). In a survey of 250 ICUs in the UK, responses from 52.5% (n=75) of the units indicated constipation was considered a problem in their unit (Mostafa et al., 2003).

Incidence rates of diarrhoea for critically ill patients reported in the literature are not as high as those for constipation. Montejo (1999) found 15% of patients (n=59) with diarrhoea when they defined it as five or more liquid stools in a 24 hour period or an estimated volume of 2000ml per day. In a medical record audit before and after introduction of a BMP Ferrie and East (2007) found 36% of patients (n=138) prior and 23% of patients (n=63) post introduction of their protocol to have diarrhoea. As well as an initial definition of diarrhoea regarding frequency and amount of liquid or loose stools (300mls, or three or more liquid/unformed stools per day) Ferrie and East (2007) adapted their definition to also include four or more stools of any consistency and for at least two consecutive days.

Critically ill patients have an increased risk of bowel dysfunction due to factors such as, dehydration; reduced mobility; underlying disease process or illness; mechanical ventilation; and the use of continuous or intermittent analgesics and sedatives (especially those that are opioid based) (Asai, 2007; Dobb, 1986; Ferrie & East, 2007; Mutlu et al., 2001; Ritchie et al., 2008)

Bowel management is frequently reported in the literature as an overlooked and neglected area of critical care (Dorman et al., 2004; Marshall, 2005), with numerous proposed reasons for this. Due to its 'low tech' nature, bowel management is lost within the 'high tech' nature of intensive care'; often described as an 'afterthought' (Dorman et al., 2004; Marshall, 2005). Nurses wish to be associated with more technical areas, and therefore basic aspects of care, such as bowel management, have become lower in status (McPeake et al., 2011; Richmond & Devlin, 2003). There is avoidance of bowel management by clinicians due to perceptions it is a taboo or stigmatised area of practice (McPeake et al., 2011). Many of the signs and symptoms of gastrointestinal dysfunction are difficult to identify in sedated and intubated patients and may be masked by the sedative or narcotic medications used in the critically ill (Sheth & LaMont, 2001). Absence of bowel motion (constipation) may be missed due to a tendency to record occurrence and measurements and the fact that several clinicians will care for a patient (Mostafa et al., 2003). Clinicians' documentation and reporting practices relating to bowel management have been shown to be low (Dorman et al., 2004; McKenna et al., 2001; McPeake et al., 2011). In addition, intensive care clinicians have expressed dissatisfaction with bowel management practices within their units (Knowles, Rolls, Elliott, Hardy, & Middleton, 2010; Thorpe & Harrison, 2002).

Regardless of the reasons critically ill patients bowel function is 'overlooked', poor bowel management can have detrimental consequences to patient outcomes in the intensive care environment (Gacouin et al., 2010; Mostafa et al., 2003; Wiesen et al., 2006). Bowel dysfunction, both constipation and diarrhoea, in critically ill patients has been associated with: increased length of stay (LOS) or delayed discharge from ICU; disturbed bowel motility, bowel obstruction and bowel perforation; dehydration and electrolyte disturbances; skin excoriation and wound contamination; delayed weaning or prolonged mechanical ventilation; and inability to tolerate enteral feeding (Ferrie & East, 2007; Gacouin et al., 2010; Martin, 2007; Mostafa, Bhandari, Ritchie, Arthan, & Gratton, 2001; Mostafa et al., 2003; Mutlu et al., 2001; van der Spoel, Oudemans-van Straaten, Stoutenbeek, Bosman, & Zandstra, 2001; Wiesen et al., 2006). Constipation can lead to distension, discomfort and restlessness in the critically ill patient and impact on

ventilatory muscle function, which may explain the failure to wean from ventilation reported in the literature (Mostafa et al., 2003). The impact of bowel dysfunction for critically ill patients may even extend beyond the ICU and hospital admission, with the literature suggesting that patients have reported constipation to be an issue at ICU follow up clinics (Hill et al., 1998).

Given the potential for adverse outcomes, ensuring that bowel function is maintained is important to avoid complications for critically ill patients (Asai, 2007; Mostafa et al., 2003; Mutlu et al., 2001; Patanwala et al., 2006).

Treatment and interventions for bowel dysfunction in the critically ill

Treatments and interventions for managing bowel dysfunction for critically ill patients aim to, firstly, maintain gastrointestinal motility and, then where appropriate, intervene to minimise constipation and diarrhoea. Assessment forms an integral part of bowel management practice. Monitoring and documenting bowel activity is often considered the domain of nurses in general and this is no exception within the intensive care environment (Dorman et al., 2004; Richmond & Devlin, 2003; Thorpe & Harrison, 2002). Medical officers have recently been encouraged to add bowel assessment to daily round checklists that are promoted for use within ICUs (Vincent & Hatton, 2009). Nursing clinicians are more likely to identify diarrhoea in patients than doctors due to the impact it has on nursing practice and patient care.

Often pharmacological measures are used to treat constipation. Prescribing is considered a medical officers practice, however, nurses can be responsible for the initiation of appropriate medications for the treatment of constipation. In NSW, nurses are allowed to initiate selective medications according to institutional protocols, including those for the treatment and prophylaxis of constipation (National Nursing & Nursing Education Taskforce, 2006).

There are a number of laxative medications shown to have positive effects on the occurrence of bowel movements for ICU patients; stimulant or osmotic laxatives (Patanwala et al., 2006), polyethylene glycol (PEG) laxatives (van der Spoel et al., 2007), and lactulose, although this was associated with a higher incidence of acute intestinal pseudo obstruction (van der Spoel et al., 2007). The American Gastroenterological Association medical position statement on constipation (Bharucha, Dorn, Lembo, & Pressman, 2013) advocates a number of osmotic laxatives, however, these can cause electrolyte disturbances and are contraindicated in the critically ill patient. Constipation as a result of opioid use is common in the ICU, for which a stool softener and stimulant may be a more appropriate treatment (Patanwala et al., 2006). Other non-pharmacological treatments for constipation, such as increasing mobility and hydration, may not always be possible in the ICU and are therefore of limited value. Hence, important components of bowel management practices and protocols in the ICU focus on the administration of prophylactic laxatives and inclusion of fibre in enteral feeding formulations (Ferrie & East, 2007). There has been recent support for investigating non-pharmacological measures for management of constipation in ICU, although these have not been systematically evaluated. One such measure is the use of prune juice being included in a BMP (Ring, 2011).

The management of diarrhoea for critically ill patients focuses on reducing the possible causes and minimising the complications while maintaining bowel function. Using fibre in enteral feed formulas and discouraging stopping of enteral feeds to manage diarrhoea are strategies advocated in the critically ill patient (Ferrie & East, 2007; Rushdi, Pichard, & Khater, 2004). Neither of these strategies increases the incidence of diarrhoea but are thought to be beneficial in maintaining bowel function. Identifying medications that may be causing diarrhoea and changing the prescription are also advocated (Wiesen et al., 2006; Yassin & Wyncoll, 2005).

There are a number of constipation risk assessment scales developed and evaluated for use in specialties other than ICU (Duffy & Zernike, 1997; Kyle, 2007; Richmond & Wright, 2005; Zernike & Henderson, 1999). Use of a constipation risk assessment scale

for ICU patients has been identified as potentially useful in prompting clinicians to initiate proactive management of constipation (Ritchie et al., 2008), though there has not been any evaluated for specific use in ICU.

Bowel management protocols for critically ill patients

Despite the potential for complications and clinicians' perceptions that bowel management is poor, evidence suggests that use of protocols or guidelines in intensive care is low (Knowles et al., 2010; Mostafa et al., 2003; Thorpe & Harrison, 2002). In national surveys in the United Kingdom (UK), Thorpe and Harrison (2002) found only 21% (n=17) of ICUs reported having a BMP or guideline, while Mostafa et al (2003) report only 3.5% had a guideline for managing constipation.

Protocols are advocated as a way to standardise bowel management practices for intensive care patients by guiding clinicians in care provision and circumventing complications by timely intervention or treatment (Dorman et al., 2004; Ferrie & East, 2007; Hill et al., 1998; McKenna et al., 2001; McPeake et al., 2011; Mostafa et al., 2003; Ring, 2011; Thorpe & Harrison, 2002; Yassin & Wyncoll, 2005). BMPs reported in the literature include aspects such as monitoring function, instigating early enteral nutrition, and prophylactic administration or aperients (Dorman et al., 2004; Ferrie & East, 2007; McKenna et al., 2001). Initial evaluations have demonstrated that BMPs developed specifically for ICU have reduced constipation and diarrhoea (Dorman et al., 2004; Ferrie & East, 2007; McKenna et al., 2001; McPeake et al., 2011; Ring, 2011). Most of these evaluations have been small single site studies assessing impact on patient outcomes and clinician practices (see Table 2.1 on page 25).

McPeake et al (2011) conducted focus groups prior to implementation of a BMP in their ICU and determined a need for further education, an improvement in documentation and team communication, and increased awareness of bowel management.

Table 2.1 Studies of introduction of BMP within intensive care

Study/Authors	Method	Sample	Implementation strategy	Main Results
Dorman et al. (2004)	Retrospective medical record audit of current practice and impact of BMP	Patients selected randomly and first 14 days of admission audited Pre = 9; Post = 10	Multidisciplinary team, peer to peer dissemination from development group	Assessment of bowel function increased (pre = 23%; post = 95%). 90% of patients had bowels open by day 4 post-implementation. The number of patients whose aperients were discontinued in the absence of diarrhoea.
Ferrie and East (2007)	2 year prospective medical record audit to determine incidence of diarrhoea and measure effect of BMP	Consecutive tube-fed patients admitted to ICU >3 days Pre = 379; Post = 279	At 12 months, BMP implemented over 8 weeks. Posters to market, in-service sessions, included in online Nursing Protocols available at bedside	Significant decrease in incidence of diarrhoea (pre=138 patients; post= 63 patients)
McKenna et al. (2001)	Retrospective medical record audit, 6 months pre and 6 months post-implementation to evaluate effect of BMP on documentation	Pre = 60; Post = 60	1 month period. Education sessions for staff and a survey of staff to evaluate BMP and assessment instrument	Increased documentation of bowel assessment and activity post-implementation
McPeake et al. (2011)	Pre and post audit and focus groups evaluating effect of BMP	Pre = 26; Post = 27	Education sessions	Bowel care documentation days increased by 13%; constipation incidence decreased by 20.7%; diarrhoea days reduced by 15.2%.
Ring (2011)	Pre and post medical record audit of current care and evaluation of BMP	Convenience sample of ventilated patients, enterally fed and not post bowel surgery. Pre = 7; Post = 7	4 to 5 months implementation, involving in-service education	Post-implementation, aperients were prescribed earlier in patients admission and bowels opened sooner.

2.4 Clinical Practice Guidelines

Clinical practice guidelines (CPG) or protocols can provide a way to bring the available evidence to the busy clinician (Feder, Eccles, Grol, Griffiths, & Grimshaw, 1999; Grimshaw, Eccles, & Tetroe, 2004a; Grimshaw & Russell, 1994; Grimshaw et al., 2004b). Guidelines, when systematically developed, summarise the current evidence in a usable format for clinicians, encourage interdisciplinary collaboration and have been shown to improve patient care (Burgers et al., 2004). Clinical practice guidelines can improve the quality of care provided by clinicians by summarising the best available evidence. However, this is dependent on the level of evidence used in developing the guidelines and on the timely updating of guidelines as new evidence is available (Shekelle, Eccles, Grimshaw, & Woolf, 2001). Grimshaw and Russell (1993) found clinical guidelines led to a statistically significant improvement in processes of care and outcomes.

There has been support for the use of CPG and protocols within ICU. They can streamline the process of accessing the available evidence (Sinuff & Cook, 2003; Sinuff et al., 2007) and provide a strategy to ensure specific tasks are carried out in a timely manner (Ibrahim & Kollef, 2001). They encourage standardised and efficient patient care, which can be advantageous in the complex ICU environment.

However, it is important to note that the absence of formal written guidelines or protocols does not equate to no routine to practice in a given area. Much of the practice in ICU is routine and built into processes of care (Wikström & Larsson, 2003) without being formalised into guidelines or protocols.

2.5 Implementation and behaviour change

Improving practices in intensive care, and specifically those related to bowel management, essentially requires a change in clinician behaviours. Evidence suggests that merely providing copies of guidelines or protocols is unlikely to change clinicians'

behaviour or practice and instead evidence-based implementation strategies must be utilised (Gagliardi & Brouwers, 2012; Grimshaw & Eccles, 2004; Grimshaw et al., 2004b). The strategies used should be locally relevant and address perceived barriers and facilitators (Doherty, 2006; Gagliardi, Brouwers, Palda, Lemieux-Charles, & Grimshaw, 2011; Grol, 1997). There is growing support for using theories in the design of behaviour change interventions (Michie & Johnston, 2012). Theory can allow closer alignment of processes with outcomes (Hatler et al., 2006). Webb and Sheeran (2006) evaluated previous research and identified three key features of a behaviour change intervention that will determine effectiveness; the interventions theoretical basis, the behaviour change methods used, and the delivery mode.

The following section provides a discussion of the clinician behaviour change literature, and the relevant theories and theoretical constructs for determining behaviour intention and engendering behaviour change. In particular, the theory of planned behaviour (TPB) and additional theoretical constructs of knowledge, perceptions of roles and past behaviour are presented in more detail as they formed the framework for this research. This is followed by a discussion of evidence-based implementation strategies and frameworks for investigating healthcare professionals' behaviours. Justification is given for the theory and implementation elements chosen for this research.

Behaviour change theories

There have been a number of reviews and discussions in the literature regarding appropriate theories for health related behaviour, and specifically those useful in understanding healthcare professionals' intentions and behaviours, behaviour change and the implementation of change (Godin et al., 2008; Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004; Grol, Bosch, Hulscher, Eccles, & Wensing, 2007; Michie et al., 2005). Authors have often chosen to categorise the numerous relevant psychological theories in different ways. For example, Grol et al (2007) used two main categories for a number of theories; process theories and impact theories, with further subcategories. While, Michie (2005) chose three theory groups to organise similar theories;

motivational, action and organisational. Walker and colleagues (2003) divided similar psychological theories into three broad categories; motivational, action and stage of change. Theories can also be described by their different level of focus; individual, social or team, organisational, political and economic context (Grol et al., 2007).

Most often, one or two theories are used to investigate health care professionals' behaviour (Godin et al., 2008). Conversely, the PRIME study evaluated constructs from six theories that explain professional behaviour in terms of motivation, action and stages of change; TPB, Social Cognitive Theory (SCT), Operant Learning Theory (OLT), implementation intention, the common sense self-regulation model and stages of change (Bonetti et al., 2006; Eccles et al., 2007; Walker et al., 2003). Walker and colleagues (2003) chose these six theories for three reasons; they have previously been extensively evaluated, their explanation of behaviour includes factors that are responsive to change, and they include non-volitional components that acknowledge individuals don't always have control over their actions. Recognising the potential of a wider number of psychological theories when implementing change, Michie and colleagues (2005) used a consensus method to derive 12 theoretical domains from 33 psychological theories that could be used in implementation research; subsequently these have been termed the Theoretical Domain Framework (TDF).

It is impractical to use all the potentially relevant theories available to a researcher when investigating behaviour change interventions (Francis et al., 2009a). Consequently, the TDF developed by Michie et al (2005) has proven useful and Francis, O'Connor and Curran (2012) have subsequently evaluated the impact of the TDF on the field of implementation research. French et al (2012) have used the TDF and developed a four step process to developing a theory-informed implementation intervention. Despite numerous studies and reviews of the relevant psychological theories and the TDF, there is still no clear process to selecting theories for investigation of clinician behaviour change (Francis et al., 2009a).

Observing and measuring clinicians' actual behaviour can require large input of resources, including time, and is therefore often not practical. Behaviour intention has been shown to be a reliable surrogate of a person's actual behaviour in a meta-analysis by Webb and Sheeran (2006) linking intention to behaviour performance for a number of behaviours. In their analysis, a medium-to-large sized change in intention was shown to engender only a small-to-medium change in behaviour. They also report that objective measures of behaviour, rather than self-reported measures, were associated with larger affect size. Eccles et al (2006) reviewed studies of clinician behaviour to determine the correlation between self-reported intention and behaviour. Although they acknowledge that the number of studies available for their review was smaller than those in the non-health professional literature, they concluded that the proportion of variance in behaviour explained by intention was similar especially in studies with self-reported behaviour.

Theory of planned behaviour

Ajzen's (2006b) theory of planned behaviour (TPB) explains what influences an individual's behaviour intention. It is an extension of Ajzen's earlier theory of reasoned action (TRA), which was limited in that it only predicted voluntary behaviours (Sheeran, Trafimow, & Armitage, 2003). The construct of perceived behavioural control was added to address this limitation.

The TPB combines three core components, namely, behavioural beliefs producing an *attitude toward the behaviour,* normative beliefs resulting in perceived social pressure or *subjective norm,* and control beliefs giving rise to *perceived behavioural control* (Ajzen, 2006b). Therefore according to the theory, to predict whether a person intends to do something, we need to know whether they are in favour of doing it (attitude), how much they feel social pressure to do it (subjective norm), and their perceived level of control over factors that may facilitate or hinder their performance of the behaviour (perceived behavioural control) (Ajzen, 2006a; Francis et al., 2004a). The dependent

variable, behaviour intention (BI), is predicted by the variables, attitude (Att), subjective norm (SN), and perceived behavioural control (PBC).

Further investigation of the construct PBC, has determined it can directly influence behaviour, bypassing behaviour intention (Ajzen, 1991; Ajzen, 2006b; Gagne & Godin, 2007). The control factors of the PBC construct can be either internal or external, and consequently some authors argue the construct is in fact two distinct constructs or sub-constructs (Ajzen, 2002; Sparks, Guthrie, & Shepherd, 1997); *self-efficacy*, also referred to as perceived difficulty and *controllability*, also referred to as perceived control (Ajzen, 2002; Leach, Hennessy, & Fishbein, 2001; Sparks et al., 1997; Trafimow, Finlay, Sheeran, & Conner, 2002). While some authors report these two constructs to replace the existing PBC in the TPB (Trafimow et al., 2002), Ajzen (2002) proposes a hierarchical model, where *self-efficacy* and *controllability* are separate sub-constructs that form the higher construct of PBC. Ajzen (2002) believes these sub-constructs reflect beliefs about both internal and external factors, despite numerous others reporting that *self-efficacy* reflects internal factors and *controllability* reflects external factors (Sparks et al., 1997; Terry & O'Leary, 1995). There have been differences in the effects of the two sub-constructs of PBC reported in the literature, however, self-efficacy has emerged as a significant positive predictor of behaviour intention (Terry & O'Leary, 1995).

Despite self-efficacy being defined as part of the perceived behavioural control construct from the TPB, the concept of self-efficacy has been identified in other theories. Most notably, the construct is part of Bandura's social cognitive theory (Bandura, 1989) and Michie et al (2005) identified self-efficacy from Bandura's theory as one of the domains in the TDF. Noar and Zimmerman (2005) highlight that similarity of constructs between theories is not new to the discussion literature.

Armitage and Conner (2001) conducted a meta-analysis of studies using the TPB (not only health related behaviour) and found evidence to support the use the theory in predicting intention and behaviour. The TPB has been the theoretical basis for

numerous studies reported in the literature investigating health-related behaviour, including investigation of health professional's behaviour intentions and uptake of evidence into practice (Francis et al., 2004a; Godin et al., 2008; Godin & Kok, 1996; Hardeman et al., 2002).

Researchers have used the TPB to investigate change and maintenance of health related behaviour of individuals (McEachan, Conner, Taylor, & Lawton, 2011), such as smoking cessation (Conner, Sandberg, McMillan, & Higgins, 2006), safe sexual practices (Godin, Gagnon, Lambert, & Conner, 2005), and maintenance of physical activity (Armitage, 2005). The TPB has been the theoretical basis of studies investigating health care professionals' behaviour and the determinants of their behaviour intentions for nurses, doctors, pharmacists and allied health professionals (Godin et al., 2008).

Studies of nurses using the TPB include investigations of their intentions to: provide support to breast feeding mothers during the immediate in-hospital postpartum stay (Bernaix, 2000), provide professional labour support (Sauls, 2007), document practices (Renfroe, O'Sullivan, & McGee, 1990), use guidelines (Kortteisto, Kaila, Komulainen, Mantyranta, & Rissanen, 2010), and integrate evidence into practice (Côté, Gagnon, Houme, Abdeljelil, & Gagnon, 2012). Studies using the TPB have also investigated nurses' adherence to hand hygiene recommendations (Eiamsitrakoon, Apisarnthanarak, Nuallaong, Khawcharoenporn, & Mundy, 2013; O'Boyle, Henly, & Larson, 2001) and the predictors of nurses' adherence to universal precautions when performing venipunctures (Godin, Naccache, Morel, & Ébacher, 2000).

Physician behaviours investigated with the TPB include their intentions to; prescribe hormone therapy (Legare et al., 2005), use of clinical practice guidelines (Limbert & Lamb, 2002), and disclose a diagnosis of dementia (Foy et al., 2007).

Clinicians' hand hygiene practices and compliance have been the focus of numerous studies using the TPB as the theoretical basis (Jenner, Watson, Miller, Jones, & Scott, 2002; Nicol, Watkins, Donovan, Wynaden, & Cadwallader, 2009; Pessoa-Silva et al.,

2005; Whitby, McLaws, & Ross, 2006) with some studies including ICUs clinicians (De Wandel, Maes, Labeau, Vereecken, & Blot, 2010; O'Boyle et al., 2001).

The TPB has been reported as the theoretical basis for investigating and changing clinician behaviour within the intensive care environment, although use of questionnaires based on the TPB specifically within ICU was not reported. In a study of the factors influencing nurses' behaviour intention to perform haemodynamic assessment using a pulmonary artery catheter by Pinto, Colombo and Gallani (2006), the TPB was used to conceptualise results of staff interviews. Hatler and colleagues (2006) used the TPB during the introduction and monitoring phases of their project aimed at improving practices with a Ventilator Associated Pneumonia (VAP) bundle. They developed strategies that addressed the TPB constructs; clinicians were provided with a one page summary of practice for preventing VAP which increased their control over and ability to perform the desired behaviours, and the new behaviours were enforced as the 'norm' by use of recognition, rewards and opinion leaders. In a study investigating intensive care nurses' knowledge, attitudes and perceived barriers to pressure ulcer prevention, Strand and Lindgren (2010) discussed their results in relation to the TPB constructs, however their survey was not specifically designed to measure the constructs.

Although these three studies in intensive care report using the TPB as a framework for further understanding, none report specifics around measuring the TPB constructs or the use of questionnaire tools based on the TPB. There were no previous studies using the TPB as a theoretical basis to investigate clinicians' bowel management practices in general, or within intensive care, reported in the literature.

Within the discipline of implementation research, the TPB has proven useful in understanding study outcomes and clinician behaviour change. The TPB has been used in the process evaluation phase for a clinical trial of knowledge translation strategies (Ramsay, Thomas, Croal, Grimshaw, & Eccles, 2010) and to investigate clinicians' intention to use, or compliance with clinical practice guidelines (Beatty, Beatty, & Beatty,

2004; Hart & Morris, 2008; Kortteisto et al., 2010; Puffer & Rashidian, 2004). At the time of inception of this PhD project, there was emerging support for the use of TPB to guide the development of behaviour change interventions (Hardeman et al., 2002).

Often the TPB is used in combination with other theories or constructs. For example, Eccles and colleagues (2007), as well as the TPB, used Social Cognitive Theory, Common Sense Self-Regulation Model, Operant Learning Theory, Implementation Intention and Stage Model to investigate physicians management of upper respiratory tract infection without the use of antibiotics (Eccles et al., 2007). They also included the non-theoretical construct of 'knowledge'. Maue and colleagues (2004) developed the Physician Guideline Compliance Model (PGCM) to predict provider intention to comply and compliance with treatment guidelines. They adapted the constructs and conceptual framework for PGCM from TRA and TPB. A comparison of the TRA and the TPB to predict behaviour was conducted by Millstein (1996) in relation to physicians' intentions to educate adolescent patients about sexually transmitted diseases or HIV transmission.

Within intensive care, there have also been studies that have used TPB constructs in combination with constructs from other theories. For example, when interviewing intensive care and neonatal consultations to identify relevant domains to transfusion practices and to then select appropriate theories for predicting transfusion behaviour, Francis et al (2009b) used the Theoretical Domain Framework constructs identified by Miche et al (2005), which includes constructs from the TPB along with constructs from other psychological theories.

The utility of the TPB in investigating health related behaviours is further highlighted by Francis and colleagues' (2004a) development of a manual to guide the construction of questionnaires to measure the TPB constructs. They aimed to simplify the often complex process of navigating the source literature (for example Ajzen, 2006b) and debate regarding constructs in developing TPB questionnaire tools. This allows for a more streamlined process for health services researchers to develop questionnaires

based on the TPB to measure the core components. Many of the above TPB studies have used questionnaires based on the theory to measure the theoretical constructs.

Ajzen (2006b) asserts that the behaviour of interest being investigated with the TPB needs to be clearly defined using the elements of Target, Action, Context and Time (TACT). Observing this *principle of compatibility* means that in turn the theory constructs can be defined in terms of the same elements. The manual developed by Francis et al (2004a) highlights this principle and provides easy to follow instructions in developing items to measure the theory constructs either directly or indirectly while observing the *principle of compatibility*. In a systematic review, Godin et al (2008) determined that most studies did not comply with the *principle of compatibility* (TACT) when measuring objective behaviour and this results in a lack of correspondence between the measures of behaviour and intention. The use of vignettes or scenarios to assist in clearly defining the intended context for the behaviour of interest is supported (Francis et al., 2004a) and can be especially useful for complex clinical-related behaviours (Godin et al., 2008).

To overcome the difficulties in measuring actual behaviour performance through direct observation, some studies using the TPB constructs have measured actual behaviour through medical record or documentation audits. For example, Maue et al (2004) conducted medical record audits following guideline implementation in addition to self-reported compliance data collected via survey.

Additional constructs

In addition to the TPB constructs, there are a number of constructs identified in the literature that may be useful in determining behaviour intention; knowledge, perceptions of role, and past behaviour.

Michie et al (2005) identified knowledge as one of the relevant theoretical domains in their TDF. Studies measuring the TPB constructs have also included measures of knowledge; for example both Francis et al (2009b) and Bonetti et al (2006) recognised

the relevance of knowledge when predicting clinician behaviour. Bernaix (2000) measured knowledge as well as TRA constructs when determining nurses intention to provide in-hospital breastfeeding support and found that knowledge and attitude were direct predictors of actual behaviour. Knowledge was also measured by Strand and Lindgren (2010) in their study of nurses pressure ulcer attitudes and perceived barriers using the TPB as a framework.

In earlier studies of bowel management, although not in the intensive care environment, there has been an assumption that knowledge is integral to clinician practices and is associated with behaviour; the assumption being if a clinician knows a practice can improve patient outcomes they are more likely to do the practice. There were a small number of studies conducted in other specialties evaluating nurses' knowledge of bowel management practices (Carey, 1995; George, Hayward, Lowe, & Page, 1996; Moore, Matyas, & Boudreau, 1996; Richmond & Devlin, 2003; Vanderlaan & Kolodny, 1989).

Vanderlaan and Kolodny (1989) aimed to improve bowel management practices in two long-term care units in Canada and assessed nursing staffs' knowledge about bowel management via a self-administered 22-item questionnaire prior to, and following, attendance at two educational sessions. They found a statistically significant improvement in nurses' knowledge following the education sessions. Their questionnaire contained multi-choice response format and covered areas such as assessment, gastrointestinal system function, contributing factors to poor bowel function, definitions and symptoms.

Moore, Matyas and Boudreau (1996) conducted another study in Canada and aimed to improve bowel management for all patients in an acute care centre. Their 40-item questionnaire was influenced by Vanderlaan et al's study (1989). Moore and colleagues (1996) used fixed response options, 'true', 'false' and 'don't know' for the 40 items, under four content areas; medications and medical diagnoses that could contribute to constipation, signs and symptoms of constipation and faecal impaction, pharmacological interventions for constipation, nonpharmacological interventions for constipation.

Richmond and Devlin (2003) evaluated nurses' knowledge of prevention and management of constipation and utilised the survey previously administered in the study by Moore et al (1996) with some modification. The survey tool consisted of 28 items, 26 of which had a fixed response format of 'true', 'false', or 'unsure' while the remaining two items were open ended. The researchers directly administered the survey to participants to reduce the possibility of collusion and influencing knowledge scores. A copy of the tool used by Richmond and colleagues (2003) was obtained by the candidate and guided the development of knowledge questionnaire items in the staff survey (see chapter five for further details). Nurses' knowledge of bowel management was also assessed by George et al (1996) and Carey (1995).

Knowledge has also been included as a potential barrier to behaviour in a number of frameworks. Cochrane et al (2007) identified lack of knowledge to be a cognitive-behavioural barrier to optimal healthcare. Cabana et al (1999) included lack of familiarity and lack of awareness as knowledge barriers in their Physician Adherence to Practice Guidelines framework.

Previous studies using the TPB to investigate health care professionals' behaviour intention have included items to investigate the influence of clinicians' perception of roles in relation to the behaviour of interest. Foy et al (2007) included items to measure perceptions of role and responsibility in their questionnaire based on the TPB and SCT when investigating what factors influenced physicians intention to disclose a diagnosis of dementia. In the TDF, Michie et al (2005) included the domain 'social-professional role and identity', also referred to as self-standards, that highlights the importance of professional role to behaviour. Finally, Godin et al (Godin et al., 2008) included 'role and identity' in their *hypothesized theoretical framework for the study of healthcare professionals' behaviour and intention*.

Past behaviour has been acknowledged by many to influence current behaviour and behaviour intention (Maue et al., 2004; McEachan et al., 2011; Ouellette & Wood, 1998). McEachan et al (2011), acknowledged the effect of past behaviour on behaviour intention

and attempted to control for this effect in their meta-analysis of studies using the TPB. Maue et al (2004) added an evaluation of past behaviour in their study of physicians' compliance with clinical practice guidelines using TPB and TRA constructs, accrediting the construct of past behaviour to Bentler and Speckart (1979). In a meta-analysis of studies assessing past behaviours effect on predicting behaviour intention, Oeullette and Wood (1998) determined that past behaviour was an important predictor of future behaviour. Walker et al (2003) reference the theoretical construct of 'frequency of performing the behaviour in the past' and attribute it to be from the action theory, Operant Conditioning, and included it as one of the theoretical constructs in their evaluations. Ajzen (1991) has previously acknowledged the influence of past behaviour and habitual responses in predicting behaviour.

Due to the perceived importance past behaviour has to behaviour intention, there has been adaptation in studies based on the TPB to measure self-reported past behaviour with items worded in much the same way as behaviour intention items (Walker, Grimshaw, & Armstrong, 2001). Godin et al (2008) propose that with the increase in the number of studies predicting behaviour, our understanding of the importance of past behaviour and habit will increase.

Evidence based implementation strategies

There have been a number of systematic reviews of implementation strategies that provide a concise summary of the available evidence and have identified a number of strategies that have shown some effectiveness in engendering clinician behaviour change (Grimshaw et al., 2004b; Grol & Grimshaw, 2003). In particular there are those conducted by the Cochrane Effective Practice and Organisation of Care (EPOC) Group, a review group of the Cochrane Collaboration, and include; printed educational material (Farmer et al., 2011), tailored interventions (Baker et al., 2010), educational meetings (Forsetlund et al., 2009), local opinion leaders (Flodgren et al., 2011), computerised reminders (Arditi, Rège-Walther, Wyatt, Durieux, & Burnand, 2012), and mass media

(Grilli, Ramsay, & Minozzi, 2009). A summary of the effectiveness of each of these implementation strategies is presented in Table 2.2 on page 40.

Printed educational materials traditionally consist of formats such as monographs, publications in peer review journals and clinical guidelines (Farmer et al., 2011). A widely used method for disseminating information, printed educational materials can be a cost effective passive strategy that reaches a large number of healthcare professionals (Grimshaw, Eccles, Lavis, Hill, & Squires, 2012). However, the effectiveness of printed educational materials may only be on improving process outcomes and not patient outcomes.

According to Baker et al (2010), tailored strategies are those designed to improve professional practice that are planned taking into account prospectively identified barriers to change. The Cochrane EPOC Group classify barriers into nine categories: information management, clinical uncertainty, sense of competence, perceptions of liability, patient expectations, standards of practice, financial disincentives, administrative constraints and other (Baker et al., 2010). Interventions that are tailored to address prospectively assessed barriers are more likely to improve professional practice compared to no intervention or simply dissemination (Baker et al., 2010).

Educational meetings, one of the most common continuing medical education activity, can include various formats, such as courses and workshops and printed materials are usually an integral component of educational meetings (Forsetlund et al., 2009). They are likely to only have a small to moderate effect on professional practice and healthcare outcomes for patients.

Local opinion leaders are influential in communication networks and may successfully promote evidence-based practice in their peers (Flodgren et al., 2011). However, effectiveness varies both within and between studies and often opinion leadership is not well described.

Computer generated reminders printed on paper have been shown to achieve a moderate improvement in processes of care (Arditi et al., 2012). The effect of paper reminders on clinicians' performance of desired behaviours is currently the focus of a new Cochrane review (see Pantoja et al., 2009 for the review protocol), though previous reviews have noted the positive use of reminders with other implementation strategies (Grimshaw et al., 2004b).

Grilli et al (2009) suggest mass media interventions may have an important role in influencing the use of healthcare interventions, although the supporting evidence is sparse. The use of mass media to communicate health information to the public has become common (Grilli et al., 2009).

There have been various systematic reviews investigating the implementation strategies for introducing guidelines into clinical practice (Baker et al., 2010; Francke et al., 2008; Grimshaw et al., 2001; Grimshaw et al., 2004b). The evidence suggests that combining two or more implementation strategies, or multifaceted interventions as they are known, can increase the successful uptake of evidence into practice. . However, there is no clear evidence of which strategies or combination of strategies are most effective and in which clinical settings (Grimshaw et al., 2006; Grimshaw, Eccles, Walker, & Thomas, 2002). In fact, Grimshaw et al (2006) did not find a relationship between the number of components and the effects of multifaceted interventions.

Table 2.2 Effectiveness of implementation strategies from selected EPOC systematic reviews

Intervention	Number of studies	Effect size	Author's conclusions
Printed education materials Farmer et al. (2011)	12 randomised trials 11 nonrandomised studies	Median absolute improvement in categorical process outcomes 4.3 (IQR -8.0 to +9.6)	May have beneficial effect on process outcomes but not on patient outcomes.
Educational meetings Forsetlund et al. (2009)	81 randomised trials	Median absolute improvement in care 6.0% (IQR +1.8% to +15.3%)	Alone or combined with other interventions, can improve professional practice and healthcare outcomes for the patients. The effect is most likely to be small. Not likely to be effective for changing complex behaviours.
Tailored interventions Baker et al. (2010)	26 randomised trials (Meta-regression using 12 randomised trials)	Pooled odds ratio 1.54 (95% CI, 1.16 to 2.01)	More likely to improve professional practice than no intervention or dissemination of guidelines.
Local opinion leaders Flodgren et al. (2011)	18 randomised trials	Median absolute improvement of care 12.0% (IQR +6.0% to +14.5%)	Alone or in combination with other interventions may successfully promote evidence-based practice, but effectiveness varies both within and between studies.
Computer-generated reminders delivered on paper Arditi et al. (2012)	27 randomised trials 5 nonrandomised trials	Median improvement of processes of care 7.0% (IQR: 3.9% to 16.4%)	May achieve moderate improvement in process of care.
Mass media Grilli et al. (2009)	22 nonrandomised trials	Not able to be determined	May have an important role in influencing the use of health care interventions.

IQR = interquartile range

There are limitations with the evidence used in these systematic reviews; there are differences in the implementation strategies, the settings, the delivery and the evaluation of the strategies reported in the included studies. It is therefore difficult to determine the true benefit of the strategies.

In addition, despite evidence to support a number of strategies to influence clinicians' behaviour, there is no clear understanding of which are most effective in the intensive care setting (Sinuff, 2006). One particular strategy reported in the literature that was utilised in the ICU is the 'fact sheet' (Berenholtz et al., 2004). Berenholtz et al (2004) provided the 'fact sheet' as a summary of supportive evidence for the practices of interest for the VAP prevention bundle they introduced. Although this strategy can be classified under the education category of implementation strategies, in particular provision of printed educational material, there was no systematic evaluation of the effect of the 'fact sheet' on eliciting clinician behaviour change. Since inception of this research, Black et al (2012) have published a review of multifaceted implementation strategies used in ICU that identified education and daily reminders to be common strategies used as behaviour change interventions. The multifaceted implementation strategies in the included studies varied from between two and four elements. There was a consistent improvement in process compliance for the relevant practice areas with the various multifaceted interventions which was sometimes in conjunction with an improvement in patient outcomes.

There were no systematic evaluations or systematic reviews identified in the literature of the implementation strategies used to introduce BMPs, in general, or within intensive care. Strategies described in individual studies used to implement BMPs include: education packages, poster advertising, and focus group evaluation of barriers. Ferrie and East (2007) report the use of an 'education package' and posters to market their BMP during its introduction. McKenna et al (2001) and McPeake et al (2011) also used education as part of their implementation process. McPeake (2011) conducted focus groups prior to implementation to identify potential barriers to their BMP. Although these studies detected improvements in patient outcomes, there are several limitations

of these previous studies into the introduction or implementation of BMPs within intensive care. The implementation strategies used are not well explained or described, there was no evidence base provided for the strategies used and no direct evaluation of the implementation strategy or strategies.

2.6 Summary: What the literature suggests

There are a number of areas of focus for EBP within the intensive care environment and that have collectively been included in initiatives such as the 5 Million Lives Campaign and Safe Systems – Saving Lives (SSSL); only SSSL included reference to bowel management. Bowel management is overlooked within the intensive care and is also under represented in research studies. Intensive care patients are at risk of complications from poor bowel management practices (Gacouin et al., 2010; Mostafa et al., 2003; Wiesen et al., 2006). Bowel management protocols BMP have been associated with improved outcomes for patients in ICU, however, previous studies reporting the introduction of BMPs have not described or evaluated the implementation strategies well.

Simply providing copies of guidelines or protocols to clinicians does not lead to behaviour change (Francke et al., 2008; Gagliardi & Brouwers, 2012). Instead, evidence-based implementation strategies should be used. There are gaps in understandings regarding effective implementation strategies in the ICU environment (Sinuff, 2006).

Investigation of behaviour change interventions should use a theoretical basis (Michie & Johnston, 2012). The theory of planned behaviour explains the influences on individual's intentions to perform a behaviour (Ajzen, 1991), and behaviour intention can be used as a reliable proxy for actual behaviour (Webb & Sheeran, 2006). Use of a survey based on the TPB can be useful in identifying clinicians' behaviour intentions, and in evaluating the effect of a targeted implementation strategy on clinician behaviour change. Reports of surveys based on the TPB evaluating bowel management practices or

other practices within the ICU were not identified. Therefore, the utility of TPB survey items to measure ICU clinicians' intentions related to bowel management should be undertaken. Theory should continue to have questioners and not just loyal followers (Noar & Zimmerman, 2005). The additional constructs of knowledge, perceptions of roles and responsibilities and past behaviour can also influence behaviour intention. A lack of knowledge can be a potential barrier to behaviour change.

There is a need for systematic evaluation of the implementation strategy used to introduce BMPs into intensive care and their impact on clinician practices and patient outcomes, including the incidence of constipation and diarrhoea. It is the intention of this research to contribute to the understanding of implementation strategies and behaviour change interventions within intensive care.

The following four chapters report the methods and results for the two studies of this research and are presented in the format of manuscripts, either published, accepted for publication or under editorial review.

3 STUDY ONE: NSW INTENSIVE CARE GUIDELINES AND PRACTICES

3.1 Introduction to published manuscript

There are a number of practice areas important for critically ill patients highlighted in the literature and discussed in the previous chapter. The FAST HUG mnemonic highlights some of these key areas (Vincent, 2005). However, it does not reference bowel management. Clinical practice guidelines can offer a convenient way to bring the best available evidence to the clinician and improve practice (Burgers et al., 2004). Within the intensive care environment, it is also common for much of what is done to be routine and not formalised in a protocol or guideline. Before development and implementation of new clinical guidelines it is important to understand the current practices and guidelines in use within the intensive care environment.

The first study that comprises a part of this research aimed to investigate the current intensive care practices (informal) and written guidelines or protocols in use within NSW ICUs and to identify neglected areas of clinical practice to inform study two of this research. The method, results and discussion for this study are presented in a published manuscript in section 3.2 of this chapter.

To provide context to study one, a review of the relevant ICU monitoring and grading systems is first presented, followed by a brief explanation of the project management process for this study.

NSW Intensive Care Coordination and Monitoring Unit

The NSW Intensive Care Coordination and Monitoring Unit (ICCMU), established in 2003, provides advice to the Director–General and NSW Health on matters pertaining to distribution, utilization and outcomes of intensive care services in NSW. Since 2003,

ICCMU's expanded role now includes promoting excellence in the standard of care in all NSW ICUs. Following this aim, a workshop "Getting Evidence into Practice" was conducted in June 2005 with representatives from all NSW ICUs and High Dependency Units (HDUs) attending. At this workshop a number of areas where clinical practice in ICUs may be less than optimal were identified. Guideline Development Networks (GDN) were established across NSW and coordinated by ICCMU to develop evidence based practice guidelines in these areas (Principal Supervisor SM co–chaired one of these groups) (Rolls & Elliott, 2008).

Joint Faculty of Intensive Care Medicine designation system

The Joint Faculty of Intensive Care Medicine (JFICM) classifies ICUs in a designation system recognised within Australia and New Zealand. ICUs are assigned a Level from I – III according to the level of support and services they provide. Those ICUs classified as Level III are 'tertiary referral unit(s) for intensive care patients and should be capable of providing the highest level of care' while Level I ICUs are those 'capable of providing immediate resuscitative management for the critically ill' and 'short term cardio-respiratory support' (Anaesthetists, 1997) (see Figure 3.1 on page 46 for further details).

Figure 3.1 Intensive Care Indicators

LEVEL III ADULT INTENSIVE CARE UNIT

A Level III ICU is a tertiary referral unit for intensive care patients and should be capable of providing the highest level of care including complex multi-system life support for an indefinite period. It must be capable of providing mechanical ventilation, extra-corporeal renal support services and invasive cardiovascular monitoring for an indefinite period. It should have extensive backup laboratory and clinical service facilities. All patients admitted to the Unit must be referred for management to the attending intensive care specialist.

A Level III ICU should be a self-contained area, with easy access to the emergency department, operating theatres and organ imaging. It should have:

1.1. Defined admission, discharge and referral policies.

1.2. At least six staffed and equipped beds.

1.3. More than 350 mechanically ventilated patients per annum.

1.4. A medical director who is recognised by the Joint Specialist Advisory Committee in Intensive Care (JSAC-IC) as a specialist in intensive care. The medical director must have a clinical practice predominantly in intensive care medicine.

1.5. Sufficient supporting specialist(s) so that consultant support is always available to the medical staff in the Unit. There should be sufficient specialist staff to provide for reasonable working hours and leave of all types and to allow the duty specialist to be available exclusively to the Unit; all attending specialists in the Unit should be recognised by the JSAC-IC as specialists in intensive care.

1.6. At least one of the supporting specialists exclusively rostered to the Unit (or to more than one Unit in the same building) at all times. During normal working hours this specialist must be predominantly present in the Unit, and at all other times be able to proceed immediately to it.

1.7. In addition to the attending specialist, at least one registered medical practitioner with an appropriate level of experience exclusively rostered and predominantly present in the Unit at all times.

1.8. A minimum of 1:1 nursing for ventilated and other similarly critically ill patients, and nursing staff available to greater than 1:1 ratio for patients requiring complex management.

1.9. A nurse in charge of the Unit with a post registration qualification in intensive care or in the clinical specialty of the Unit.

1.10. The majority of nursing staff must have a post registration qualification in intensive care or in the specialty of the Unit.

1.11. All nursing staff in the Unit responsible for direct patient care should be registered nurses.

1.12. A nurse educator and formal nursing educational programme.

1.13. 24 hour access to pharmacy, pathology, operating theatres and tertiary level imaging services, and appropriate access to physiotherapy and other allied health services.

1.14. Suitable infection control and isolation procedures and facilities including ideally one wash basin per bed, and at least one isolation room with controllable air flow.

1.15. Formal audit and review of its activities and outcomes.

1.16. Support staff as appropriate, eg. biomedical engineer, clerical and scientific staff.

1.17. Educational programmes for medical staff.

1.18. Adequate office space.

1.19. An active research programme.

1.20. An orientation programme for new staff.

Figure 3.1 Intensive Care Indicator (Cont')

LEVEL II ADULT INTENSIVE CARE UNIT

A Level II ICU should be capable of providing a high standard of general intensive care, including complex multi-system life support which supports the hospital's other delineated roles, eg. general medicine, surgery, trauma management, neurosurgery, vascular surgery, etc. It should be capable of providing mechanical ventilation, extracorporeal renal support services and invasive cardiovascular monitoring for at least several days. All patients admitted to the Unit must be referred for management to the attending intensive care specialist.

A Level II ICU should be a self-contained area with easy access to the emergency department, operating theatres and organ imaging. It should have:

2.1. Defined admission, discharge and referral policies.

2.2. A medical director recognised by the JSAC-IC as a specialist in intensive care. The medical director must have a clinical practice predominantly in intensive care medicine.

2.3. At least one other specialist recognised by JSAC-IC as a specialist in intensive care.

2.4. The Unit needs sufficient specialist staff to provide reasonable working hours and leave of all types and to allow the duty specialist to be rostered and available exclusively to the Unit.

2.5. In addition to the attending specialist, at least one registered medical practitioner with an appropriate level of experience exclusively rostered to the Unit and immediately available at all times.

2.6. A nurse in charge of the Unit with a post registration qualification in intensive care or in the clinical specialty of the Unit.

2.7. All nursing staff responsible for direct patient care being registered nurses and the majority of nursing staff having a post registration qualification in intensive care or in the clinical specialty of the Unit.

2.8. Nursing staff : patient ratio of 1:1 for all ventilated and other critically ill patients; the capacity to provide greater than 1:1 nursing for selected patients: some patients may require less than 1:1 nursing.

2.9. Access to a nurse educator.

2.10. Educational programmes for medical and nursing staff.

2.11. An orientation programme for new staff.

2.12. Formal audit and review of its, operating theatres, basic imaging services and appropriate access to physiotherapy and other allied health services.

2.13. Support staff as appropriate, eg. biomedical engineer, clerical staff.

2.14. Adequate office space.

Figure 3.1 Intensive Care Indicator (Cont')

LEVEL I ADULT INTENSIVE CARE UNIT

A Level I ICU should be capable of providing immediate resuscitative management for the critically ill, short term cardio-respiratory support, and have a major role in monitoring and prevention of complications in "at risk" medical and surgical patients. It must be capable of providing mechanical ventilation and simple invasive cardiovascular monitoring for a period of at least several hours.

The patients most likely to benefit from Level I care include:

(a) patients with uncomplicated myocardial ischaemia;
(b) post-surgical patients requiring special observations and care;
(c) unstable medical patients requiring special observations and care beyond the scope of a conventional ward, and
(d) patients requiring short term mechanical ventilation.

A Level I ICU should be a self-contained area with easy access to the emergency department, operating theatres and organ imaging. It should have:

3.1. Defined admission, discharge and referral policies.
3.2. A medical director who is recognised by JSAC-IC as a specialist in intensive care.
3.3. Consultant support always available.
3.4. At least one registered medical practitioner who is available to the Unit at all times.
3.5. A nurse in charge of the Unit who has a post registration qualification in intensive care or in the clinical specialty of the Unit.
3.6. All nursing staff of the Unit responsible for direct patient care being registered nurses; and the majority must have a post registration qualification in intensive care or in the clinical specialty of the Unit.
3.7. A nursing staff : patient ratio of 1:1 for all critically ill patients.
3.8. A minimum of two registered nurses present in the Unit at all times when there is a patient admitted to the Unit.
3.9. Educational programmes for both medical and nursing staff.
3.10. An orientation programme for new staff.
3.11. Audit of its activities and their outcome.
3.12. 24 hour access to pharmacy, pathology, operating theatres and basic imaging services and appropriate access to physiotherapy and other allied health services.
3.13. Support services, eg. technical, clerical.
3.14. Adequate office space.

NSW Role Delineation

In comparison, the NSW Role Delineation offers a way to classify health care facilities according to the level of support they provide and is not specific to just ICUs. However, using this classification system, ICUs and HDUs in NSW can be graded and classified from Level 3 to 6. Level 6 ICUs are capable of providing more intensive care capability, comparable to a JFICM Level III ICU, while those classified as Level 3 provide shorter term support or HDU facilities (see Figure 3.2 on page 50 for further details).

ICUs and HDUs in NSW monitored by ICCMU are classified under the NSW Role Delineation, including more units than are classified under the JFICM system. This ensures inclusion of smaller ICUs and HDUs with the capacity to provide short-term ventilation. However, JFICM Levels are also recorded for those units who meet this classification standard.

Figure 3.2 NSW Role Delineation

NSW Health Draft Role Delineation

Level 1
Primarily supportive. Management by General Practitioners and generalist community nurses (community patients). Inpatient management has registered nurse in charge on each shift. Quality assurance activities. Interpreters available.
Minimum level of support services: pathology (1), pharmacy (1), diagnostic imaging (1), anaesthetics (1).

Level 2
As Level 1 plus consultation available from specialist physician. Continuing nurse education programs available specific to needs of the service.
Minimum level of support services as above.

Level 3
As level 2 plus consultative support from clinical nurse specialist/ clinical nurse consultant (community patients). Inpatient management by accredited medical practitioners or by specialist physicians. Nursing unit manage. Access to social worker. Formal quality assurance program.
Minimum level of support services: pathology (1), pharmacy (1), diagnostic imaging (1), anaesthetics (1), ICU (2), CCU (1).

Level 4
As Level 3 plus mobile consultancy support from medical practitioner specialising in palliative care (community patients) and designated palliative care beds managed by medical practitioner specialising in palliative care. Social worker and allied health professionals on staff.
Minimum level of support services: pathology (3), pharmacy (2), diagnostic imaging (2), anaesthetics (3), ICU (3), CCU (2), operating suites (3).

Level 5
As Level 4 plus integrated community/hospice consultative service under direction of medical practitioner accredited in palliative medicine or palliative care physician. Has medical officer or medical registrar. Clinical nurse consultant or clinical nurse specialist, social worker and allied health professional staff attached to service. Has links with oncology, radiotherapy, anaesthetics, psychiatry, multidisciplinary pain clinic, rehabilitation and surgical services.
Minimum level of support services: pathology (4), pharmacy (4), diagnostic imaging (2), nuclear medicine (3), anaesthetics (4), ICU (2), CCU (1), operating suites (3).

Level 6
As for Level 5 plus palliative care specialist providing liaison consultancy to various units at major referral hospitals. Link with multidisciplinary pain clinic. Has registrar in palliative medicine. Based in or has staff with conjoint appointments between hospice and major referral hospital.
Minimum level of support services: pathology (4), pharmacy (4), diagnostic imaging (5), nuclear medicine (4), anaesthetics (5), ICU (3), CCU (1), operating suites (4).

Classification of ICUs and HDUs in this study

Intensive Care Units (ICUs) and High Dependency Units (HDUs) included in this study will be herein referred to collectively as '*units*'. Units included in this study are classified and ranked according to the JFICM designation system as it is recognised across the Australian and New Zealand Intensive Care community. However, there are other units included in this study that come under the monitoring of ICCMU yet are not classified under the JFICM system. These units will be referred to as HDUs when describing their level. In this study HDUs are those units with the capacity to provide short term ventilation and as such excludes units akin to Acute Coronary Care units.

Project Management

This study was a joint initiative between ICCMU and Australian Catholic University, School of Nursing, NSW and ACT. A project working group was established (see Table 3.1 on page 52) in November 2005. Members of the working group from ICCMU were interested in telephoning units within NSW to establish the current practice for endotracheal tube (ETT) and tracheostomy tube stabilisation. Members of the working group from Australian Catholic University (led by the candidate) were interested in establishing the existence of guidelines for a number of practice areas within units in NSW; bowel management, feeding, analgesia, sedation, thromboembolic prevention, head of bed elevation, stress ulcer prophylaxis and glucose control. Given that the target participant in each unit to answer these questions was the same person, it was agreed that a combined survey would be developed and administered. Results relating to the ETT and tracheostomy tube stabilisation practices are the property of ICCMU however the impact of this added section in the questionnaire will be discussed where appropriate and permission to present these results in this thesis has been granted (Appendix 3).

Ethics approval for this study was obtained from Australian Catholic University Human Research Ethics Committee (HREC) (see Appendix 1).

Table 3.1 Working Group

Members	Project Role	Affiliation
Serena Knowles	Coordinator	Australian Catholic University
Kaye Rolls	Co-investigator	ICCMU
Sandy Middleton	Supervisor	Australian Catholic University
Jennifer Hardy	Supervisor	Australian Catholic University
Anthony Burrell	Advisor	ICCMU
Doug Elliot	Supervisor	ICCMU
		University of Technology, Sydney
Di Kowal	Advisor	ICCMU
Karena Hewson	Advisor	ICCMU

The following section presents the manuscript published in Australian Critical Care in 2010. The referencing style is that required by the journal and the corresponding references are presented at the end of the manuscript.

3.2 Manuscript I

Knowles, S., Rolls, K., Elliott, D., Hardy, J., & Middleton, S. (2010). Patient care guidelines: A telephone survey of intensive care practices in New South Wales. *Australian Critical Care, 23*(1), 21-29. doi:10.1016/j.aucc.2009.10.001

Abstract

Background

There are a number of practice areas highlighted in the literature as important for the care of critically ill patients. However, the current implementation of evidence into clinical practice for these areas is largely unknown. The development of clinical practice guidelines can translate the current evidence into useful tools to guide clinicians in providing evidence based care.

Aim

To identify existence of current guidelines and informal routine procedures and clinicians' views of same within New South Wales (NSW) Intensive Care Units (ICUs) and High Dependency Units (HDUs) for 11 practice areas, namely, bowel management, endotracheal tube (ETT) stabilisation, tracheostomy tube stabilisation, feeding, analgesia, sedation, thromboembolic prevention, head of bed elevation, ulcer prophylaxis and glucose control.

Method

A telephone survey conducted with a representative from NSW ICUs and HDUs.

Results

There was variation in the number of guidelines and informal routine procedures reported for the 11 practice areas within the study units. Larger ICUs (Joint Faculty of Intensive Care Medicine Level II and Level III) and those who employed an onsite CNC were significantly more likely to have formal guidelines in place. Overall, there were very few audits reportedly conducted for the 11 practice areas. Bowel management was the area of practice most respondents reported as a neglected area of critical care nursing practice and the one they were least satisfied with.

Conclusion

This survey provides a baseline of current practice and guideline use within NSW ICUs and HDUs. It also highlights areas for consideration to further develop clinical practice guidelines that could benefit critically ill patients.

Introduction

Critically ill patients have complex management needs that pose unique challenges for clinicians. Areas for practice improvement in the Intensive Care Unit (ICU) have recently been highlighted in the literature [1-4]. A systematic review identified interventions that improve patient outcomes and developed a potential list of quality indicators to improve ICU care [2]. These included prevention of ventilator pneumonia, appropriate sedation and appropriate peptic ulcer disease and deep venous thrombosis prophylaxis [2]. Some of these quality indicators have been embraced by the Institute for Healthcare Improvement (IHI) in the United States of America as part of their 5 Million Lives Campaign. The ventilator-associated pneumonia (VAP) intervention, one of 12 intervention bundles in the campaign, prescribes care for elevation of head of bed, sedation vacation, peptic ulcer prophylaxis and deep vein thrombosis prophylaxis [5].

Similar to the IHI's 5 Million Lives Campaign, the Safer Systems – Saving Lives (SSSL) project in Australia [6] also drew on the emerging evidence for single interventions and combined them into a 'bundled' care approach for intensive care patients in their "Preventing ventilator-associated complications" (VAC) intervention. This intervention incorporated eight practice areas or care components: daily assessment of readiness to extubate, deep venous thrombosis prophylaxis, peptic ulcer prophylaxis, skin integrity breakdown, analgesia management, nutritional planning, bowel management and elevation of the head of bed.

Additionally, Vincent [7] has proposed the 'Fast Hug' mnemonic to draw ICU clinicians' attention to seven key aspects of general care for all critically ill patients: **F**eeding, **A**nalgesia, **S**edation, **T**hromboembolic prevention, **H**ead of bed elevation, **U**lcer prophylaxis and **G**lucose control. Vincent advocates clinicians consider these seven areas at least once a day to ensure the appropriate care is given to all patients [7]. Although intended as a checklist or reminder for ICU clinicians, the mnemonic eloquently brings together a number of practice areas to be addressed for each critically ill patient.

However, Vincent fails to highlight the important area of bowel management which was included in the Safer Systems – Saving Lives project. While the management of critically ill patients' bowel function is often overlooked in light of more immediate demands of cardio-pulmonary support [8-10], critically ill patients are also more likely to suffer from constipation and diarrhoea due to factors such as the medications they receive, their immobility status and the feeding formulas administered [11-14].

Another ICU practice area recently highlighted in the literature, yet not included in the previously discussed Fast Hug, 5 Million Lives campaign or Safer System – Saving Lives project, is the stabilisation of oral endotracheal or tracheostomy tubes [15]. In their systematic review Gardner et al [15] found very little evidence to support one method of stabilisation over another, yet acknowledged securing the endotracheal or tracheostomy tube is an important aspect of maintaining a patent airway and ensuring adequate ventilation for the critically ill patient.

The 5 Million Lives Campaign and the Safe Systems – Saving Lives project both encouraged the use of checklist or audit forms to prompt clinicians in the care they provide. The projects also involved local adaptation of the evidence into protocols or guidelines [6, 16].

Despite an ever increasing amount of research generated evidence, clinicians often fail to apply this evidence into their practice [17]. One strategy proposed to help bring the evidence to the busy clinician is the development of clinical practice guidelines (CPG) [18]. Well developed CPGs summarise the current evidence and present it in a usable format for clinicians [19]. Guidelines can lead to improvements in patient care for a number of reasons, including, their ability to summarise research evidence, improve the available information about optimal care, and provide a basis for interdisciplinary collaboration [19]. In a systematic review, Grimshaw and Russell [20] found statistically significant improvements in the process of care and outcomes as the result of clinical guidelines.

It is important to recognise that the absence of a guideline or protocol does not necessarily equate to no routine practice in any given area. Often much of the

practice within ICUs is routine and built into the processes of care [21], without being formalised in a written guideline or protocol.

This paper presents the results of a survey on the existence of current guidelines and informal routine procedures in the following 11 practice areas within New South Wales (NSW) public adult ICUs: bowel management, endotracheal tube (ETT) stabilisation, tracheostomy tube stabilisation, feeding, analgesia, sedation, thromboembolic prevention, head of bed elevation, ulcer prophylaxis, and glucose control. We also sought to determine any predictors for the existence of guidelines and informal routine procedures.

Method

A list of all public hospitals in NSW with ICUs and HDUs was compiled (n=44). Included ICUs were classified using the Joint Faculty of Intensive Care Medicine (JFICM) Levels, where Level III were those tertiary referral ICUs capable of providing the highest level of care and Level I ICUs were those capable of providing immediate and short term management. HDUs included in this study were those units with the capacity to provide short term ventilation and as such excluded units such as acute Coronary Care Units.

Nurse Unit Managers (NUMs) from each eligible unit were contacted via email and asked to confirm the name of a senior nurse with responsibility for nursing education and practice development within their units. Initial contact with respondents was made by mailing an information letter and a copy of the telephone survey. Each respondent was then telephoned to obtain consent to participate and to arrange a suitable time for the telephone interview. Surveys were completed by telephone interview.

Survey Instrument

For each of the 11 areas of practice, namely, enteral nutrition, parenteral nutrition, analgesia, sedation, thromboembolic prevention, head of bed elevation, ulcer prophylaxis, glucose control, bowel management, endotracheal tube stabilisation and

tracheostomy tube stabilisation, our 24-page questionnaire asked respondents about existing ICU written formal protocols or guidelines, herein referred to as 'guidelines' (eight questions), their opinion about the practice area (two questions) and audit activities within their units (five questions). These questions used a variety of fixed response options including, 5 point Likert scales from 'highly unlikely' to 'highly likely' or 'very dissatisfied' to 'very satisfied'; 'yes', 'no', 'unsure' options; and time categories ranging from 'within last 6 months' to 'greater than 4 years'. Three of the above questions included in our questionnaire were adapted from a professional opinion survey on bowel management guidelines conducted in the UK [10], namely "*Does your unit have a bowel management guideline/protocol?*", "*If no, would you find it helpful to have a guideline/protocol for practice?*" and "*In your opinion do you feel bowel management is a neglected area of critical care nursing practice?*" and were repeated for each of the 11 practice areas.

For nine areas of practice, namely enteral nutrition, parenteral nutrition, analgesia, sedation, thromboembolic prevention, head of bed elevation, ulcer prophylaxis, glucose control and bowel management, respondents were asked about routine procedures or practices in their ICU that were not formalised in a guideline or protocol (two questions), herein referred to as 'informal routine procedures'. These questions had the same variety of fixed response options as mentioned above. For the remaining two practice areas, namely endotracheal tube stabilisation and tracheostomy tube stabilisation, instead of questions about informal routine procedures we asked a set of questions around the specific methods of stabilisation used within the unit, the skin integrity assessment and management conducted, and who decided on the method of stabilisation used. These findings have been reported elsewhere[22].

Respondent demographic data were collected (five questions) including sex, length of time registered, membership of Australian College of Critical Care Nurses (ACCCN), current position and length of time in that position. Respondents were also asked if they had heard of the FAST HUG approach to patient care (one questions) and if they were aware of the recent systematic review on endotracheal tube stabilisation practices [15] (one question).

Demographic data for participating units were obtained from the ICCMU database, including the level of the unit and employment of Clinical Nurse Consultant (CNC) and educators. Employment of an 'onsite CNC' was considered present if the CNC was responsible for the ICU/s in only one hospital. 'Area CNC' was used to describe those responsible for ICUs in more than one hospital. Employment of an educator was present if the unit had at least one dedicated nurse educator for the ICU. There was no distinction made between Clinical Nurse Educator (CNE) or Nurse Educator (NE), and the presence of more than one CNE, NE or CNC was not measured.

Data Analysis

Data were analysed using SPSS Version 14 [23]. Frequencies for variables were determined. For the purposes of this paper, the unit of analysis for the existence of guidelines and informal routine procedures was the ICU/HDU, herein referred to as 'unit'. Where participants were asked to express an opinion or view this is clearly stated in the presentation of the results. Where it was reported that a unit did not have a written formal guideline for a practice area, we undertook analyses to determine if a routine informal procedure had been reported for that practice area. Where there was no formal guideline and no routine informal procedure reported we referred to this as a 'protocol gap'. Chi-square tests for categorical variables and Mann-Whitney U tests for continuous variables were performed to determine relationships between the level of ICU, employment of educator, onsite CNC, and area CNC with the presence of formal guidelines and informal routine procedures. The relationship between the number of guidelines per unit, the number of informal routine procedures and views of the respondents were also analysed using chi-square, Fischer's Exact and Mann-Whitney U tests.

Ethics approval to conduct this study was granted from the Human Research Ethics Committee at ACU National.

Results

Data were provided from 41 of the 44 eligible units (response rate 93%) with all NSW Area Health Services were represented. There were 11 (27%) JFICM Level III ICUs,

ten (24%) JFICM Level II ICUs, 13 (32%) JFICM Level I ICUs and seven (17%) HDUs (Table 3.2 on page 61). Forty respondents completed the survey (i.e. one respondent reported for two units). The majority of respondents were female (n=31, 78%) and members of the Australian College of Critical Care Nurses (ACCCN) (n=26, 65%) (Table 3.2 on page 61).

Respondents had been registered nurses for 7 - 40 years (median = 20) and had been employed in their current position ranged for a median of 2.3 years (ranged 1 month to 20 years).

Table 3.2 Demographic Data

Unit Demographics (n=41)	**n (%)**
Level of Unit	
JFICM Level III	11 (27)
JFICM Level II	10 (24)
JFICM Level I	13 (32)
HDU	7 (17)
Unit employs	
Educator	32 (78)
Unit CNC	13 (32)
Area CNC	20 (49)
Respondent Demographics	
Female	31 (78)
Male	9 (22)
Member of ACCCN	26 (65)
Current Position	
Registered Nurse (RN)	1 (3)
Clinical Nurse Specialist (CNS)	3 (7)
Clinical Nurse Educator (CNE)	12 (30)
Clinical Nurse Consultant (CNC)	14 (35)
Nurse Educator (NE)	1 (3)
Nurse Unit Manager (NUM)	9 (22)

Formal Guidelines

No participants reported that their unit had written formal guidelines for all 11 practice areas but all units had at least one guideline (median =5). The highest number of reported written formal guidelines for any one unit was nine, reported from only one unit. Guidelines with the highest reported frequency were enteral nutrition (n=33, 81%) and parenteral nutrition (n=31, 76%). Thromboembolic prevention (n=10, 25%) and head of bed elevation (n=4, 10%) were the areas of practice with the lowest reported frequency (Table 3.3 on pages 65-66).

Interestingly, thromboembolic prevention was the guideline most frequently reported as 'highly likely' or 'likely' to be implemented for all patients. Participants from all ten units (100%) with this guideline reported this to be the case (Table 3.3 on pages 65-66). In contrast, head of bed elevation (n=2, 50%) and bowel management (n=7, 54%) were the least frequently reported guideline as 'highly likely' or 'likely' to be implemented for all patients. Participants from all eight units (100%) without a guideline for enteral nutrition agreed a guideline would be helpful for practice (Table 3.3 on pages 65-66).

Participants from JFICM level II and III ICUs were significantly more likely to report their units as having a higher number of formal guidelines (median = 6) than participants from JFICM level I ICUs and HDUs (median = 4) (χ^2=4.188, *df*=1, p=0.04). Participants from units who employed a clinical nurse consultant (CNC) onsite (n=27) were significantly more likely to report their unit as having more formal guidelines (median = 6) than participants from units who did not employ an onsite CNC (n=13) (median = 5) (*z*=-2.141, p=0.03).

In comparison, there was no statistically significant difference between the number of reported formal guidelines for units who employed an area CNC (n=20) (median =5) and for those units who did not employ an area CNC (n=21) (median =5) (*z*=-0.754, *p*=0.451).

There was no statistically significant difference between the number of reported guidelines for units where a nurse educator was employed (either CNE or NE) (n=32)

(median =5) and the number of reported guidelines for units not employing a nurse educator (n=8) (median = 4.5) (z=-1.168, p=0.243).

Informal Routine Procedures

The median number of informal procedures reported was five (the highest number reported for any unit was eight, reported for only one unit). One unit was reported to have no informal routine procedures for any of the nine practice areas. The practice area with the most highly reported informal routine procedure was analgesia (71%) followed by thromboembolic prevention (68%) and sedation (66%) (Table 3.3 on pages 65-66).

Parenteral nutrition (n=8, 89%), glucose control (n=16, 88%) and ulcer prophylaxis (n=21, 88%) were the areas of practice for which informal routine procedures were most frequently reported as 'likely' and 'highly likely' to be implemented for all patients (Table 3.3 on pages 65-66). Bowel management (n=20) was the area of practice for which informal routine procedures were least frequently reported as 'likely' or 'highly likely' to be implemented for all patients (n=7, 35%) (Table 3.3 on pages 65-66).

'Protocol gap': Practice areas with no formal guideline and no informal routine procedure

Only eight units (20%) were reported by participants to have an informal routine procedure where no formal guideline was in place. For 33 units (80%) there were practice areas for which there were no formal guideline and no informal routine procedure, that is a 'protocol gap'. This protocol gap ranged from one practice area to eight practice areas per unit (median = 2).

The areas of practice with the highest number of 'protocol gaps' were head of bed elevation (n=14, 34%), bowel management (n=12, 29%) and analgesia (n=11, 27%) (Table 3.3 on pages 65-66). Enteral nutrition (n=5, 12%) and parenteral nutrition (n=5, 12%) had the lowest number of 'protocol gaps' (Table 3.3 on pages 65-66). Smaller ICUs (JFICM level I and HDUs) (n=20) were significantly more likely to have 'protocol gaps' (median = 2) than larger ICUs (JFICM level II and III ICUs) (n=21)

(median = 1) (z= -3.393, p=0.001). Units not employing an onsite CNC (n=27) were also significantly more likely to have greater numbers of 'protocol gaps' (median = 2) than units employing an onsite CNC (n=13) (median = 1) (z=-2.216, p=0.031).

Table 3.3 Summary of Practices

Practice area	**Written formal guidelines** (n=41)			**Informal routine procedures** (n=41)		**Protocol gap** (n=41)	**Audits** (n=41)	**Views** (n=41)
	Existing written guideline ^	**Highly likely or likely implemented for all patients ^**	**No written formal guideline but would be helpful ^**	**Informal routine procedure ^***	**Highly likely or likely implemented for all patients ^***	**No written formal guideline or informal routine procedure ^***	**Audit conducted ^**	**View of '*neglected area of critical care nursing practice*' ^**
	n (%)	**n/# (%)**	**n/# (%)**	**n (%)**	**n/# (%)**	**n (%)**	**n (%)**	**n (%)**
Analgesia	11 (27)	9/11 (82)	23/28 (82)	29 (71)	22/29 (76)	11 (27)	6 (15)	18 (44)
Bowel Management	13 (32)	7/13 (54)	26/28 (92)	20 (49)	7/20 (35)	12 (29)	8 (20)	28 (68)
Endotracheal Tube stabilisation	17 (42)	16/17 (94)	21/24 (88)				2 (5)	8 (20)
Enteral nutrition	33 (81)	26/33 (79)	8/8 (100)	7 (17)	5/7 (71)	5 (12)	5 (12)	12 (29)
Glucose control	24 (59)	19/24 (79)]	15/17 (88)	18 (44)	16/18 (88)	7 (17)	4 (10)	19 (46)
Head of bed elevation	4 (10)	2/4 (50)	30/36 (83)	24 (59)	17/24 (70)	14 (34)	7 (17)	26 (67)
Parenteral nutrition	31 (76)	27/31 (87)	7/9 (78)	9 (22)	8/9 (89)	5 (12)	2 (5)	6 (15)
Sedation	15 (37)	11/15 (73)	23/26 (88)	27 (66)	18/27 (67)	8 (20)	6 (15)	20 (49)
Thromboembolic prevention	10 (25)	10/10 (100)	28/30 (93)	28 (68)	24/28 (86)	6 (15)	4 (10)	13 (32)

Table 3.3 Summary of Practices (Cont')

Practice area	Written formal guidelines (n=41)			Informal routine procedures (n=41)		Protocol gap (n=41)	Audits (n=41)	Views (n=41)
	Existing written guideline ^	Highly likely or likely implemented for all patients ^	No written formal guideline but would be helpful ^	Informal routine procedure ^*	Highly likely or likely implemented for all patients ^*	No written formal guideline or informal routine procedure ^*	Audit conducted ^	View of '*neglected area of critical care nursing practice*' ^
	n (%)	n/# (%)	n/# (%)	n (%)	n/# (%)	n (%)	n (%)	n (%)
Tracheostomy tube stabilisation	25 (61)	22/24 (92)	15/16 (94)				1 (2)	3 (7)
Ulcer Prophylaxis	11 (27)	8/11 (73)	23/29 (82)	24 (59)	21/24 (88)	8 (20)	1 (2)	12 (29)

^ More than one answer possible per unit

Relevant denominator shown

* Questions about informal routine procedures not asked for endotracheal or tracheostomy tube stabilisation

Respondent views

The areas of practice for which respondents reported the highest level of satisfaction were tracheostomy tube stabilisation (n=33, 81%) and parenteral nutrition (n=29, 71%) (Table 3.4 on page 68). Respondents were least satisfied with bowel management (n=21, 51%) and sedation practices (n=18, 45%) (Table 3.4 on page 68). Glucose control was the only practice area where respondents were significantly more likely to report being 'satisfied' or 'very satisfied' where there was a formal guideline present (n=18, 75%) compared to respondents from units without a guideline (n=6, 25%) (χ^2=6.464, *df*=1, p=0.01).

Bowel management (68%) and head of bed elevation (67%) were the most highly reported practice areas to be viewed as a neglected area of critical care nursing practice (Table 3.3 on pages 65-66). Enteral nutrition, glucose control and thromboembolic prevention were the only practice areas where a statistically significant association was found between the presence of formal guidelines and the respondents' reporting the practice area as neglected. Specifically, respondents were less likely to report that enteral nutrition was a neglected area of critical care nursing practice if there was an enteral nutrition guideline in place (n=23, 93%) compared with respondents from units that did not have a guideline (n=2, 7%) (Fischer's Exact test p=0.004). Similarly, respondents were less likely to report glucose control as a neglected area of critical care nursing practice if there was a glucose guideline in place (n=16, 73%) compared with respondents from units without a guideline (n=6, 27%) (χ^2=3.939, *df*=1, p=0.047). In contrast, all respondents who reported thromboembolic prevention as a neglected area of critical care nursing practice reported no guideline in their unit (n=13, 100%) (Fischer's Exact test p=0.017).

Table 3.4 Satisfied with management (n=41)^

	Satisfied/ very satisfied	Neither	Dissatisfied/ very dissatisfied
Practice area	**n (%)**	**n (%)**	**n (%)**
Tracheostomy tube stabilisation	33 (81)	5 (12)	3 (7)
Parenteral nutrition	29 (71)	8 (20)	4 (9)
Endotracheal tube stabilisation	26 (64)	14 (34)	1 (2)
Enteral nutrition	25 (61)	9 (22)	7 (17)
Ulcer prophylaxis	25 (61)	10 (25)	6 (14)
Glucose control	24 (58)	8 (20)	9 (22)
Thromboembolic prevention	22 (53)	13 (32)	6 (15)
Analgesia	17 (42)	10 (24)	14 (34)
Sedation	13 (31)	10 (24)	18 (45)
Bowel management	10 (25)	10 (24)	21 (51)
Head of bed elevation	6 (15)	19 (46)	16 (39)

^ More than one answer possible per unit

Audit of Practice Areas

Bowel management (n=8, 20%) and head of bed elevation (n=7, 17%) were the practice areas where auditing was most frequently reported (Table 3.3 on pages 65-66). Overall, there were 46 audits reported across participating units. Of these audits, 21 (46%) were conducted prospectively, 19 (41%) were retrospectively, and one (2%) was conducted both retrospectively and prospectively. The nature of the data collection was not identified for five audits (11%). There was a large variation reported in the time since the audits were conducted (range within last six months to greater than 4 years).

Knowledge of 'Fast Hug' and systematic review of endotracheal tube stabilisation

Nineteen respondents (46%) stated they had heard of the 'Fast Hug'[7] approach to patient care. These respondents were significantly more likely to be from larger ICUs (JFICM Level II and III) (median level of ICU was Level II) than respondents who had not heard of the 'Fast Hug' approach to patient care (n=22) (median level of ICU was Level I) ($z=-3.037$, $p=0.002$). Twenty respondents (49%) reported they were aware of the recent systematic review on endotracheal tube stabilisation practices [15].

Discussion

The areas of practice examined in this survey have been previously highlighted as important to the care of critically ill patients [1, 7, 13, 15, 24-28]. Given that clinical practice guidelines have been shown to improve processes of care [20] the existence of guidelines for these practice areas could improve the care of ICU patients within NSW Intensive Care Units. We found the existence of formal written guidelines for these 11 practice areas within the study units was variable. Additionally, where formal guidelines existed, implementation was often reported as less than optimal. The existence of informal routine procedures was also variable. Larger ICUs and those employing an onsite CNC were significantly more likely to have written formal guidelines in place. Interestingly, employment of a CNE/NE or Area CNC was not a predictor for the presence of more guidelines.

The development of guidelines at a local level is acknowledged as a time and resource intensive exercise [19]. Given this fact, it is not surprising that many of the units surveyed did not have guidelines in place for all of the practice areas. It is possible that larger ICUs have more resources available to them and are therefore more capable of developing and implementing guidelines. The reason why an onsite CNC was a predictor of the existence of guidelines and not a CNE/NE or Area CNC is unclear but of note. It may be a result of a particular attribute of these senior clinicians or the fact they have more dedicated time or focus for the development of guidelines.

The finding that many units did not have routine informal practices or procedures for these practice areas was unexpected, considering the amount of literature highlighting these areas as important for critically ill patients and that much of what clinicians do is routine. Additionally, over three quarters of the units reported no formal guideline and no informal routine procedure in place for at least one of the practice areas, referred to as a 'protocol gap'. Identification of these 'protocol gaps' means that there are opportunities for development of practice and/or improvement in the documentation for these 11 areas.

Not surprisingly, larger ICUs (JFICM II & III) were more likely to have formal guidelines, and therefore were less likely to have 'protocol gaps'. This may be due to a higher degree of available resources within larger ICUs. Conversely, smaller units (JFICM I & HDUs) in this study were more likely not to have guidelines or informal routine procedures and therefore more likely to have a 'protocol gap'. These results may reflect the limited resources of smaller units and lower staff numbers such as a CNC available to assist clinicians to keep pace with changes in practice. These findings therefore support initiatives from organisations such as the NSW Intensive Care Coordination and Monitoring Unit (ICCMU) to form networks to develop practice guidelines [29] and enabling improvements to ICU practices for all NSW ICUs and HDUs.

This study also showed relatively low rates of auditing of the 11 practice areas within NSW ICUs. Clinical audit can be an effective quality improvement tool [30] and forms an important aspect of evaluating guidelines after their implementation [31]. Results of

this study indicate that many units have guidelines in place that have not been evaluated by audit after their implementation. This suggests that without evaluation, the true extent to which the guidelines within the study units are implemented into usual care and their impact on improving patient outcomes cannot be accurately determined.

Bowel management was the practice area most reported as a neglected area of critical care nursing practice and where more respondents reported being 'dissatisfied' or 'very dissatisfied' with the management in their units. This is comparable to results from a previous survey[10] where 80% of respondents felt bowel management was a neglected area. The number of units in our study with formal guidelines or informal routine procedures for bowel management was relatively low compared to the other practice areas. A similar result was reported in the same previous study[10] with only 21% of units having a bowel management protocol. There were also almost a third of units with neither a formal guideline nor informal routine procedure for bowel management. Interestingly, bowel management was the practice area where the greatest number of audits were reported. This result, combined with the participants' reported dissatisfaction with bowel management, may indicate that NSW ICU clinicians are already aware of a deficiency in their practice in this area and are looking for ways in which they can improve practice. Our findings support a previous suggestion that a guideline or protocol for the management of bowel function for patients in the ICU could assist clinicians and reduce the incidence of complications associated with poor bowel management [24].

This survey provided an indication of current practice and guideline use within NSW ICUs and HDUs. Although there was an excellent survey response rate, results should be interpreted with caution as data were collected as a self-reported measure from one respondent as a representative for each unit. It is important to remember that responses to this survey may not reflect the actual practice within the study units. It is also important to acknowledge that the mere presence of guidelines does not ensure that local practice conforms to that guideline. The degree to which guidelines are implemented within the units was not measured, and only an opinion expressed of participants.

Conclusion

The results of this telephone survey indicate that larger ICUs have more formal written guidelines in place and smaller ICUs are more likely to have a number of areas with a 'protocol gap'. Workforce issues also predicted the number of formal guidelines and 'protocol gaps'. Bowel management is an identified area of concern for ICU clinicians in NSW and more needs to be done to improve patient care in this area.

ICCMU has recently coordinated the development of guidelines for six common clinical practices (eye care, oral care, endotracheal tube management, suctioning, arterial line management, central venous catheter management) using consensus methods [29]. There are however opportunities for the sharing and/or development of protocols for other clinical practice areas identified in this survey (i.e. bowel management, feeding, analgesia, sedation, thromboembolic prevention, head of bed elevation, ulcer prophylaxis, and glucose control). Recommendations for practice therefore include: 1) development of a bowel management protocol; 2) construction of audit tools and processes to enable systematic and standardised evaluation of formalised clinical practice guidelines in the identified areas of practice; 3) exploration of informal routine procedures to inform the development of formal guidelines.

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3.3 Summary to published manuscript I

There was varied use of guidelines in NSW ICUs for the 11 practice areas in study one. From the results of the first study presented in the preceding manuscript, the practice area of bowel management was identified as a neglected area of practice in NSW ICUs and one for which there was limited written guidelines or protocols. Hence bowel management was chosen as the focus for the second study of this research. The next chapter reports the development and testing of a questionnaire based on the TPB for study two.

4 STUDY TWO: CONSTRUCTION AND TESTING OF AN INSTRUMENT

4.1 Introduction to manuscript under review

The TPB was chosen as the theoretical basis for study two of this research. As discussed in the literature review chapter (see page 29), the TPB constructs of attitude, subjective norm and perceived behavioural control are measured as predictors of behaviour intention. Despite Francis and colleagues (2004a) providing comprehensive guidance in the development of questionnaires to measure the TPB constructs, it is important to evaluate developed tools to ascertain agreement of the items with the theory constructs. Theory should also have constructive questioning to strengthen its applicability (Noar & Zimmerman, 2005).

A questionnaire with items to measure the TPB constructs was constructed as part of study two of this research. The development of the questionnaire including selection of theory and behaviours, construction of questionnaire items and testing of the instrument are presented in a manuscript submitted for publication in the following section (Section 4.2) of this chapter. The manuscript, submitted to *Research in Nursing and Health*, is presented in line with the journals requirements for referencing style and the reference list is provided at the end of the chapter.

4.2 Manuscript II

Knowles S, Lam L, McInnes E, Hardy J, Elliott D & Middleton S. Clinicians' attitudes, beliefs and behaviour intentions related to bowel management for intensive care patients: construction and testing of an instrument using the Theory of Planned Behaviour.

Under Editorial Review: *Research in Nursing and Health*.

Abstract

Poor bowel management can have deleterious consequences for the critically ill. We constructed and tested an instrument based on the theory of planned behaviour to measure intensive care clinicians' attitudes, beliefs and behaviour intentions related to three bowel management practices. Data were collected from 76 nurses and 12 doctors. Confirmatory factor analysis for each practice section demonstrated loading of the items onto three factors and explained 63% to 69% of total variance, however, these were not entirely in line with published TPB constructs. We achieved adequate internal consistency (alphas 0.709 and 0.848) for attitude and subjective norm construct scales across the behaviours. Application of the instrument could identify factors impeding practice change for this important area of patient care.

Background

Bowel management in the intensive care

Intensive care is often portrayed in terms of the high level of monitoring, technology and interventions used to support commonly failing cardiovascular, respiratory and renal physiological systems. Although not placed as highly on the list of priorities for a critically ill patient (Marshall, 2005), a poorly functioning and managed bowel can have detrimental consequences for patient outcomes in the intensive care unit (ICU) environment (Gacouin et al., 2010). Patients in ICU are at increased risk of gastrointestinal complications due to factors such as their immobility, dehydration, and receiving continuous infusions of sedatives and/or analgesics (Asai, 2007). Mechanical ventilation can also either cause or worsen gastrointestinal complications associated with the underlying critical illness (Mutlu, Mutlu, & Factor, 2001), including delays in weaning from mechanical ventilation (Mostafa, Bhandari, Ritchie, Gratton, & Wenstone, 2003). Complications associated with poor bowel management include, increased length of stay (both in the ICU and in hospital), bowel obstruction, disturbed motility and perforation (Mostafa et al., 2003; van der Spoel, Oudemans-van Straaten, Stoutenbeek, Bosman, & Zandstra, 2001). Constipation has been reported to be as high as 83% in critically ill populations (Montejo et al., 2002; Mostafa, Bhandari, Ritchie, Arthan, & Gratton, 2001; Mostafa et al., 2003; Patanwala, Abarca, Huckleberry, & Erstad, 2006), causing delays in ICU discharge; a problem in 18% of UK units (Mostafa et al., 2003; Mutlu et al., 2001).

Although poor bowel management has been reported as a problem in the literature, the use of protocols or guidelines to inform practice is relatively sparse (Knowles, Rolls, Elliott, Hardy, & Middleton, 2010; Mostafa et al., 2003; Thorpe & Harrison, 2002). It would appear that much of ICU clinicians' practice is therefore idiosyncratic.

Given the potential for adverse outcomes and complications if bowel function is not appropriately managed, it is essential that ways to improve practice be explored. Introducing a protocol for bowel management may initiate clinician behaviour change in this practice area (McPeake, Gilmour, & MacIntosh, 2011). However, in

order to successfully implement a protocol, it is important to consider what factors may influence clinician behaviour intentions related to the desired practices (Ajzen, 2006). We therefore constructed and tested an instrument to measure clinicians' attitudes, beliefs and behaviour intentions related to three bowel management practices. Ajzen's Theory of Planned Behaviour (TPB) (Ajzen, 1991) was selected as an appropriate model to guide this process. This instrument can be used to measure clinicians' current behaviour intentions prior to implementation of a protocol. Information regarding clinicians' attitudes and beliefs can also be beneficial in directing the design of specific implementation strategies (Eccles et al., 2007). Reapplication of the instrument post implementation of a protocol can evaluate the implementation strategy in changing behaviour intentions of clinicians. Our aim therefore was to construct and test items to measure the TPB constructs related to intention to undertake three bowel management practices in the ICU setting.

Methods

The instrument was developed in several steps.

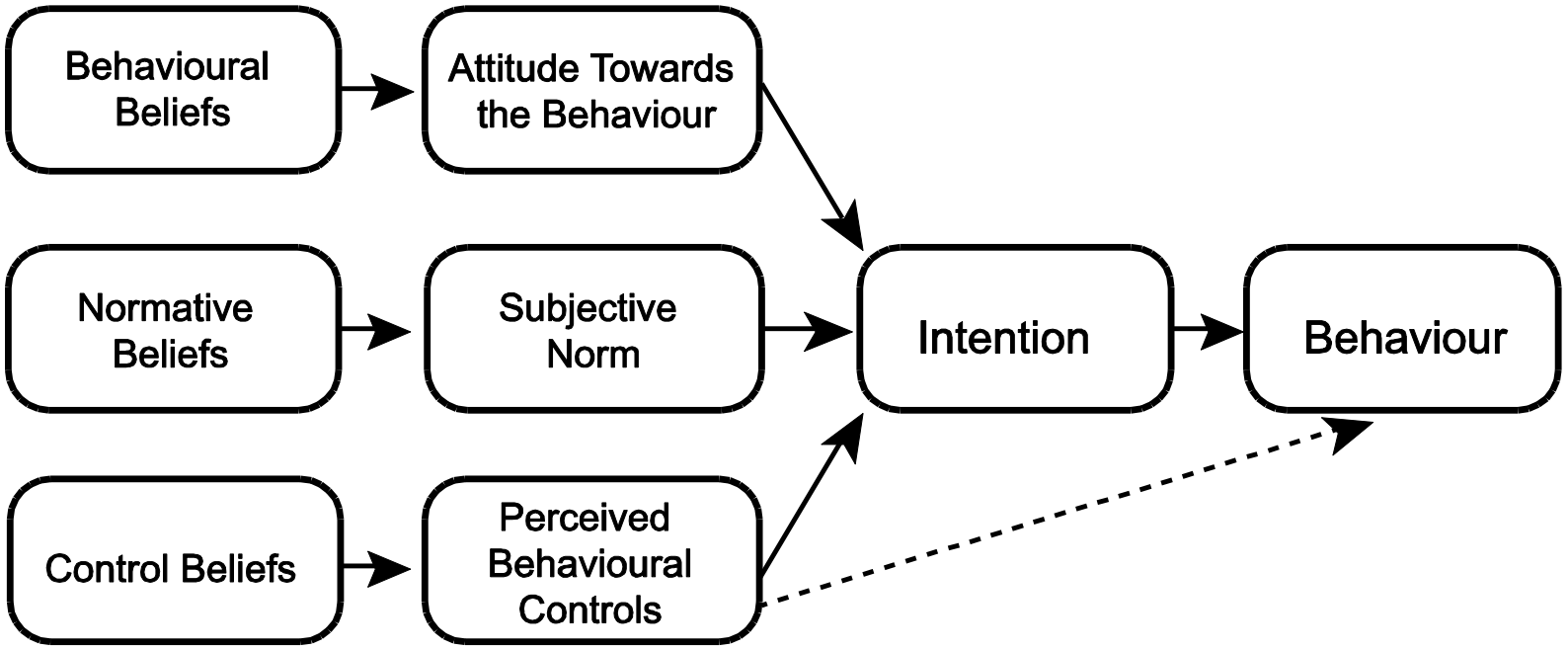
Selection of theory

To guide the process of constructing questionnaire items we selected Ajzen's Theory of Planned Behaviour (TPB) (Ajzen, 1991); it conceptualizes behaviour in factors that can be manipulated to elicit behaviour change (Foy et al., 2007) and has been used in numerous studies, including those investigating health care professionals behaviour, process evaluations and adherence to clinical guidelines (Francis, Johnston, Eccles, Grimshaw, & Kaner, 2004). A systematic review of studies investigating healthcare professionals' intention and behaviour included the TPB as one of the social cognitive theories assessed and concluded the TPB was the most relevant to predict behaviour (Godin, Belanger-Gravel, Eccles, & Grimshaw, 2008).

According to the TPB there are three components that influence human action: behavioural beliefs concerning the likely outcomes of the behaviour (*attitude toward the behaviour)*, normative beliefs regarding the expectations of others and the corresponding motivation to comply with these (*subjective norm)*, and control beliefs

concerning factors that may facilitate or hinder and the perceived level of control over these factors (*perceived behavioural control*) (see Figure 4.1 on page 82) (Ajzen, 1991). Therefore, to predict whether a person intends to do something (behaviour intention construct: BI), we need to know whether they are in favour of doing it (attitude construct: ATT), how much they feel social pressure to do it (subjective norm construct: SN), and whether they feel in control of the action in question (perceived behavioural control construct: PBC) (Francis, Eccles, et al., 2004). Consequently, a person's intention is thought to capture the motivational factors that influence their subsequent behaviour. That is an individual is more likely to perform a behaviour if they have more favourable attitudes, subjective norms and greater perceived control (Ajzen, 2006). They would then perform the behaviour according to their intentions if there was sufficient actual control over the behaviour and the opportunity is present, with intention the immediate precursor of behaviour (Ajzen, 2006).

Figure 4.1 Schematic representation of the Theory of Planned Behaviour (TPB)



An extension of the earlier Theory of Reasoned Action, Ajzen's TPB considers the existence of external factors that may influence clinicians' practice with the inclusion of the additional construct of perceived behavioural control and is therefore more appropriate for investigation of health professionals' behaviour (Puffer & Rashidian, 2004). Authors have argued that the control factors of PBC can be either internal or external and that the PBC construct is in fact two distinct constructs or sub-constructs of *self-efficacy* (or perceived difficulty) concerning internal factors, and *controllability* (or perceived control) referring to external factors (Sparks, Guthrie, & Shepherd, 1997). Studies have shown that the effects of these two sub-constructs of PBC differ, with self-efficacy emerging as a significant (positive) predictor of behaviour intention (Terry & O'Leary, 1995).

Selection of behaviours

Guided by previous research (Foy et al., 2007) in selecting a maximum of three behaviours to investigate, we selected three target behaviours relating to bowel management for ICU patients for two reasons; 1) they are common behaviours that any ICU clinician could reasonably be expected to perform; and 2) we intended to administer the developed instrument to clinicians prior to and following implementation of a newly developed bowel management protocol (BMP), and these behaviours would be specifically detailed in the BMP. The three practices were:

1. ***Performing*** *an assessment of bowel function* (Action) on an ICU patient at least once every 8 hours for the duration of their ICU admission (referred to as '*assessment of bowel function*')
2. ***Performing*** *a per rectum (PR) examination* (Action) on an ICU patient, presented in the context of scenario Day three and bowels not opened during admission (referred to as '*performing a PR exam*')
3. ***Prescribing or nurse initiating*** *the administration of Microlax enema(s)* (Action) for ICU patients with a PR exam result of full and soft (referred to as '*administration of enema*')

We clearly defined the three practices using the elements of Target, Action, Context, and Time (TACT) as recommended by Ajzen to ensure that the measures for attitude (ATT), subjective norm (SN) and perceived behavioural control (PBC) observed the principle of compatibility (Ajzen, 2006; Francis, Eccles, et al., 2004).

Constructing an instrument based on TPB

No previous studies were identified that investigated nursing or medical clinicians' attitudes, beliefs and behaviour intentions for bowel management. We constructed items to measure the TPB constructs of behaviour intention (BI), ATT, SN and PBC, guided by Francis and colleagues' (2004) manual on constructing questionnaires based on the TPB.

We constructed a total of 14 items;

- three items for the dependent variable BI
- four items for the predictor variable ATT
- three items for the predictor variable SN
- four items for the predictor variable PBC (see Table 4.1 on page 85).

Table 4.1 Items used to assess Theory of Planned Behaviour constructs

Construct	Label	Questions (shortened versions)	Response scale
Behaviour Intention (BI)	BI1	I intend to perform X	*Strongly agree (1) to Strongly disagree (7)*
	BI2	I will perform X	
	BI3	I plan to perform X	
Attitude (ATT)	Att1	In my opinion, performing X is	*Good practice/ Bad practice (1) to (7)*
	Att2		*Helpful/ Unhelpful (1) to (7)*
	Att3		*Necessary/ Unnecessary (1) to (7)*
	Att4		*Satisfying/ Not satisfying (1) to (7)*
Subjective norm (SN)	SN1	I feel under social pressure, from my professional colleagues, to perform X	*Strongly agree (1) to Strongly disagree (7)*
	SN2	People who are important to me professionally, think that I should perform X	
	SN3	My professional colleagues, whose opinions I respect, think that I should perform X	
PBC – Controllability (PBCC)	PBCC1	I have complete control over performing X	*Strongly agree (1) to Strongly disagree (7)*
	PBCC2	There are factors outside of my control that would prevent me from performing X	
PBC – Self efficacy (PBCE)	PBCE1	I am confident in knowing when an intensive care patient requires X	*Strongly agree (1) to Strongly disagree (7)*
	PBCE2	In my opinion, performing X is	*Very easy/ Very difficult (1) to (7)*

Table designed after Puffer & Rashidian (2004). Substitute X with specific behaviour.

In response to the debate in the literature regarding the PBC construct, the four PBC items were further subdivided into controllability (PBCC) and self-efficacy (PBCE) components. The set of 14 items, presented on a seven point Likert scale, were repeated for each of the three target behaviours. A response option from strongly agree to strongly disagree was used for nine of the 14 items, with the remaining five items presented with varying response stems.

Scenarios were developed to contextualize the series of TPB items for two behaviour sections (Francis, Eccles, et al., 2004), *performing a PR exam;* and *administration of enema*. Two versions of the scenarios were developed to account for the varied nature of the ICU specialties where the instrument was to be administered: a general patient with sepsis of unknown origin; and a post-cardiothoracic surgery patient.

Establishing face validity of scenarios

To ensure that participants would reply similarly to either version of the questionnaire a process to establish face validity of the scenarios was undertaken by independent review. Three senior ICU nursing clinicians from outside the study units were asked to indicate if the scenarios were comparable and would elicit similar clinical decisions regarding bowel management or to indicate the differences if they did not consider the scenarios to be comparable. Following scenario review, changes were made as suggested to improve their comparability.

Testing the instrument

Sample and data collection

We distributed our self-administered questionnaire to all nursing and medical staff with a patient care role employed within three Australian ICUs at two co-located metropolitan hospitals, one a tertiary referral public hospital, the other a private hospital. The ICU specialties were, 1) cardiothoracic surgery, 2) general medical and surgical, including neurology, and 3) private hospital ICU, with mostly post-operative admissions, including cardiothoracic surgery.

Construct validity testing: Confirmatory factor analysis

We used post hoc confirmatory factor analysis to establish if the TPB items conformed to the theory constructs. Data were entered into SPSS 17.0 (IBM, Chicago, IL, USA). Factor analysis using principle component and varimax rotation was performed for each of the three behaviour sections to confirm the predictor variables attitude, subjective norm and perceived behavioural control (11 items). A separate analysis was performed for the three items measuring the dependent variable, behaviour intention, as a degree of correlation could be expected with the predictor variable items. During analysis missing values for items were replaced with the mean and items with a factor loading of 0.4 or more were retained (Portney & Watkins, 2009). If an item loaded on more than one factor, a factor was chosen based on the theory construct the item was designed to measure (Sparks et al., 1997).

It was hypothesized that differences between professional groups may have influenced results, and hence a sub-sample of nurses was analysed using factor analysis. Analysis of a sub-sample of doctors was not possible due to the low numbers of respondents.

Internal consistency testing

To determine internal validity of the construct scales, we conducted internal consistency reliability analysis using Cronbach's alpha coefficient, where 0.6 or higher was deemed acceptable (Francis, Eccles, et al., 2004). Internal reliability was assessed for each of the three behaviour sections with the TBP items grouped, first on constructs as suggested by factor analysis results and second, on constructs as determined by the TPB. In instances where the Cronbach's alpha for a construct was less than 0.6 and deletion of an item did not produce a satisfactory level of reliability, a single item was then selected on the basis of face validity to represent that construct; a procedure previously reported in the literature (Foy et al., 2007).

Ethical considerations

Approval was obtained from the institutional Human Research Ethics Committees (HREC) at the relevant University and hospitals. Participants gave their implicit consent by return of completed surveys to the researchers.

Results

Survey sample

Of the 130 surveys distributed to staff (nurses = 103, doctors = 27), 88 were returned (68%); comprising of 76 nurses (86%) and 12 doctors (14%).

Practice 1: Assessment of bowel function

Construct validity testing: confirmatory factor analysis

Confirmatory factor analysis for *assessment of bowel function* demonstrated loading of the 11 items measuring the TPB predictor variables of attitude, subjective norm and perceived behavioural control onto three main factors accounting for 63.4% of total variance (Table 4.2 on page 91-94). This loading on the factors was not however consistent with the original TPB constructs, and labelling of these factors with theory relevant labels was difficult. A separate factor analysis of the three behaviour intention items demonstrated that they were closely related for this practice.

Confirmatory factor analysis repeated on a sub-sample (n=76 nurses) grouped the 11 items for this practice onto factors more easily identifiable as TPB constructs, most notably two of the subjective norm items grouped together on a factor and the two perceived behavioural control controllability items grouped together on another factor.

Internal consistency

Adequate internal consistency was achieved for only one factor (the one deemed most likely to represent attitude) for the practice *assessment of bowel function* when the 11

items were grouped as per results from the factor analysis. The other two factors (labelled as subjective norm and perceived behavioural control) did not reach adequate internal consistency, even when one item was deleted. When internal consistency analysis was repeated on the nurse sub-sample and with items grouped according to the factor analysis results, the factors 'subjective norm' and 'attitude' achieved adequate results (Table 4.3 on page 95). Repeated internal consistency analysis of the 11 items grouped according to the TPB resulted in adequate Cronbach's alpha results for the attitude and subjective norm constructs, but not perceived behavioural control, either with one item deleted or when split into the controllability and self-efficacy constructs (Table 4.4 on page 96).

Practice 2: Performing a PR exam

Construct validity testing: confirmatory factor analysis

Confirmatory factor analysis for *performing a PR exam* demonstrated loading of the 11 items measuring the TPB predictor variables of attitude, subjective norm and perceived behavioural control onto three main factors accounting for 62.5% of total variance (Table 4.2 on page 91-94), and resulted in items measuring the same TPB construct grouping together. Factor analysis of the three behaviour intention items showed the items were closely related. A repeated factor analysis on the nurse sub-sample did not achieve better loading of items onto factors according to the theory.

Internal consistency

Internal consistency analysis for *performing a PR exam* with the 11 items grouped according to the factor analysis results showed adequate Cronbach's alphas for the attitude and subjective norm factors (Table 4.3 on page 95). Internal consistency results for the nurse sub-sample did not improve. Cronbach's alphas were improved when internal consistency analysis was repeated with the 11 items grouped according to the TPB. The constructs of attitude, subjective norm and perceived behavioural control (with one item deleted) all reached adequate internal consistency (Table 4.4 on page 96) for *performing a PR exam*.

Practice 3: Administration of enema

Construct validity testing: confirmatory factor analysis

Confirmatory factor analysis for *administration of enema* grouped the 11 items measuring the TPB attitude, subjective norm and perceived behavioural control predictor variables onto three main factors accounting for 68.6% of total variance (Table 4.2 on page 91-94). Separate factor analysis of the three behaviour intention items showed these items were closely related. A repeated factor analysis on the nurse sub-sample did not achieve better loading of items onto factors according to the theory.

Internal consistency

Internal consistency analysis for the practice *administration of enema* with the 11 items grouped according to the factor analysis results showed adequate Cronbach's alpha for the attitude and subjective norm factors (Table 4.3 on page 95). Internal consistency results with the nurse sub-sample did not improve. Cronbach's alphas were improved when internal consistency analysis was repeated with the 11 items grouped according to the TPB. The constructs of attitude, subjective norm and perceived behavioural control (with an item deleted or the 2 item self-efficacy scale) all reached adequate internal consistency (Table 4.4 on page 96) for the practice *administration of enema*.

Table 4.2 Factor loading per behaviour section for 3 Behaviour Intention items and 11 TPB items (full sample, n=88; nurses only sample, n=76)

Rotated Component matrix [a]		**Component**		
Behaviour Intention items				
Item stem		**1 BI**		
Practice 1: Assessment of bowel function (n=88)				
BI 1:	I intend to perform			.826
BI 2:	I will perform			.923
BI 3:	I plan to perform			.933
[a] *1 component extracted; 80.182% of total variance explained*				
Practice 2: Performing a PR exam (n=88)				
BI 1:	I intend to perform			.917
BI 2:	I will perform			.941
BI 3:	I plan to perform			.945
[a] *1 component extracted; 87.341% of total variance explained*				
Practice 3: Administration of enema (n=88)				
BI 1:	I intend to perform			.866
BI 2:	I will perform			.925
BI 3:	I plan to perform			.944
[a] *1 component extracted; 83.161% of total variance explained*				
11 TPB items		**Component**		
Item stem		**1 Att**	**2 SN**	**3 PBC**
Practice 1: Assessment of bowel function (n=88)				
Att2:	In my opinion, performing X is helpful/unhelpful	.880		
Att1:	In my opinion, performing X is good practice/bad practice	.845		
Att3:	In my opinion, performing X is necessary/unnecessary	.818		
SN2:	People who are important to me professionally, think that I should perform	.753		
SN3:	My professional colleagues, whose opinion I respect, think that I should perform	.733		
PBCE2:	In my opinion, performing X is very easy/very difficult	.579	.479	
PBCE1:	I am confident in knowing when an intensive care patient requires		.611	
PBCC1:	I have complete control over performing		.591	
SN1:	I feel under social pressure, from my professional colleagues, to perform	.489	-.502	
PBCC2:	There are factors outside of my control that would prevent me from performing			.887
Att4:	In my opinion, performing X is satisfying/unsatisfying	.503		.471
[a] *Rotation converged in 7 iterations; 62.375% of total variance explained*				

Table 4.2 Factor loading per behaviour section for 3 Behaviour Intention items and 11 TPB items (full sample, n=88; nurses only sample, n=76) (Cont')

11 TPB items		Component		
Item stem		**1**	**2**	**3**
		Att	**SN**	**PBC**
Practice 1: Assessment of bowel function (nurses only, n=76)				
Att2:	In my opinion, performing X is helpful/unhelpful	.901		
Att1:	In my opinion, performing X is good practice/bad practice	.858		
Att3:	In my opinion, performing X is necessary/unnecessary	.791		
PBCE2:	In my opinion, performing X is very easy/very difficult	.745		
Att4:	In my opinion, performing X is satisfying/unsatisfying	.561		
SN3:	My professional colleagues, whose opinion I respect, think that I should perform		.767	
PBCE1:	I am confident in knowing when an intensive care patient requires		.692	
SN2:	People who are important to me professionally, think that I should perform	.425	.689	
PBCC2:	There are factors outside of my control that would prevent me from performing			.714
SN1:	I feel under social pressure, from my professional colleagues, to perform			-.679
PBCC1:	I have complete control over performing			.521
[a.] *Rotation converged in 5 iterations; 62.322% of total variance explained*				
Practice 2: Performing a PR exam (n=88)				
Att2:	In my opinion, performing X is helpful/unhelpful	.840		
Att1:	In my opinion, performing X is good practice/bad practice	.812		
Att3:	In my opinion, performing X is necessary/unnecessary	.778		
PBCE2:	In my opinion, performing X is very easy/very difficult	.689		
PBCE1:	I am confident in knowing when an intensive care patient requires	.672		
SN2:	People who are important to me professionally, think that I should perform		.816	
SN3:	My professional colleagues, whose opinion I respect, think that I should perform		.782	
SN1:	I feel under social pressure, from my professional colleagues, to perform		.729	
Att4:	In my opinion, performing X is satisfying/unsatisfying		.437	
PBCC2:	There are factors outside of my control that would prevent me from performing			.796
PBCC1:	I have complete control over performing	.515		.574
[a.] *Rotation converged in 5 iterations; 62.539% of total variance explained*				

Table 4.2 Factor loading per behaviour section for 3 Behaviour Intention items and 11 TPB items (full sample, n=88; nurses only sample, n=76) (Cont')

Practice 2: Performing a PR exam (nurses only, n=76)				
Att2:	In my opinion, performing X is helpful/unhelpful	.825		
Att1:	In my opinion, performing X is good practice/bad practice	.810		
Att3:	In my opinion, performing X is necessary/unnecessary	.754		
PBCE2:	In my opinion, performing X is very easy/very difficult	.638		
PBCE1:	I am confident in knowing when an intensive care patient requires	.623		
PBCC2:	There are factors outside of my control that would prevent me from performing	-.545		.506
SN2:	People who are important to me professionally, think that I should perform		.862	
SN3:	My professional colleagues, whose opinion I respect, think that I should perform		.822	
SN1:	I feel under social pressure, from my professional colleagues, to perform		.717	
Att4:	In my opinion, performing X is satisfying/unsatisfying			.713
PBCC1:	I have complete control over performing			.597
[a.] *Rotation converged in 5 iterations; 62.587% of total variance explained*				
Practice 3: Administration of enema (n=88)				
Att2:	In my opinion, performing X is helpful/unhelpful	.919		
Att3:	In my opinion, performing X is necessary/unnecessary	.889		
Att1:	In my opinion, performing X is good practice/bad practice	.879		
PBCE1:	I am confident in knowing when an intensive care patient requires	.741		
PBCE2:	In my opinion, performing X is very easy/very difficult	.690		
Att4:	In my opinion, performing X is satisfying/unsatisfying	.468		
SN1:	I feel under social pressure, from my professional colleagues, to perform		.811	
SN3:	My professional colleagues, whose opinion I respect, think that I should perform		.759	
SN2:	People who are important to me professionally, think that I should perform	.470	.751	
PBCC2:	There are factors outside of my control that would prevent me from performing			.897
PBCC1:	I have complete control over performing	.514		.496
[a.] *Rotation converged in 5 iterations; 68.591% of total variance explained*				

Table 4.2 Factor loading per behaviour section for 3 Behaviour Intention items and 11 TPB items (full sample, n=88; nurses only sample, n=76) (Cont')

Practice 3: Administration of enema (nurses only, n-76)				
Att2:	In my opinion, performing X is helpful/unhelpful	.893		
Att1:	In my opinion, performing X is good practice/bad practice	.871		
Att3:	In my opinion, performing X is necessary/unnecessary	.859		
PBCE1:	I am confident in knowing when an intensive care patient requires	.728		
PBCE2:	In my opinion, performing X is very easy/very difficult	.719		
PBCC1:	I have complete control over performing	.573		
SN2:	People who are important to me professionally, think that I should perform		.818	
SN3:	My professional colleagues, whose opinion I respect, think that I should perform		.815	
SN1:	I feel under social pressure, from my professional colleagues, to perform		.778	
PBCC2:	There are factors outside of my control that would prevent me from performing			.889
Att4:	In my opinion, performing X is satisfying/unsatisfying	.427		.589

[a.] Rotation converged in 5 iterations; 69.224% of total variance explained

Extraction Method: Principal Component Analysis; Rotation Method: Varimax with Kaiser Normalization.

Key: BI=Behaviour intention; Att=Attitude; SN=Subjective norm, PBCC=Perceived behavioural control – controllability, PBCE=Perceived behavioural control – self-efficacy

Table 4.3 Items per Factor following Factor Analysis for each behaviour with corresponding internal consistency

Factor	Assessment of bowel function (n=88)		Assessment of bowel function (nurses only, n=76)		Performing a PR exam (n=88)		Performing a PR exam (nurses only, n=76)		Administration of enema (n=88)		Administration of enema (nurses only, n=76)	
	Items	**Cronbach's alpha**	**Items**	**Cronbach's alpha**	**Items**	**Cronbach's alpha**	**Items**	**Cronbach's alpha**	**Items**	**Cronbach's alpha**	**Items**	**Cronbach's alpha**
ATT	Att1	0.879	Att1	0.851	Att1	0.860	Att1	0.634	Att1	0.882	Att1	0.890
	Att2		Att2		Att2		Att2		Att2		Att2	
	Att3		Att3		Att3		Att3		Att3		Att3	
	SN2		Att4		PBCE1		PBCE1		Att4		PBCE1	
	SN3		PBCE2		PBCE2		PBCE2		PBCE2		PBCE2	
	PBCE2 *						PBCC2		PBCE1		PBCC1	
SN	PBCC1	-0.018	SN2	0.640	SN1	0.703	SN1	0.787	SN1	0.773	SN1	0.788
	PBCE1	-0.133	SN3	0.714	SN2		SN2		SN2		SN2	
	SN1 *	(if delete SN1)	PBCE1	(if delete SN2)	SN3		SN3		SN3		SN3	
					Att4							
PBC	Att4	0.421	PBCC1	-0.042	PBCC1	0.253	Att4	0.400	PBCC1	0.263	Att4	0.424
	PBCC2 *		PBCC2	-0.137	PBCC2		PCCC1		PBCC2		PBCC2	
			SN1	(if delete SN1)								

* These factors contain items that loaded together, and may not be a true measure of the desired construct as labelled in the Factor column

Key: Att=Attitude; SN=Subjective norm, PBC=Perceived behavioural control, PBCC=Perceived behavioural control – controllability, PBCE=Perceived behavioural control – self-efficacy

Table 4.4 Internal consistency for TPB constructs per behaviour (items grouped according to theory) (full sample, n=88; nurses only sample, n=76)

Factor	Item stem	Cronbach's alpha					
		Assessment of bowel function		Performing a PR exam		Administration of enema	
		(n=88)	nurses (n=76)	(n=88)	nurses (n=76)	(n=88)	nurses (n=76)
BI	I intend to perform I will perform I plan to perform	0.874	0.826	0.926	0.937	0.909	0.900
ATT	In my opinion, performing X is good practice/bad practice	0.839	0.837	0.795	0.811	0.848	0.862
	In my opinion, performing X is helpful/unhelpful						
	In my opinion, performing X is necessary/unnecessary	0.929	0.931	0.952	0.959	0.952	0.955
	In my opinion, performing X is satisfying/unsatisfying	*	*	*	*	*	*
SN	I feel under social pressure, from my professional colleagues, to perform	0.739	0.709	0.753	0.787	0.773	0.788
	People who are important to me professionally, think that I should perform						
	My professional colleagues, whose opinion I respect, think that I should perform						
PBC	I have complete control over performing	0.357	0.419	0.458	0.147	0.578	0.531
(4 items)	There are factors outside of my control that would prevent me from performing						
	I am confident in knowing when an intensive care patient requires	0.396	0.444	0.652	-0.500	0.737	0.714
	In my opinion, performing X is very easy/very difficult	#	^	#	~	#	#
PBCC	I have complete control over performing	0.370	0.477	0.253	0.007	0.263	0.205
	There are factors outside of my control that would prevent me from performing						
PBCE	I am confident in knowing when an intensive care patient requires	0.251	0.256	0.580	0.517	0.722	0.700
	In my opinion, performing X is very easy/very difficult						

* if delete 'satisfying/ unsatisfying' item; # if delete 'factors outside my control' item; ^ if delete 'confident in knowing' item; ~ if delete 'complete control' item

Key: BI=Behaviour intention, Att=Attitude; SN=Subjective norm, PBC=Perceived behavioural control, PBCC=Perceived behavioural control – controllability, PBCE=Perceived behavioural control – self-efficacy

Table 4.5 Items for TPB constructs per behaviour

	Assessment of bowel function	Performing a PR exam	Administration of enema
Construct	**items**	**items**	**items**
ATT	In my opinion, performing X is good practice/bad practice	In my opinion, performing X is good practice/bad practice	In my opinion, performing X is good practice/bad practice
	In my opinion, performing X is helpful/unhelpful	In my opinion, performing X is helpful/unhelpful	In my opinion, performing X is helpful/unhelpful
	In my opinion, performing X is necessary/unnecessary	In my opinion, performing X is necessary/unnecessary	In my opinion, performing X is necessary/unnecessary
	In my opinion, performing X is satisfying/unsatisfying	In my opinion, performing X is satisfying/unsatisfying	In my opinion, performing X is satisfying/unsatisfying
SN	I feel under social pressure, from my professional colleagues, to perform	I feel under social pressure, from my professional colleagues, to perform	I feel under social pressure, from my professional colleagues, to perform
	People who are important to me professionally, think that I should perform	People who are important to me professionally, think that I should perform	People who are important to me professionally, think that I should perform
	My professional colleagues, whose opinion I respect, think that I should perform	My professional colleagues, whose opinion I respect, think that I should perform	My professional colleagues, whose opinion I respect, think that I should perform
PBC	N/A (did not reach adequate reliability)	I have complete control over performing	I have complete control over performing
		I am confident in knowing when an intensive care patient requires	I am confident in knowing when an intensive care patient requires
		In my opinion, performing X is very easy/very difficult	In my opinion, performing X is very easy/very difficult
PBCC	I have complete control over performing	I have complete control over performing	I have complete control over performing
PBCE	In my opinion, performing X is very easy/very difficult	I am confident in knowing when an intensive care patient requires	I am confident in knowing when an intensive care patient requires
		In my opinion, performing X is very easy/very difficult	In my opinion, performing X is very easy/very difficult

Key: Att=Attitude; SN=Subjective norm, PBC=Perceived behavioural control, PBCC=Perceived behavioural control – controllability, PBCE=Perceived behavioural control – self-efficacy

Discussion

This study explored the effectiveness of using the TPB in constructing questionnaire items to measure intensive care clinicians' BI and beliefs regarding three bowel management practices. Having constructed items to represent the TPB constructs, we expected theory relevant loading of items during confirmatory factor analysis. However, our factor analysis did not consistently load items onto factors that could be easily identifiable as theory constructs.

The predictor variables of attitude and subjective norm did achieve some consistent grouping of items. Three of the four attitude items grouped together on the same factor for all three practices, regardless which sample was analysed (full or nurse subset). For two of the practices (*performing a PR exam* and *administration of enemas*) the three subjective norm items grouped onto the same factor.

In contrast, the four items designed to measure perceived behavioural control did not load together for any of the practices. However, the items did group consistently with their subdivided constructs of self-efficacy and controllability for two of the practices (*performing a PR exam* and *administration of enemas*). For these two practices, the PBC controllability items loaded onto a separate factor while the PBC self-efficacy items loaded with the attitude items onto one factor. This split loading of the PBC items may be a reflection of debate in the literature regarding the dual component of the perceived behavioural control construct (Ajzen, 2002; Terry & O'Leary, 1995; David Trafimow, Finlay, Sheeran, & Conner, 2002). Loading of the PBC self-efficacy items with attitude items may indicate a strong association between these constructs or may be a reflection of the uncertainty regarding one of the self-efficacy items (easy-difficult response scale) reported in the literature (Gagne & Godin, 2007). Investigations to determine which TPB construct (PBC or attitude) an easy-difficult response scale item measures has not lead to a clearly agreed upon outcome (Gagne & Godin, 2007; Leach, Hennessy, & Fishbein, 2001; David Trafimow et al., 2002).

Further confirmation of the failure of items to load onto theory relevant factors was the poor internal consistency results achieved with items grouped according to our factor analysis results. The only factor to reach adequate internal consistency for all

three practices was the factor related to attitude, with three of the four attitude items loaded to it. Conversely, the factor identified as perceived behavioural control, which did not include all PBC items, did not reach adequate internal consistency for any of the practices.

We received best results for internal consistency analysis when we grouped the items to form construct scales as the TPB dictates. With the exception of the perceived behavioural control construct, all constructs reached adequate internal consistency for all practices. The perceived behavioural control construct did reach adequate Cronbach's alphas for two practices (*performing a PR exam* and *administration of enemas*). Our insufficient internal consistency results for the PBC construct for one behaviour (*assessment of bowel function*) may be further evidence of the uncertainty of this construct's dual components (Sparks et al., 1997; Terry & O'Leary, 1995; D Trafimow & Duran, 1998; David Trafimow et al., 2002). However, in our study, we were unable to achieve adequate internal consistency for both the PBC sub-constructs of self-efficacy and controllability. The sub-construct of self-efficacy did reach adequate internal consistency for two of the behaviours (*performing a PR exam* and *administration of enemas*), while the controllability sub-construct did not reach adequate internal consistency for any of the behaviours. The small number of items that comprised these sub-constructs (two for each) may have influenced our results.

Although it was hypothesized that differences between professional groups' responses may impact on factor analysis and reliability analysis, we did not find this to be the case. Factor analysis using the nurse sub-sample only slightly improved the item loading for one behaviour (*assessment of bowel function*) when compared with results from the entire sample Internal consistency assessed using the nurse sub-sample produced less favourable results with the items grouped to scales according to the TPB.

Based on the results from our internal consistency analysis with the items grouped according to the TPB, we have developed reliable scales to measure the TPB constructs in relation to bowel management practices in the ICU (see Table 4.5 on page 97). The constructs of attitude and subjective norm reached adequate internal consistency for all three practices using the original number of items (four and three

respectively). By deleting an item from the original four item scale, we achieved adequate internal consistency for the PBC construct in two of the behaviour sections (*performing a PR exam* and *administration of enema*). This was not possible for the remaining behaviour (*assessment of bowel function*). Subsequently, we selected one item to represent each of the PBC sub-constructs for this behaviour.

The sample in our study was of limited size, included responses from both nursing and medical staff and was from co-located hospitals, all of which may have influenced our results. Further investigation with a larger sample size across more sites may enable clearer factor analysis results in line with TPB constructs. A larger response rate from doctors would also allow for clearer comparisons between nurses and doctors to identify any difference regarding behaviour intention and the TPB constructs.

Our results showed poor factor loading for the items measuring the PBC construct. Internal consistency results for the PBC items were also poor. It may be beneficial in future studies to include more items to measure the PBC construct and its sub-constructs of controllability and self-efficacy.

Conclusion

Our constructed TPB items however show promise in measuring clinicians' attitudes, beliefs and behaviour intentions related to three bowel management practices. Our internal consistency analysis results indicate it is appropriate to use the TPB to construct scales to measure attitude, subjective norm, perceived behavioural control and behaviour intention from the 14 items. Completion of the instrument by clinicians prior to implementation of a bowel management protocol can highlight factors that may influence low behaviour intention scores for the specific behaviours (Foy et al., 2007). This information can be used in the design of implementation strategies to promote successful implementation of clinician behaviour change in this practice area. Evaluation of changes in behaviour intentions could be achieved by completion of the instrument by clinicians post implementation of a bowel management protocol.

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4.3 Summary to submitted manuscript II

This manuscript presented the construction and testing of the TPB questionnaire items developed for use in study two of this research. Although factor analysis did not consistently load the items onto factors easily identifiable as theory constructs, internal consistency analysis of items group according to the TBP constructs achieved adequate results. The questionnaire was deemed to be valid for measuring clinicians' behaviour intention related to the three bowel management practices. Results of the staff survey conducted pre and post implementation of the BMP are presented in the next chapter.

5 STUDY TWO: CLINICIANS' KNOWLEDGE, ATTITUDES, BELIEFS AND BEHAVIOUR INTENTIONS

5.1 Introduction to manuscript under review

Evaluation of the effect of a targeted implementation strategy and BMP should include measures to ascertain the impact on clinicians. Knowledge, attitudes and beliefs are all thought to be important determinants of behaviour. By using the TPB to structure questionnaire items it was possible to measure predictors of behaviour intention for the chosen practice area of bowel management. The following chapter presents the results of a survey of both nursing and medical clinicians before and after implementation of the BMP to determine the effect of the targeted implementation strategy on their knowledge, attitudes, beliefs and behavioural intentions.

This manuscript has been accepted for publication in *BMC Nursing*. The manuscript is presented in the referencing style required by this journal and the references are presented at the end of the chapter.

5.2 Manuscript III

Knowles S, Lam LT, McInnes E, Elliott D, Hardy J & Middleton S
Knowledge, attitudes, beliefs and behaviour intentions for three bowel management practices in intensive care: effects of a targeted protocol implementation for nursing and medical staff.

Accepted for publication 2014: *BMC Nursing*.

Abstract

Background

Bowel management protocols have the potential to minimize complications for critically ill patients. Targeted implementation can increase the uptake of protocols by clinicians into practice. The theory of planned behaviour offers a framework in which to investigate clinicians' intention to perform the behaviour of interest. This study aimed to evaluate the effect of implementing a bowel management protocol on intensive care nursing and medical staffs' knowledge, attitude, subjective norms, perceived behavioural control, behaviour intentions, role perceptions and past behaviours in relation to three bowel management practices.

Methods

A descriptive before and after survey using a self-administered questionnaire sent to nursing and medical staff working within three intensive care units before and after implementation of our bowel management protocol (pre: May – June 2008; post: Feb – May 2009).

Results

Participants had significantly higher knowledge scores post-implementation of our protocol (pre mean score 17.6; post mean score 19.3; p=0.004). Post-implementation there was a significant increase in: self-reported past behaviour

(pre mean score 5.38; post mean score 7.11; p=0.002) and subjective norms scores (pre mean score 3.62; post mean score 4.18; p=0.016) for bowel assessment; and behaviour intention (pre mean score 5.22; post mean score 5.65; p=0.048) for administration of enema.

Conclusion

This evaluation, informed by the theory of planned behaviour, has provided useful insights into factors that influence clinician intentions to perform evidence-based bowel management practices in intensive care. Addressing factors such as knowledge, attitudes and beliefs can assist in targeting implementation strategies to positively affect clinician behaviour change. Despite an increase in clinicians' knowledge scores, our implementation strategy did not, however, significantly change clinician behaviour intentions for all three bowel management practices. Further research is required to explore the influence of opinion leaders and organizational culture on clinicians' behaviour intentions related to bowel management for intensive care patients.

Keywords

Bowel management, intensive care, nursing, theory of planned behaviour, questionnaire

Background

Bowel management in intensive care

Maintenance of normal bowel function for a critically ill patient, although often viewed as a low care priority in the highly technical intensive care unit (ICU) environment, is imperative to avoid complications that can delay discharge [1-4]. Critically ill patients are at increased risk of complications from bowel dysfunction due to factors such as reduced mobility, underlying disease process or illness, mechanical ventilation, and the use of continuous or intermittent analgesics [3-5]. Complications include constipation, diarrhoea, delays in mechanical ventilation weaning, greater length of stays, dehydration, and bowel obstruction or perforation [3, 6-9].

Protocols can improve bowel management within ICU; guiding clinicians in care provision, ensuring that timely treatment or intervention is instigated, and to minimise complications [1, 10-13]. Bowel management protocols (BMPs) have been developed for specific use with ICU patients, with initial evaluations demonstrating a reduction in constipation and diarrhoea [10-15]. Most evaluations of BMP have however only assessed impact on patient outcomes and clinician practices within single site studies; e.g. [15].

Despite the potential for BMPs to standardise care and improve outcomes for critically ill patients, use of protocols is low. Two national surveys in the United Kingdom (UK) found that only 3.5% of ICUs (n=5) had a guideline for the management of constipation [1], while 21% (n=17) had a BMP or guideline [14]. In our previous research [16], 32% of 41 responding ICUs in New South Wales, Australia in 2006 had a guideline or protocol for bowel management. This survey also identified bowel management as a practice clinicians viewed as a neglected area [16], similar to findings in the UK [1]. One common limitation with these studies was the lack of detail about the implementation strategies used and the evaluation process.

Implementation of protocols

Protocols should not be presented to clinicians in isolation, but instead, introduced with evidence-based implementation strategies to increase their uptake into practice [17, 18]. A number of implementation strategies have been described and evaluated in the literature that have demonstrated some effectiveness in changing clinician practices in a variety of settings. These include education, audit and feedback, reminders, mass media, and use of local opinion leaders [19-22]. Central to the process of implementing protocols into clinical practice is clinician behaviour change [23]. Implementation of a protocol requires understanding of what clinicians already do in practice, how the protocol could be adopted within routine practice, and whether clinicians would need to change their practices or behaviours. In addition, behaviour intention is a reliable proxy for actual behaviour when estimating actual clinician practice [24]. Identifying factors that may influence clinician intention to perform behaviours is important for eliciting behaviour change [24, 25]. Behaviour intention, the precursor to behaviour performance, is influenced by an individual's attitudes and beliefs regarding that behaviour [26]. Assessing clinician attitudes and beliefs related to specific behaviours facilitates identification of predictors of behaviour intention and behaviour change.

Theory of planned behaviour

One model that explains the influences of attitudes and beliefs on behaviour intention is Ajzen's Theory of Planned Behaviour (TPB) [26]. According to the TPB, an individual's intention to perform a behaviour can be predicted by determining their attitude toward the behaviour, their beliefs regarding motivation to comply with others expectations (subjective norms) and their beliefs regarding the perceived level of control over factors that may facilitate or hinder their performance of the behaviour (perceived behavioural control). This construct of perceived behavioural control (PBC) can directly influence behaviour, bypassing behaviour intention [26, 27]. The control factors of the PBC construct can be either internal or external, with some authors arguing the presence of two distinct constructs or sub-constructs; *self-efficacy* (perceived

difficulty); and *controllability* (perceived control) [28, 29]. These sub-constructs are seen by some to reflect beliefs about both internal and external factors [30], while others suggest that *self-efficacy* reflects internal factors and *controllability* reflects external factors [28, 31]. While the effects of these two PBC sub-constructs have differed across studies, self-efficacy does appear to be a significant positive predictor of behaviour intention [31].

The TPB has been previously used in studies in the ICU; to examine the influences of nurse behaviour intention to perform hemodynamic assessment using a pulmonary artery catheter [32], and for changing clinician behaviour with the introduction of care bundles [33]. We undertook a before and after evaluation, not previously done before, of tailored multi-faceted implementation of a BMP into intensive care on clinicians' knowledge, attitudes, beliefs, role perceptions and behaviour intentions related to three specific bowel management practices.

Methods

Aim

To evaluate the effect of implementing a BMP on the knowledge, attitudes, subjective norms, perceived behavioural control, behaviour intention and role perceptions for ICU nursing and medical staff using three bowel management practices. The following hypotheses were tested.

Nurses and doctors working in the study units post targeted implementation of a BMP, compared to those pre-implementation, would report;

- Higher knowledge scores regarding bowel management practices for intensive care patients
- More positive attitudes towards three bowel management practices
- Greater social pressure to perform three bowel management practices

- Greater perceived behavioural control over performing three bowel management practices
- Greater behaviour intention to perform three bowel management practices
- Higher self-reported past behaviour scores for three bowel management practices
- Greater confidence in deciding when to perform a per rectum examination
- Greater confidence in choosing the correct enema or suppository in relation to per rectum examination results

Clinician perceptions of roles and responsibilities regarding three bowel management practices was also examined.

Design

A pre and post study was conducted, using self-report, self-administered questionnaires. Data were collected at two time points; pre-implementation and post-implementation of the BMP.

Participants and recruitment

The study was conducted in three ICUs at a tertiary referral public hospital and a magnet private hospital co-located on the same metropolitan campus, in Australia. Specialties for the three ICUs were cardiothoracic surgery (cardiothoracic ICU), general medical and surgical, including neurology (general ICU) and private, mostly surgical, including cardiothoracic surgery (private ICU).

A list of current nursing and medical staff working in the three ICUs was obtained. Due to staff mobility and rotating rosters it was not possible to follow one sample of staff for the entire study period. Staff who were on extended leave, had resigned or who worked casually were ineligible. Nursing staff with limited direct-care clinical activities, such as nurse unit managers (NUM), clinical nurse educators (CNE), nurse educators (NE), and clinical nurse consultants (CNC) also

were excluded. All other nursing and medical staff working in the study units were eligible to participate.

Recruitment of participants for the questionnaires was divided into four phases: pre-notification involving advertisements and advanced letters; round one questionnaire mail out; round two reminder mail out; and round three repeat questionnaire mail out. Sample size calculations were not conducted as the sample was limited to all eligible nurses and doctors employed in the ICUs of the study hospitals.

Implementation of the new BMP

A BMP was developed by a multidisciplinary team (nurses, doctor, pharmacist, and nutritionist) following review of the literature and existing protocols received from our previous research [16]. A tailored multi-faceted implementation intervention was developed to optimise uptake of the new BMP into practice [22, 34]. The implementation intervention consisted of: education sessions, a fact sheet, and reminders, and ran for a period of five months (further details of the BMP and implementation strategy are published in [35]).

Questionnaire

We developed a questionnaire comprising 98 items divided into six sections; demographics (10 items), knowledge (31 items), three behaviours assessed by TPB constructs (15 items repeated for three behaviour sections), and perceptions of roles and responsibilities (12 items) (additional material 1).

The knowledge items were guided by previous studies [36-39]: two items used multi-choice response options (one correct answer) while the remaining 29 items had fixed response options of *true, false* or *unsure*. These items assessed knowledge of medications that cause constipation (10 items), medications that cause diarrhoea (10 items) and general bowel management (11 items).

We chose three behaviours to be assessed by the TPB as, they related to bowel management for ICU patients, they were common behaviours ICU clinicians

would perform during their roles, and they were specifically detailed in the new BMP implemented as part of this study. The three behaviours were:

1. ***Performing*** *an assessment of bowel function* (determining presence or absence of: bowel movements, bowel sounds, flatus, distension, tenderness) on an ICU patient at least once every 8 hours (reflected the shift patterns for nurses at the time of the study) for the duration of their ICU admission (herein referred to as '*assessment of bowel function*')
2. ***Performing*** *a per rectum (PR) examination* on an ICU patient, presented in the context of scenario day three and bowels not opened during admission (herein referred to as '*performing a PR exam*')
3. ***Prescribing or nurse initiating*** *the administration of Microlax enema(s)* for ICU patients with a PR exam result of 'full and soft' (herein referred to as '*administration of enema'*)

We also developed items to measure the constructs of behaviour intention (3 items), attitude (4 items), subjective norm (3 items) and perceived behavioural control (4 items). The four items representing perceived behavioural control were further divided into the sub-constructs of self-efficacy and controllability (2 items each). These items were repeated for the three behaviour sections and scored using a 7-point Likert scale. Past behaviour may influence behaviour intention [40], therefore we included a final item to assess clinicians' self-reported past behaviour using a response scale of zero to ten.

We complied with Ajzen's [27] *principle of compatibility* by clearly defining the three behaviours in relation to the elements of Target, Action, Context, and Time (TACT). Vignettes or scenarios assist in defining the intended context of behaviour especially when clinical-related behaviours are complex [41]. We therefore developed scenarios to contextualise the TPB items for two of our behaviours (*performing a PR exam* and *administration of enema*). We used two scenario versions which considered the study ICU specialties; a general patient with sepsis of unknown origin (Gen ICU scenario) and a post-cardiothoracic surgery patient (CT ICU scenario). Scenario versions were allocated to nursing participants based on the study unit in which they worked, while doctors rotated

through the study units and consequently scenario versions were randomly allocated.

We designed items to further explore participant perception of roles and responsibilities related to the three behaviours assessed by the TPB [42]. One item assessed participant views on the frequency the behaviour *assessment of bowel function* should be performed and two items assessed participant confidence in *deciding/choosing* related to *performing a PR exam* and *administration of enema* using a 7-point Likert scale. The remaining nine items assessed who were responsible for performing, deciding to perform, and should perform the three behaviours and were presented with eight response options (*the bedside nurse, the nursing team leader, the resident, the registrar, the NUM, the educator, the consultant, other*). An additional response option (*the ICU team (nursing & medical)*) was included in the post-implementation questionnaire, and consequently between group comparisons were not possible for these nine items.

Questionnaire validity

We determined construct validity of our 14 items designed to measure the TPB constructs and face validity of the scenarios used to contextualize these items for two of the behaviour sections. Briefly, Cronbach's alpha values were calculated on the pre-implementation responses to determine internal consistency for the TPB construct scales; with ≥ 0.6 considered acceptable [43]. Adequate internal consistencies were achieved for the behaviour intention, attitude and subjective norm constructs for all three behaviours, while the perceived behavioural control construct did not reach adequate internal consistency as a four item scale for any of the behaviour sections (Table 5.1 on page 116). However, a three item perceived behavioural control construct scale did reach adequate internal consistency for two behaviour sections (*performing a PR exam* and *administration of enema*).

Table 5.1 Internal consistency for TPB constructs per behaviour

Factor	Cronbach's alpha		
	Assessment of bowel function	**Performing a PR exam**	**Administration of enema**
	(n=88)	**(n=88)**	**(n=88)**
Behaviour Intention (3 items)	0.874	0.926	0.909
Attitude (4 items)	0.839	0.795	0.848
Subjective Norm (3 items)	0.739	0.753	0.773
Perceived behavioural control (4 items)	0.357	0.458	0.578
	0.396# if delete an item	0.652# if delete an item	0.737# if delete an item
Perceived behavioural control: controllability (2 items)	0.370	0.253	0.263
Perceived behavioural control: self-efficacy (2 items)	0.251	0.580	0.722

if delete 'factors outside my control' item

Data collection

Data were collected by self-administered questionnaire at two time points; pre-implementation and post-implementation. The pre-implementation survey was conducted from May to July in 2008, directly prior to staff review and implementation of the BMP. The post-implementation survey occurred from February to May 2009, five weeks following the end of the five month implementation strategy.

Ethical considerations

Approval to conduct this study was obtained from the Human Research Ethics Committees at St. Vincent's Hospital (Sydney) and the Australian Catholic University. Participation was voluntary which was explicitly stated in an attached information letter as well as the intention to publish non-identifiable results. By returning the completed survey to the researchers participants gave their implicit consent.

Data analysis

Data were analysed using SPSS Statistics for Windows, Version 17.0 (SPSS Inc., Released 2008 Chicago, IL, USA). Demographics were described using frequencies. Differences between pre-implementation and post-implementation group responses for independent sample comparisons were examined using t-tests or chi squares (χ^2) procedures. Scores for total knowledge and the three knowledge subsets were calculated for each participant, with frequencies and between-group differences examined. TPB items were recoded to ensure that higher scores correlated with more positive responses and construct scores were calculated by adding responses to the corresponding items and dividing by the number of items in the scale. Descriptive data and between-group differences were examined for individual TPB items and construct scores for each of the behaviour sections. Descriptive statistics were examined for responses to perceptions of roles and responsibilities items.

Results

Participants

Of the 130 questionnaires distributed to all relevant staff during the pre-implementation survey (nurses = 103, doctors = 27), 88 (68%) were returned; 76 (86%) from nurses and 12 (14%) from doctors. In the post-implementation survey, 138 questionnaires were distributed (nurses = 110, doctors = 28) and 69 (50%)were returned; 58 (84%) from nurses and 11 (16%) from doctors. Demographic characteristics for both the pre-implementation and the post-implementation data collection points were not significantly different (Table 5.2 on page 119-121).

Knowledge

Participants' overall knowledge scores were significantly higher in the post-implementation group when compared to the pre-implementation group (t=-2.905, df=153.4, p=0.004) (Table 5.3 on page 122). The post-implementation group scored significantly higher for knowledge of medications that cause diarrhoea (t=-2.350, df=148.2, p=0.02) and knowledge of general bowel management (t=-2.499, df=152, p=0.014) than the pre-implementation group. No significant differences in scores for knowledge of medications that cause constipation were evident (p=0.23).

Table 5.2 Participant demographics

Demographic variable		Pre (N=88)	Post (N=69)	
		n (%)	n (%)	Test statistics
Gender	Female	63(72)	53(77)	x^2 =0.546, *df*=1, p = 0.46
	Male	25(28)	16(23)	
Scenario version	CT ICU scenario	48(55)	45(65)	x^2 =1.824, *df*=1, p = 0.177
	Gen ICU scenario	40(45)	24(35)	
Age	20 - 29	21(24)	21(30)	x^2 =2.566, *df*=4, p = 0.63
	30 - 39	43(49)	29(42)	
	40 - 49	20(23)	18(26)	
	50 - 59	3(3)	1(1)	
	60 - 69	1(1)		
Current unit *		**[n=76]**	**[n=58]**	x^2 =3.469, *df*=2, p = 0.176
	Private ICU	25(33)	17(29)	
	General ICU	32(42)	18(31)	
	Cardiothoracic ICU	19(25)	23(40)	
Current designation	RN	56(64)	39(567)	x^2 =5.331, *df*=6, p = 0.502
	CNS	20(23)	19(27)	
	RMO	3(3)	1(1)	
	Registrar/Senior Registrar	5(6))	7(10)	
	Consultant	4(4)	2(3)	

Table 5.2 Participant demographics (cont')

Demographic variable		Pre (N=88)	Post (N=69)	
		n (%)	n (%)	Test statistics
Role	Nurse	76(86)	58(84)	x^2 =0.164, *df*=1, p = 0.69
	Doctor	12(14)	11(16)	
Current employment type	Full Time	64(73)	47(69)	x^2 =1.154, *df*=3, p = 0.76
	Part Time	22(25)	20(29)	
	Casual/Other	2(2)	1(1)	
Highest level of education	Hospital Certificate	3(4)		x^2 =7.35, *df*=8, p = 0.499
	Associate Diploma/Diploma	8(9)	2(3)	
	Bachelors Degree	39(44)	28(41)	
	Graduate Certificate	21(24)	20(29)	
	Graduate Diploma	6(7)	9(13)	
	Masters Degree	8(9)	8(12)	
	PhD	1(1)	1(1)	
	Other	2(2)	1(1)	
Enrolled in higher degree study ^	Yes	25(29)	13(20)	x^2 =1.642, *df*=1, p = 0.20

Table 5.2 Participant demographics (cont')

Demographic variable		Pre (N=88)	Post (N=69)	
		n (%)	n (%)	Test statistics
Level of higher degree study enrolled in ^		**[n=25]**	**[n=13]**	x^2 =3.562, *df*=4, p = 0.47
	Graduate Certificate/Diploma	14(56)	6(50)	
	Masters Degree by coursework	5(20)	4(33)	
	PhD	2(8)	2(17)	
	Other	4(16)		

	mean(SD)	range	mean(SD)	range	
Years employed in current unit^	5.09(6.09)	3 weeks to 38 yrs	4.61(4.57)	1 month to 18 yrs	t=0.561, df=151.63, p=0.576
Years of ICU experience	7.03(6.55)	3 weeks to 38 yrs	6.58(5.70)	1 month to 21 yrs	t=0.457, df=153.24, p=0.649

^ Missing data; Relevant denominator shown [n=x]; *Only measured for nursing staff

Table 5.3 Bowel management knowledge scores

	Pre (n=88)		Post (n=69)		
	Mean (SD)	**range**	**Mean (SD)**	**range**	**Test statistics**
Overall knowledge score (31 items)	17.64 (3.72)	8-25	19.25 (3.22)	11-27	t=-2.905, *df*=153.43, p=0.004
Knowledge of medications that may cause diarrhoea (10 items)	4.91 (1.92)	0-9	5.62 (1.86)	1-9	t=-2.35, *df*=148.154, p=0.02
Knowledge of general bowel management (11 items)	8.52 (1.49)	5-11	9.09 (1.34)	6-11	t=-2.499, *df*=152.03, p=0.014
Knowledge of medications that may cause constipation (10 items)	4.2 (1.61)	2-8	4.54 (1.78)	1-9	t=-1.208, *df*=138.84, p=0.229

Maximum possible score for overall knowledge score was 31

Behaviour 1: 'Assessment of bowel function'

Subjective norm, past behaviour

Participants in the post-implementation group reported higher mean scores for the subjective norm items '*My professional colleagues, whose opinion I respect, think that I should perform*' (t=-2.095, df=147.3, p=0.037); and '*I feel under social pressure, from my professional colleagues, to perform*' (t=-2.267, df=139.1, p=0.02) for assessment of bowel function than those in the pre-implementation group (Table 5.4 on pages 126-128).

Those in the post-implementation group reported significantly higher subjective norm construct scores (t=-2.434, df=142.8, p=0.016); and past behaviour scores (t=-3.174, df=137.1, p=0.002) for assessment of bowel function than those in the pre-implementation group (Table 5.4 on pages 126-128).

Behaviour intention, attitude, perceived behavioural control

There were no statistically significant differences in mean scores for any single item for behaviour intention, attitude or perceived behavioural control between groups (Table 5.4 on pages 126-128). There were also no statistically significant differences in the construct scores between groups for behaviour intention (p=0.1), attitude (p=0.76) or perceived behavioural control; either as a four item scale (p=0.58) or split into the two item controllability (p=0.98) and self-efficacy (p=0.6) scales (Table 5.4 on pages 126-128).

Behaviour 2: 'Performing a PR exam'

Subjective norm

Participants in the post-implementation reported higher mean scores for the subjective norm item '*I feel under social pressure, from my professional colleagues, to perform*' than those in the pre-implementation group (t=-2.843, df=137.5, p=0.005) (Table 5.4 on pages 126-128).

Behaviour intention, attitude, perceived behavioural control, subjective norm, past behaviour

There was no statistically significant difference in mean scores for any of the behaviour intention, attitude, perceived behavioural control items; and two of the subjective norm items, '*People who are important to me professionally, think that I should perform'* and '*My professional colleagues, whose opinion I respect, think that I should perform',* for performing a PR exam between groups (Table 5.4 on pages 126-128).

No statistically significant differences were noted in the construct scores for behaviour intention (p=0.97); attitude (p=0.8); perceived behavioural control, either as a four item scale (p=0.76), a 3 item scale (p=0.97), or split into the two item controllability (p=0.83) and self-efficacy scales (p=0.42); subjective norm (p=0.26); and past behaviour scores (p=0.16) (Table 5.4 on pages 126-128).

Behaviour 3: 'Administration of enema'

Perceived behavioural control, behaviour Intention

Participants post-implementation reported higher mean scores for two of the four perceived behavioural control items: '*I have complete control over performing*' (*t*=-2.512, *df*=152.0, p=0.013); and '*I am confident in knowing when an intensive care patient requires*' (*t*=-2.407, *df*=148.9, p=0.017) for administration of enema than those in the pre-implementation group (Table 5.4 on pages 126-128).

Post-implementation participants reported higher mean scores for the behaviour intention items '*I plan to perform*' (*t*=-2.339, *df*=147.9, p=0.020); and '*I intend to perform*' (*t*=-2.034, *df*=150.5, p=0.044) for administration of enema (Table 5.4 on pages 126-128). Participants in the post-implementation also reported significantly higher behaviour intention construct scores for administration of enema than those in the pre-implementation group (*t*=-1.996, *df*=147.3, p=0.048) (Table 5.4 on pages 126-128).

Attitude, subjective norm, perceived behavioural control, past behaviour

There were no statistically significant group differences in mean scores for any of the attitude or subjective norm items; and one of the three behaviour intention items, *'I will perform'* (Table 5.4 on pages 126-128).

For administration of enema, there was no statistically significant difference between groups in the construct scores for attitude (p=0.75); subjective norm (p=0.18); perceived behavioural control, either as a four item scale (p=0.1), a three item scale (p=0.07) or split into the two item controllability (p=0.09) and self-efficacy (p=0.24) scales; and past behaviour scores (p=0.39) (Table 5.4 on pages 126-128).

Table 5.4 Mean responses to TPB items and construct scores per Behaviour (Pre-implementation n=88; Post-implementation n=69)

TPB constructs	TPB items	Assessment of bowel function			Performing a PR exam			Administration of enema		
		Mean(SD)		*p-values*	Mean(SD)		*p-values*	Mean(SD)		*p-values*
		Pre	Post		Pre	Post		Pre	Post	
Past behaviour	Thinking about the last ten ICU patients you have cared for, for how many of them did **you** perform+	[n=85] 5.38(3.38)	[n=63] 7.11(3.22)	0.002	[n=88] 1.81(2.51)	[n=64] 2.45(2.98)	0.161	[n=84] 2.32(3.37)	[n=58] 2.84(3.72)	0.394
Behaviour Intention#	I intend to perform	[n=88] 5.02(1.86)	[n=66] 5.45(1.61)	0.125	[n=86] 4.70(1.86)	[n=65] 4.75(1.76)	0.850	[n=88] 5.17(1.56)	[n=66] 5.64(1.29)	0.044
	I will perform	[n=88] 5.02(1.83)	[n=67] 5.25(1.49)	0.388	[n=85] 5.29(1.75)	[n=66] 5.26(1.58)	0.893	[n=87] 5.32(1.5)	[n=66] 5.65(1.22)	0.136
	I plan to perform	[n=88] 4.97(1.79)	[n=65] 5.46(1.48)	0.063	[n=86] 5.05(1.68)	[n=66] 5.12(1.67)	0.785	[n=85] 5.09(1.62)	[n=65] 5.65(1.27)	0.021
Behaviour Intention (3 item scale)		[n=88] 5.0(1.63)	[n=64] 5.41(1.40)	0.101	[n=85] 5.02(1.65)	[n=65] 5.03(1.59)	0.970	[n=85] 5.22(1.43)	[n=65] 5.65(1.17)	0.048
Attitude#	In my opinion, performing X is good practice/bad practice	[n=87] 6.15(1.30)	[n=68] 6.09(1.27)	0.768	[n=83] 5.69(1.34)	[n=65] 5.55(1.38)	0.557	[n=84] 5.77(1.29)	[n=65] 5.78(1.27)	0.959
	In my opinion, performing X is helpful/unhelpful	[n=81] 5.86(1.47)	[n=66] 5.83(1.38)	0.896	[n=79] 5.62(1.34)	[n=64] 5.52(1.32)	0.641	[n=80] 5.75(1.29)	[n=62] 5.71(1.27)	0.852
	In my opinion, performing X is necessary/unnecessary	[n=82] 5.45(1.78)	[n=66] 5.62(1.44)	0.522	[n=83] 5.39(1.61)	[n=64] 5.22(1.47)	0.515	[n=81] 5.51(1.42)	[n=62] 5.69(1.33)	0.417
	In my opinion, performing X is satisfying/unsatisfying	[n=78] 4.22(1.87)	[n=65] 4.02(1.88)	0.522	[n=79] 3.38(1.99)	[n=64] 3.55(2.01)	0.620	[n=79] 4.54(1.92)	[n=62] 4.05(2.16)	0.158

Table 5.4 Mean responses to TPB items and construct scores per Behaviour (Pre-implementation n=88; Post-implementation n=69) (Cont')

TPB constructs	TPB items	Assessment of bowel function			Performing a PR exam			Administration of enema		
		Mean(SD)		*p-values*	Mean(SD)		*p-values*	Mean(SD)		*p-values*
		Pre	Post		Pre	Post		Pre	Post	
Attitude (4 item scale)		[n=77] 5.44(1.32)	[n=65] 5.37(1.28)	0.763	[n=79] 5.02(1.23)	[n=63] 4.97(1.3)	0.798	[n=79] 5.36(1.24)	[n=62] 5.29(1.26)	0.755
Subjective norms#	I feel under social pressure, from my professional colleagues, to perform	[n=85] 2.39(1.63)	[n=68] 3.01(1.75)	0.025	[n=87] 2.67(1.7)	[n=66] 3.47(1.76)	0.005	[n=87] 3.31(1.94)	[n=66] 3.82(1.95)	0.112
	People who are important to me professionally, think that I should perform	[n=88] 4.32(1.85)	[n=66] 4.58(1.69)	0.371	[n=86] 4.44(1.75)	[n=66] 4.45(1.61)	0.963	[n=86] 4.43(1.64)	[n=66] 4.59(1.70)	0.559
	My professional colleagues, whose opinion I respect, think that I should perform	[n=87] 4.32(1.83)	[n=66] 4.91(1.62)	0.038	[n=87] 4.51(1.72)	[n=66] 4.45(1.66)	0.852	[n=85] 4.68(1.59)	[n=65] 4.97(1.50)	0.260
Subjective Norms (3 item scale)		[n=85] 3.62(1.42)	[n=66] 4.18(1.36)	0.016	[n=86] 3.87(1.41)	[n=66] 4.13(1.37)	0.258	[n=84] 4.15(1.44)	[n=65] 4.48(1.46)	0.175
Perceived behavioural control - controllability#	I have complete control over performing	[n=86] 5.38(1.59)	[n=67] 5.36(1.67)	0.924	[n=87] 5.15(1.87)	[n=66] 5.47(1.47)	0.238	[n=88] 5.26(1.62)	[n=66] 5.83(1.21)	0.013
	There are factors outside of my control that would prevent me from performing	[n=88] 3.57(1.84)	[n=67] 3.64(2.02)	0.816	[n=85] 3.80(1.93)	[n=65] 3.57(1.83)	0.455	[n=85] 3.87(1.86)	[n=65] 4.05(2.07)	0.591
Perceived behavioural control: controllability (2 item scale)		[n=86] 4.49(1.35)	[n=67] 4.5(1.36)	0.979	[n=85] 4.46(1.44)	[n=65] 4.51(1.32)	0.829	[n=85] 4.57(1.33)	[n=65] 4.93(1.29)	0.091

Table 5.4 Mean responses to TPB items and construct scores per Behaviour (Pre-implementation n=88; Post-implementation n=69) (Cont')

TPB constructs	TPB items	Assessment of bowel function			Performing a PR exam			Administration of enema		
		Mean(SD)		*p-values*	Mean(SD)		*p-values*	Mean(SD)		*p-values*
		Pre	Post		Pre	Post		Pre	Post	
Perceived behavioural control – self efficacy#	I am confident in knowing when an intensive care patient requires	[n=88] 5.84(1.18)	[n=67] 5.91(1.11)	0.708	[n=87] 5.77(1.38)	[n=66] 5.79(1.20)	0.932	[n=86] 5.31(1.61)	[n=65] 5.86(1.18)	0.017
	In my opinion, performing X is very easy/very difficult	[n=80] 5.31(1.67)	[n=65] 5.05(1.58)	0.326	[n=80] 5.20(1.59)	[n=64] 4.83(1.58)	0.163	[n=81] 5.58(1.4)	[n=62] 5.48(1.40)	0.683
Perceived behavioural control: self-efficacy (2 item scale)		[n=80] 5.54(1.1)	[n=64] 5.44(1.18)	0.603	[n=80] 5.46(1.26)	[n=64] 5.29(1.22)	0.421	[n=80] 5.42(1.34)	[n=62] 5.67(1.18)	0.238
Perceived behavioural control (4 item scale)		[n=80] 5.0(0.92)	[n=64] 4.91(0.99)	0.578	[n=80] 4.94(1.05)	[n=64] 4.88(1.06)	0.758	[n=79] 4.98(1.08)	[n=62] 5.26(0.97)	0.102
Perceived behavioural control (3 item scale)#					[n=80] 5.34(1.25)	[n=64] 5.33(1.17)	0.967	[n=80] 5.35(1.25)	[n=62] 5.71(1.06)	0.067

Relevant denominator shown [n=x]; +Based on a possible range of 0-10 indicating the number of patients for which the behaviour has been performed in the past (self-reported measure); #Based on a possible range of 1-7 with higher scores indicating a more positive response; # if delete 'factors outside my control' item

Perceptions of roles and responsibilities

Table 5.5 on pages 131 to 133 presents descriptive results for participants' perceptions of roles and responsibilities for the three behaviours. In both pre-implementation and post-implementation groups the majority of participants indicated in their unit that a nurse performs a bowel function assessment on ICU patients, and that they perceive nurses to have primary responsibility for performing a bowel function assessment.

Just over half of the participants in the pre-implementation group (n=51, 58%) indicated a bowel function assessment should be performed *on admission, and at least once every 8 hours* (in line with the new BMP). In contrast, less than half of participants in the post-implementation group (n=32, 46%) indicated this option, instead responses to *'other'* included comments that the eight hourly timeframe was not necessary and should be either once or twice per day.

In both the pre-implementation and post-implementation groups just over half of the participants indicated that; within their unit a nurse decides when to perform a PR exam, and that nurses should decide when to perform a PR exam. Over three quarters of participants indicated that in their unit nurses were responsible for performing a PR exam. The majority of participants indicated, that in their unit, it is a nurse who was responsible for administering an enema.

There was a statistically significant difference in the mean scores between groups for responders confidence in choosing the correct enema or suppository dependent on the result of a per rectum examination. Participants in the post-implementation group reported higher mean scores for the item '*I feel confident in choosing the correct enema or suppository to prescribe/nurse initiate dependent on the results of a PR exam*' than those in the pre-implementation group (t=-2.486, df=152.0, p=0.014), thus confirming the hypothesis (Table 5.5 on page 131-133). Following implementation of the BMP, participant confidence in choosing an enema or suppository increased.

There was no statistically significant group difference in mean scores for responders confidence in deciding when to perform a per rectum examination (Table 5.5 on page 131-133). The hypothesis was not confirmed. Confidence in deciding when to perform a pre rectum examination was not significantly influenced by implementation of the BMP.

Table 5.5 Perceptions of roles and responsibilities and confidence in performing (Pre-implementation n=88; Post-implementation n=69)

Behaviour	Item stem	Response option group	Pre	Post	
			n (%)	n (%)	Test statistics
Bowel Assessment	How often should intensive care patients have their bowel function assessed?	Once, on admission		1(1)	
		On admission, and at least once every 8 hours	51(58)	32(46)	
		On day 3 of admission	4(4)	6(9)	
		Other	33(38)	27(39)	
	Who performs bowel assessment	Nurse	66(75)	46(66)	
		Doctor	11(12)		
		ICU Team	N/A	16(23)	
	Who is responsible for bowel assessment	Nurse	71(81)	44(64)	
		Doctor	7(8)	4(6)	
		ICU Team	N/A	16(23)	
PR exam	Who is responsible for PR	Nurse	69(78)	53(77)	
		Doctor	12(14)	4(6)	
		ICU Team	N/A	7(10)	

Table 5.5 Perceptions of roles and responsibilities and confidence in performing (Pre-implementation n=88; Post-implementation n=69) (Cont')

Behaviour	Item stem	Response option group	Pre	Post	
			n (%)	n (%)	Test statistics
PR exam (Cont')	Who decides to do a PR	Nurse	46(52)	37(54)	
		Doctor	22(25)	8(12)	
		ICU Team	N/A	18(26)	
	Who should decide to do PR	Nurse	50(57)	39(56)	
		Doctor	17(19)	5(7)	
		ICU Team	N/A	19(28)	
Administration of enema	Who is responsible for administering enema	Nurse	87(99)	62(90)	
		Doctor		1(1)	
		ICU Team	N/A	1(1)	
	Who is responsible for prescribing enema	Nurse	18(20)	19(27)	
		Doctor	53(60)	26(38)	
		ICU Team	N/A	17(27.4)	

Table 5.5 Perceptions of roles and responsibilities and confidence in performing (Pre-implementation n=88; Post-implementation n=69) (Cont')

Behaviour	Item stem	Response option group	Pre	Post	
			n (%)	n (%)	Test statistics
Administration of enema (cont;)	Who is responsible for nurse initiating enema	Nurse	72(82)	55(80)	
		Doctor	4(5)	2(3)	
		ICU Team	N/A	6(9)	
	Who should decide enema	Nurse	36(41)	24(35)	
		Doctor	31(35)	13(19)	
		ICU Team	N/A	27(39)	
Confidence in performing			**Mean (SD)**	**Mean (SD)**	
I feel confident in deciding when it is appropriate to perform a PR exam on an intensive care patient#			[n=88] 5.58 (1.68)	[n=69] 5.79 (1.31)	t=-0.866, *df*=151.78, p=0.388
I feel confident in choosing the correct enema or suppository to prescribe/nurse initiate dependant on the results of a PR exam#			[n=88] 4.97 (1.78)	[n=69] 5.59 (1.34)	t=-2.486, *df*=152.0, p=0.014

Where totals do not equal 100%, data were missing; Relevant denominator shown [n=x]; #Based on a possible range of 1-7 with higher scores indicating a more positive response

Discussion

Key findings

Following implementation of the bowel management protocol, we detected an improvement in clinicians' overall knowledge scores, knowledge of medications that cause diarrhoea, and knowledge of general bowel management. As education was a key component of our implementation strategy, we expected an improvement in clinicians' knowledge scores.

We saw a significant increase in the self-reported past behaviour score for behaviour 1: *assessment of bowel function*, indicating that post-implementation clinicians were performing an assessment of bowel function more frequently. Assessment of bowel function is an important aspect of bowel management practices [10]. Assessment was a prominent aspect of our BMP, highlighted in reminders, and was the first element we evaluated to determine clinician compliance with the BMP. However, despite education supporting the importance of frequent assessments of bowel function, responses in the post-implementation group to our item regarding the frequency bowel assessment should be conducted did not support the eight hourly time frame of our BMP, and instead suggested once or twice daily time frames.

Despite also detecting a significant increase in clinicians' subjective norm scores for assessment of bowel function, we only detected a non-significant increase in behaviour intention during post-implementation of the BMP. Although clinicians in the post-implementation group reported higher past behaviour scores and greater subjective norm scores for bowel assessment, their behaviour intention did not significantly increase. The lack of increase in behaviour intention for assessment of bowel function may be related to the fact that there was no significant change in clinicians' attitude or perceived behavioural control for this behaviour. It also may be related to participants' comments indicating that our BMPs requirement for eighth hourly assessment was an unrealistic timeframe.

For behaviour 2: *performing a PR exam*, we only detected a significant change in one of the subjective norm items and not in behaviour intention score or any of the other

TPB construct scores. Participants' confidence in deciding when to perform a PR exam did not significantly increase following implementation of our BMP, despite the BMP advocating the performance of a PR exam on day three if a patient had not had their bowels open. It is possible that clinicians are discouraged from intending to perform this behaviour because of the 'unpleasant' connotations associated with it [44].

We detected a significant increase in behaviour intention and two PBC items (however, these were not from the same sub-construct) for behaviour 3: *administration of enema*. We also detected a significant increase in responders' confidence in choosing the correct enema or suppository. Our BMP included an algorithm to guide clinicians in the appropriate action to take dependent on the results of a PR exam, and this may explain clinicians increased intention to prescribe or nurse initiate the administration of an enema for a given PR exam result and their increased confidence in choosing the correct enema or suppository based on the results of a PR exam.

Both behaviours *performing a PR exam* and *administration of enema* were presented in the context of scenarios and required certain criteria to be met before clinicians were required to perform the behaviour. This clear definition of the context for the behaviours is aligned with Ajzen's [27] principle of compatibility, however, such specificity may have confused clinicians responding to our questionnaire and responses may not be a true indication of clinicians' intention to perform these behaviours. The lack of a significant change in past behaviour scores for both these behaviours could also be related to there not being a need to perform them for all patients; a PR exam and administration of enema was only advocated if a patients' bowels had not opened by day three of ICU admission. In comparison, our BMP advocated behaviour 1, *assessment of bowel function,* was performed for all patients. Additionally, the need to perform a PR exam or administer enemas may have been decreased in the post-implementation group if, as our BMP advocated, patients had regular bowel activity as a result of clinicians assessing bowel function and administering aperients. We did not detect any changes in the attitude construct for any of the three behaviours.

We added a response option (the ICU team) in the post-implementation questionnaire for items regarding clinician perceptions of roles and responsibilities. This was in reaction to multiple response options being chosen by participants in the pre-implementation group. We also thought it important to allow this response as one objective of introducing our BMP was for all staff to take responsibility for bowel management and for a 'team' management approach to become part of practice. However, comparison between groups was therefore not possible and we also cannot easily determine if responders perceive bowel management to be part of their role.

Comparisons with previous studies

Previous studies investigating nurses' knowledge of bowel management practices reported an increase in knowledge scores following education sessions [37, 38] though neither of these studies was specifically within an ICU setting. However, considered with our other results, an improvement in overall knowledge scores does not necessarily translate into an improvement in clinician behaviour intentions related to bowel management. This highlights the importance of factors other than knowledge in influencing clinician behaviour [45].

Positive attitudes towards guidelines within the ICU have been associated with higher self-reported use of guidelines [46]. The processes clinicians use in making decisions, and not just simply a 'know-do-gap', can also influence their use of guidelines [34, 47]. Implementation strategies can impact differently on various health care professionals [48, 49], however we did not specifically account for differences between clinician groups (nurses and doctors) in our implementation strategy.

We asserted that our targeted implementation strategy would influence clinicians in relation to the TPB constructs of attitude, subjective norms and perceived behavioural control. In particular, by obtaining support from opinion leaders we sought to create greater expectations for clinicians to comply with protocol behaviour from their peers and colleagues, affecting change in social norms [19]. We prompted staff with reminders that were clearly visible to all staff, and that could empower clinicians to act in instigating bowel management for their patients, affecting change

in perceived behaviour control [22]. Further, we endeavoured to change attitudes around bowel management by promoting the complications of poor bowel management for critically ill patients in our education sessions and fact sheet.

Study strengths and weaknesses

Our results showed variability in clinician behaviour intentions and TPB constructs of attitude, subjective norms and perceived behavioural control for three bowel management practices in intensive care following implementation of our BMP. To our knowledge, there have been no previous studies of intensive care clinician bowel management practices utilizing the TPB to investigate clinician behaviour intention. Although our study was conducted in 2008-2009, the results remain relevant. There has been little progress in the practice area of bowel management in ICU.

Study limitations are noted. Our study was conducted in three ICUs at two co-located hospitals, and so our sample size was limited to the number of staff working within the units. We were therefore unable to determine differences between nursing and medical staff, given the small response rate from medical staff. Another noted limitation was that we did not include other factors that may influence clinicians' behaviour intention, such as moral norm [50, 51]. We also could have further developed our implementation strategies to specifically address each of the TPB constructs and therefore initiate change in clinician behaviour intentions [52, 53]. We acknowledge that behaviour intention and self-reported past behaviour does not necessarily replace objective measures of behaviour [40] and further investigation to determine clinicians actual bowel management practices in intensive care would increase our understandings of this important area. We did not repeat administration of our questionnaire over time. Although sustainability of an intervention is an important issue, this was beyond the scope of our study. Whilst our results were statistically significant, further research is warranted to define parameters to determine clinically meaningful change in clinician behaviour in relation to bowel management.

Conclusion

Bowel management for critically ill patients is a complex behaviour, and ICU clinicians should be considering ways to ensure their management of bowel function is aligned to minimise complications for patients. Conducting surveys based on the TPB can provide useful insights into factors that influence clinicians' intentions to perform behaviours and can be used to evaluate the effectiveness of implementing BMPs within ICU. Further refinement of items to measure clinicians' perceptions of roles and responsibilities regarding bowel management in the intensive care would allow greater insight into their influence on behaviour intention. Ensuring the uptake of BMPs into clinician practice will require further investigation to better understand what influences clinicians' clinical decisions and behaviours in relation to bowel management. Future investigation into the factors that influence opinion leaders and organizational culture in relation to bowel management may shed light on reasons for the minimal change in clinicians' behaviour intentions.

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5.3 Epilogue to manuscript III

The following section presents additional data arising from further analysis of the responses to the TPB survey (pre-implementation) not contained in the previous manuscript, but which contributes to the thesis, has been presented at an international conference and will be prepared into a manuscript for publication.

The aim of this additional analysis was to identify any predictors of nursing and medical clinicians' behaviour intention (BI) related to the three bowel management behaviours for intensive care patients. This section reports the results of performing multiple regression analysis on the responses to the pre-implementation staff survey.

Data Analysis

To determine any correlations with BI and potential predictors bivariate analysis was conducted for each of the three behaviour sections. Demographic variables as well as the questionnaire scenario, knowledge scores and TPB construct scores (Att, SN, PBC) were entered into the analysis. In addition, two items from the Roles and Responsibilities section of the survey were also compared with the relevant BI. An item regarding participants' confidence in '*deciding when it is appropriate to perform a PR exam on an intensive care patient*' was compared with the behaviour 2 BI scores and an item regarding participants' confidence in '*choosing the correct enema or suppository to prescribe or nurse initiate dependent on the results of a PR exam*' was compared with behaviour 3 BI.

For dichotomous variables, a 2 sample t-test was performed and if Levene's Test for Equality of Variance was significant then equal variances were not assumed. One way ANOVA analysis was performed for those variables with more than 2 groups. For continuous variables, bivariate correlations (Pearson's correlation) were performed. Prior to analysis, missing values for the construct scores were replaced with the mean.

Any variables with a p value of less than or equal to 0.2 following bivariate analysis met the criteria of a potential predictor variable for inclusion in the next stage of

analysis (see Table 5.6 on pages 147-149). Multiple linear regressions using a stepwise model reduction, with the outcome variable of interest as BI and the predictor variables from the bivariate analysis were conducted for each of the three behaviour sections.

Results

The TPB constructs of attitude and subjective norm were predictor variables of behaviour intention for all three practices, with the models explaining between 57% and 67% of variance (Table 5.7 on pages 150-151).

For behaviour 1, assessment of bowel function, a significant model emerged ($F_{3,82}=38.907$, $p=0.000$, Adjusted R square=0.572) with the predictor variables of attitude (Beta=0.602, p=0.000), subjective norm (Beta=0.358, p=0.000) and a single perceive behavioural control item 'I have complete control over performing' (Beta=0.171, p=0.018).

For behaviour 2, performing a per rectum examination, a significant model emerged ($F_{3,84}=54.165$, $p=0.000$, Adjusted R square=0.647) with the predictor variables of attitude (Beta=0.691, p=0.000), subjective norm (Beta=0.273, p=0.002) and a single item 'I have confidence in deciding when to perform a per rectum exam' (Beta=0.271, p=0.000).

For behaviour 2, administration of enema, a significant model emerged ($F_{4,83}=44.028$, $p=0.000$, Adjusted R square=0.669) with the predictor variables of attitude (Beta=0.363, p=0.000), subjective norm (Beta=0.294, p=0.000), perceived behavioural control (3 item scale) (Beta=0.307, p=0.003) and a single item 'I have confidence in choosing correct enema' (Beat=0.144, p=0.013).

Table 5.6 Bivariate analysis results for the three behaviours

	Behaviour 1	**Behaviour 2**	**Behaviour 3**
	test statistic mean(sd)	**test statistic mean(sd)**	**test statistic mean(sd)**
Age Group	F(2,154)=1.050, p=0.352	F(2,154)=0.671, p=0.513	F(2,154)=1.875, p=0.157
20-29 (n=42)	5.2955(1.36598)	5.0403(1.62833)	5.4836(1.26913)
30-39 (n=72)	4.9951(1.44383)	4.8808(1.52229)	5.2060(1.22330)
>40 (n=43)	5.3876(1.77867)	5.2335(1.64502)	5.6771(1.43233)
Gender	t=2.402,*df*=54.813,p=0.02	t=0.781,*df*=155.96,p=0.436	t=1.178,*df*=60.481.96,p=0.243
Female (n=116)	5.3827(1.32961)	5.0787(1.56919)	5.4888(1.22908)
Male (n=41)	4.6179(1.87907)	4.8540(1.62459)	5.1843(1.48503)
Knowledge Score	r=-0.000 p=0.997	r=-0.084, p=0.298	r=-0.139, p=0.082
Knowledge level	t=0.251, *df*=155,p=0.802	t=-1.419, *df*=155,p=0.158	t=-2.195, *df*=155,p=0.030
Up to 50% correct (n=48)	5.2292(1.40609)	4.7510(1.5249)	5.0695(1.25785)
Greater than 50% correct (n=109)	5.1626(1.57876)	5.1386(1.59996)	5.5589(1.29958)
Current designation	F(6,150)=3.693, p=0.002	F(6,150)=1.782, p=0.107	F(6,150)=2.689, p=0.017
RN (n=95)	5.2718(1.43449)	5.0430(1.60246)	5.3589(1.31887)
CNS (n=39)	5.3952(1.36124)	5.1293(1.57200)	5.5175(1.23540)
RMO (n=4)	3.75(1.93170)	4.3333(1.69967)	4.1667(1.59861)
Reg (n=11)	2.9096(1.72394)	4.8485(1.16775)	5.0890(0.98867)
Senior Reg (n=1)			
Consultant (n=6)	6.0686(1.47470)	5.7265(1.15955)	6.9444(0.13608)

Table 5.6 Bivariate analysis results for the three behaviours (cont')

	Behaviour 1	Behaviour 2	Behaviour 3
	test statistic mean(sd)	**test statistic mean(sd)**	**test statistic mean(sd)**
Designation	F(2,154)=3.247, p=0.042	F(2,154)=0.460, p=0.632	F(2,154)=0.208, p=0.813
Nurse (n=95)	5.2718(1.43449)	5.0430(1.60246)	5.3589(1.31887)
Senior Nurse (n=39)	5.3952(1.36124)	5.1293(1.57200)	5.5175(1.23540)
Medical (n=23)	4.4561(1.95118)	4.7402(1.54730)	5.4339(1.39042)
Role	t=2.005, *df*=26.083,p=0.055	t=0.918, *df*=155,p=0.360	t=-0.098, *df*=155,p=0.922
Nurse (n=134)	5.3077(1.40959)	5.0681(1.58824)	5.4050(1.29254)
Doctor (n=23)	4.4561(1.95118)	4.7402(1.54730)	5.4339(1.39042)
Highest level of education	t=-1.020, *df*=155, p=0.309	t=0.413, *df*=155, p=0.680	t=-1.923, *df*=155, p=0.056
Undergraduate (n=80)	5.06(1.58707)	5.0713(1.65496)	5.2148(1.30871)
Postgraduate (n=77)	5.3094(1.45483)	4.9668(1.51018)	5.6113(1.27356)
Years experience in Intensive Care	r=-0.037, p=0.648	r=-0.020, p=0.805	r=-0.176, p=0.028
Period of Intensive Care experience	t=-0.873,*df*=155, p=0.417	t=-0.868,*df*=155, p=0.387	t=-2.356,*df*=155, p=0.020
Up to 5 years (n=46) 1= 82	5.0882(1.53104)	4.9151(1.48689)	5.1784(1.19672)
Greater than 5 years (n=42) 2= 75	5.2865(1.51946)	5.1348(1.68181)	5.6617(1.37344)
Years employed in current unit	r=0.101, p=0.211	r=0.107, p=0.186	r=0.196, p=0.015
Time employed in current unit	t=-0.688,*df*=152, p=0.493	t=-0.778,*df*=152, p=0.438	t=-2.398,*df*=152, p=0.018
Up to 5 years (n=59) 1= 105	5.1260(1.55647)	4.9434(1.57538)	5.2303(1.28761)
Greater than 5 years (n=27) 2 = 49	5.3093(1.50451)	5.1584(1.64427)	5.7634(1.27876)

Table 5.6 Bivariate analysis results for the three behaviours (cont')

	Behaviour 1	Behaviour 2	Behaviour 3
	test statistic mean(sd)	**test statistic mean(sd)**	**test statistic mean(sd)**
Scenario	t=-1.007, *df*=135.433, p=0.316	t=-4.003, *df*=154.961, p=0.000	t=-2.804, *df*=155, p=0.006
CT (n=93)	5.0814(1.52279)	4.6425(1.70783)	5.1726(1.35856)
Gen (n=64)	5.3306(1.52528)	5.5688(1.19130)	5.7532(1.14200)
Confidence in deciding when to perform a PR	N/A	r=0.583, p=0.000	N/A
Confidence in choosing an appropriate enema or suppository	N/A	N/A	r=0.602, p=0.000
Attitude	r=0.691, p=0.000	r=0.746, p=0.000	r=0.710, p=0.000
Subjective Norm	r=0.598, p=0.000	r=0.568, p=0.000	r=0.598, p=0.000
PBC (4 items)	r=0.404, p=0.000*	r=0.460, p=0.000*	r=0.563, p=0.000*
PBC (3 items)	r=0.460, p=0.000*	r=0.549, p=0.000	r=0.724, p=0.000
PBCC – controllability (2 items)	r=0.275, p=0.001*	r=0.263, p=0.001*	r=0.217, p=0.006*
PBCC – controllability (1 item) pX3	r=0.363, p=0.000	r=0.469, p=0.000	r=0.476, p=0.000
PBCC – controllability (1 item) pX7	r=0.118, p=0.144	r=-0.030, p=0.719	r=-0.071, p=0.389
PBCE – self efficacy (2 items)	r=0.441, p=0.000*	r=0.521, p=0.000*	r=0.752, p=0.000
PBCE– self efficacy (1 item) pX10	r=0.279, p=0.000	r=0.520, p=0.000	r=0.815, p=0.000
PBCE – self efficacy (1 item) atX5e	r=0.450, p=0.000	r=0.432, p=0.000	r=0.562, p=0.000

Those highlighted met the *p-value* of ≤0.2

Table 5.7 Multiple regresssion analysis results for the three behaviours

Behaviour	Initial Variables	Final Variables	Beta (Unstandardised)	Std. Error (Unstandardised)	t	Sig.
1	Gender	Attitude	0.602	0.112	5.375	0.000
	Current designation/designation/role	Subjective norm	0.358	0.098	3.645	0.000
	Highest level of education	p33	0.171	0.071	2.408	0.018
	Years employed in current unit					
	Attitude					
	Subjective norm					
	PBC (p33)					
		$F(3,82)=38.907$, $p=0.000$; $R^2=0.587$; Adj $R^2=0.572$				
2	Knowledge level	pr611a	0.271	0.070	3.887	0.000
	Scenario	Attitude	0.691	0.107	6.453	0.000
	pr611a (confidence in deciding when to perform PR)	Subjective norm	0.273	0.086	3.179	0.002
	Attitude					
	Subjective norm					
	PBC (3 item)					
		$F(3,84)=54.165$, $p=0.000$; $R^2=0.659$; Adj $R^2=0.647$				

Table 5.7 Multiple regresssion analysis results for the three behaviours (cont')

Behaviour	Initial Variables	Final Variables	Beta (Unstandardised)	Std. Error (Unstandardised)	t	Sig.
3	Age	e612a	0.144	0.057	2.525	0.013
	Knowledge level	Attitude	0.363	0.100	3.625	0.000
	Current designation	Subjective norm	0.294	0.074	3.984	0.000
	Years experience in intensive care	PBC (3 item)	0.307	0.101	3.052	0.003
	Years employed in current unit					
	Scenario					
	e612a (confidence in choosing correct enema/suppository)					
	Attitude					
	Subjective norm					
	PBC (3 item)					
		F(4,83)=45.028, p=0.000; R^2=0.685; Adj R^2=0.669				

Discussion

For all three behaviour sections, attitude and subjective norm were predictors of clinicians' behaviour intention. So according to the TPB, these results mean that if clinicians have more positive attitudes they are more likely to have increased behaviour intention towards the three behaviours. Clinicians' behaviour intention is also more likely to be high if they feel social pressure from their colleagues to perform the behaviours. In this sample, clinicians who felt they had greater control over performing behaviour three, prescription or nurse-initiation of Microlax enema, would have higher behaviour intention. Therefore, to effect change in clinicians' behaviour intention related to the three bowel management practices, clinicians' attitudes and subjective norms (social pressure to perform the behaviour) need to be increased.

5.4 Summary to submitted manuscript III and additional analysis

In this manuscript the discussion focused on the effect of the targeted implementation strategy and BMP on clinicians' knowledge, attitudes, beliefs and behaviour intention related to three bowel management practices. The implementation strategy appears to have increased clinicians' knowledge, however this did not translate into improved attitudes, beliefs or behaviour intentions. In chapter six the results of the pre and post-implementation medical record audit to evaluate the impact of the targeted implementation strategy and BMP on clinician practices and patient outcomes is presented.

6 STUDY TWO: CLINICIAN PRACTICES AND PATIENT OUTCOMES

6.1 Introduction to manuscript accepted for publication

A bowel management protocol (BMP) was developed as part of study two of this research. The developed BMP and an evaluation of the success of its implementation are presented in a manuscript accepted for publication in *The Journal of Clinical Nursing* in the following section (section 6.2). The methods, results and discussion for an evaluation of the BMP and an evaluation in the form of a retrospective audit of patient medical records pre and post implementation are presented. The manuscript is presented in the referencing style required by the journal and the corresponding reference list is provided at the end of the chapter.

6.2 Manuscript IV

Knowles S, McInnes E, Elliott D, Hardy J & Middleton S Evaluation of the implementation of a bowel management protocol in Intensive care: Effect on clinician practices and patient outcomes

Accepted for publication 2013: *Journal of Clinical Nursing*

Abstract

Aims

To evaluate the effect of a multi-faceted implementation of a bowel management protocol on outcomes for intensive care patients, in particular the incidence of constipation and diarrhoea, and on clinicians' bowel management practices.

Background

Complications associated with poor bowel management for critically ill patients result in adverse outcomes. Implementation of protocols requires strategies proven to change clinician behaviour.

Design

Before and after study.

Methods

Our bowel management protocol was implemented using three evidence-based elements: education sessions, printed educational materials in the form of a fact sheet, and reminders. We retrospectively collected data from patients' medical records admitted at two time points within three Sydney metropolitan intensive care units (pre-implementation n=101; post-implementation n=107).

Results

No significant difference was found in the incidence of constipation and diarrhoea pre and post-implementation of the protocol. 72% (n=73) of patients pre-implementation and 70% (n=75) of patients post-implementation experienced one or more episodes of constipation (bowels not open for 72 hours or greater); and 16% (n=16) of patients pre-implementation and 20% (n=21) of patients post-implementation experienced one or more episode of diarrhoea. There was a slight non-significant increase in bowel assessment on admission by medical officers post-implementation (pre 47%,n=48; post 60%, n=64).

Conclusion

Targeted multifaceted implementation of a bowel management protocol did not have an impact on the incidence of constipation or diarrhoea for intensive care patients, or on clinician practices. The lack of impact on patient outcomes may be due to clinicians' non-adherence to our bowel management protocol. Reasons clinicians' practices did not change may include the influences of clinical decision making on behaviour.

Relevance to clinical practice

This study highlights difficulties inherent in changing clinician behaviour and practices to improve patient outcomes despite using an evidence-based multifaceted implementation strategy. Further research is required to ascertain the most effective implementation strategies.

Keywords

bowel management, intensive care, constipation, diarrhoea, protocol, clinician practices, medical record audit

What does this paper contribute to the wider global clinical community?

- This is the first study to evaluate the effect of targeted implementation of a bowel management protocol on patient outcomes within intensive care.
- Findings suggest that practice change is difficult with complex behaviour change interventions.

Introduction

Critically ill patients are at risk of bowel dysfunction such as constipation and diarrhoea (Asai 2007, Ferrie & East 2007, Mutlu *et al.* 2001), which can lead to further complications including increased length of stay (LOS), delays in weaning from mechanical ventilation and bowel obstruction (Mostafa *et al.* 2003, van der Spoel *et al.* 2001). Clinicians have reported dissatisfaction with the management of bowel function for intensive care patients within their units (Knowles *et al.* 2010, Thorpe & Harrison 2002). Bowel management protocols (BMPs) have the potential to improve practices in intensive care for critically ill patients (Dorman *et al.* 2004). Introduction of protocols into practice should be supported with evidence-based implementation strategies (Grimshaw & Eccles 2004). This paper reports the evaluation of an implementation strategy introducing a BMP into intensive care on clinician practices and the incidence of constipation and diarrhoea for intensive care patients.

Background

Bowel dysfunction in the intensive care

Critically ill patients are at risk of constipation and diarrhoea due to a number of factors including: dehydration; continuous or intermittent administration of sedatives or analgesics, including opioids; decreased mobility; mechanical ventilation; or their underlying illness or disease process (Asai 2007, Mutlu *et al.* 2001). Both constipation and diarrhoea can lead to adverse outcomes for intensive care patients (Gacouin *et al.* 2010, Wiesen *et al.* 2006), including dehydration; electrolyte disturbances; skin excoriation or wound contamination; disturbed bowel motility and perforation; delayed weaning or prolonged mechanical ventilation; and increased LOS (Mostafa *et al.* 2003, van der Spoel *et al.* 2001).

The incidence of constipation and diarrhoea in intensive care is variable: with reports for constipation ranging from 16% (Montejo 1999) to 50% (Patanwala *et al.* 2006) and in one instance even as high as 83% (Mostafa *et al.* 2003); and reports of diarrhoea ranging from 15% (Montejo 1999) to 36% (Ferrie & East 2007). Such

variation in incidence could be due to differences in definitions used for critically ill patients (Lebak *et al.* 2003, Wiesen *et al.* 2006).

Although there is a lack of consensus, and often a use of complex criteria and subjective or estimated measures (Ferrie & East 2007, Lebak *et al.* 2003, Sabol & Carlson 2007, Yassin & Wyncoll 2005), diarrhoea is commonly defined by consistency, frequency and amount (Lebak *et al.* 2003). Similarly, definitions of constipation for critically ill patients vary in the literature, however most focus on one aspect, the frequency of bowel movement. The most common timeframe to define constipation for critically ill patients is three days (Dorman *et al.* 2004, Hill *et al.* 1998, Mostafa *et al.* 2003, Ritchie *et al.* 2008), however some have suggested allowing an additional day from admission for stabilisation of the patient (no bowel motion within 96 hours of admission) (Patanwala *et al.* 2006).

Despite critically ill patients being at increased risk of complications from bowel dysfunction, it is often a low priority, when considered against other demands of the highly technical intensive care environment (Marshall 2005). In addition, bowel management is an area where clinicians' documentation and reporting rates have been shown to be low (Dorman *et al.* 2004, McKenna *et al.* 2001, McPeake *et al.* 2011).

Bowel management in the intensive care

Due to the potential for critically ill patients to develop complications associated with bowel dysfunction it is essential that ways to improve practices are explored; protocols offer a way to standardise bowel management practices (Dorman *et al.* 2004, Ferrie & East 2007, Hill *et al.* 1998, McKenna *et al.* 2001). Despite clinicians' perceptions that bowel management is a problem there is relatively low use of protocols or guidelines to inform practice in the intensive care setting (Knowles *et al.* 2010, Mostafa *et al.* 2003, Thorpe & Harrison 2002). Only 32% (n=13) of responding ICUs in New South Wales, Australia reported using a guideline or protocol for bowel management (Knowles *et al.* 2010), 21% (n=17) of United Kingdom (UK) ICUs had a BMP or guideline (Thorpe & Harrison 2002) and only 3.5% (n=5) of UK ICUs had a guideline for management of constipation (Mostafa *et al.* 2003).

Managing bowel dysfunction for critically ill patients is aimed at ensuring gastrointestinal motility is sustained through assessment, appropriate interventions are used when required, and constipation and diarrhoea are minimised. BMPs can cover aspects such as monitoring function, instigating early enteral nutrition, and prophylactic administration of aperients (Dorman *et al.* 2004, Ferrie & East 2007, McKenna *et al.* 2001).

Within the intensive care environment, monitoring and documenting bowel activity to identify constipation is often considered within the domain of nurses (Dorman *et al.* 2004, Richmond & Devlin 2003, Thorpe & Harrison 2002), however, more recently bowel assessment has been added to daily checklists for medical officers (Vincent & Hatton 2009). Treatment for constipation often includes pharmacological measures prescribed by medical officers; however, in NSW, nurses can initiate medications according to institutional protocols, including medications for the treatment and prophylaxis of constipation (National Nursing & Nursing Education Taskforce 2006).

The use of a constipation risk assessment for intensive care patients has been identified as potentially useful in prompting clinicians to initiate proactive management of constipation (Ritchie *et al.* 2008). There have been a number of constipation risk assessment scales developed and evaluated, though none specifically for the ICU environment (Duffy & Zernike 1997, Kyle 2007, Richmond & Wright 2005, Zernike & Henderson 1999).

A number of laxative medications have been shown to have positive effects on the occurrence of bowel movements for ICU patients: stimulant or osmotic laxatives (Patanwala *et al.* 2006); polyethylene glycol (PEG) laxatives (van der Spoel *et al.* 2007); and lactulose, however, lactulose was associated with a higher incidence of acute intestinal pseudo obstruction (van der Spoel *et al.* 2007). Many of the osmotic laxatives advocated in the American Gastroenterological Association medical position statement on constipation (Bharucha *et al.* 2013) can cause electrolyte disturbances and are contraindicated in critically ill patients. In addition, constipation associated with opioid use is likely in the ICU and therefore, a stool softener with stimulant may be more appropriate (Patanwala *et al.* 2006). Non-pharmacological treatments for

constipation, such as increasing mobility and hydration, are not always possible in the ICU and are therefore of limited value, and as such prophylactic administration of laxatives and enteral feeding form an integral component of a BMP in the ICU (Ferrie & East 2007).

Managing diarrhoea in critically ill patients is focused on reducing the possible causes and complications of diarrhoea while maintaining bowel function. It is advocated that using fibre in enteral feed formulas (Rushdi *et al.* 2004) and discouraging stopping of enteral feeds to manage diarrhoea (Ferrie & East 2007) does not increase the incidence of diarrhoea and is beneficial in maintaining bowel function. Other management strategies for diarrhoea include identifying medications causes and changing prescriptions if possible.

Implementation of practice change initiatives

Simply providing protocols or guidelines to clinicians is unlikely to lead to a change in practice (Gagliardi & Brouwers 2012, Grimshaw *et al.* 2004), instead, evidence-based implementation strategies that are locally relevant should be used (Doherty 2006, Gagliardi *et al.* 2011, Grol 1997). Strategies shown to have some effectiveness in disseminating protocols into practice, include; distribution of educational materials, educational meetings and outreach visits; audit and feedback; reminders; mass media; and use of local opinion leaders (Flodgren *et al.* 2011, Forsetlund *et al.* 2009, Grimshaw *et al.* 2004, Grol & Grimshaw 2003). Multifaceted interventions may be more successful in changing clinicians' practice (Baker *et al.* 2010, Francke *et al.* 2008, Grimshaw *et al.* 2001, National Health and Medical Research Council (Australia) 2000), although, it is not fully understood what single component or combination of components are more effective (Grimshaw *et al.* 2006, Grimshaw *et al.* 2002); there should be adaptation of implementation strategies to overcome local barriers (Grimshaw *et al.* 2002). Previous research describing the introduction of BMPs into ICUs has typically provided scant detail of any implementation strategies used to introduce the protocol into practice (Dorman *et al.* 2004, Ferrie & East 2007, Hill *et al.* 1998, McKenna *et al.* 2001, McPeake *et al.* 2011).

Minimising complications for critically ill patients by managing bowel function is important for intensive care clinicians. BMPs offer a way to guide clinicians in standardised assessment and appropriate treatment of bowel function for intensive care patients. Protocols should be implemented using systematic targeted strategies aimed at changing clinician behaviour (Gagliardi & Brouwers 2012). There has been no previous evaluation of the implementation strategy used to introduce a BMP into the intensive care environment. We conducted a study to evaluate targeted implementation of a BMP on patient outcomes and clinician practices.

Method

Aims and objectives

The purpose of this study was to evaluate the effect multi-faceted implementation of a bowel management protocol had on outcomes for intensive care patients, namely the incidence of constipation and diarrhoea, and on clinicians' bowel management practices within three Sydney metropolitan ICUs.

Design

We conducted a pre and post study using retrospective medical record audit. Outcome data were collected one month post-implementation of a structured introduction of a BMP and at an identical calendar time point eleven months pre-implementation to provide baseline data.

Hypotheses

We hypothesised that, patients admitted to the three study ICUs following the implementation of the BMP would have, compared to patients admitted to the study ICUs prior to implementation of the BMP:

Patient Outcomes

- Decreased length of time from ICU admission to first bowels open (within 72 or 96 hours of admission)

- Lower incidence of constipation during ICU admission (Bowels not opened (BNO) for 72 hours)
- Lower incidence of patients with bowels not open during ICU admission
- Lower incidence of diarrhoea during ICU admission (4 or more loose/liquid stools or greater than 200mls in a day)
- Decreased percentage of admission patient has diarrhoea
- Lower mean LOS in ICU

Clinician Behaviour Change Outcomes

- All patients bowel function assessed and documented on ICU admission (by medical officer and/or a registered nurse)
- All patients bowel function assessed daily (by a medical officer and/or a registered nurse)
- All patients prescribed medications for management of bowel function according to the BMP

Intervention

We firstly, developed a BMP and secondly, undertook qualitative barriers assessment of the BMP using focus groups. We then developed a tailored multifaceted evidence-based implementation intervention to introduce the BMP into practice within the study units. Our BMP and implementation strategy were targeted at all nursing and medical officers within the study units.

BMP development

Our BMP was developed by a multidisciplinary team consisting of nurses (clinical nurse consultant, clinical nurse specialist), a doctor (senior consultant intensivist), pharmacist and dietician who reviewed existing protocols reported in the literature (Dorman *et al.* 2004, Ferrie & East 2007, Hill *et al.* 1998, McKenna *et al.* 2001,

Thorpe & Harrison 2002, Yassin & Wyncoll 2005) and protocols received from other New South Wales (NSW) ICUs during a previous study (Knowles *et al.* 2010).

The aim of our BMP was to prompt nursing and medical clinicians to monitor bowel function, to act in a timely manner to reduce complications and to proactively initiate aperient administration in patients at risk of constipation during their ICU stay. Our BMP included four decision algorithms (Constipation, Per Rectum exam, Impaction, & Diarrhoea) and a quick reference table for common laxative medications (see Appendix 4 for a copy of the BMP algorithms). We developed a bowel function chart which included constipation risk assessment to be completed for each patient on admission. There was no valid risk assessment instruments specifically for use in ICU and so four key elements were chosen that are associated with constipation risk for critically ill patients: mechanical ventilation for greater than 24 hours; immobility for greater than 24 hours; use of neuromuscular blocking agents; and use of opioids. Our constipation risk assessment aimed to highlight patients' risk of constipation to clinicians. We defined constipation as 'the absence of bowel movements for three consecutive days' and clinically significant diarrhoea as 'liquid stool >300mls per day or four loose stools per day'.

Our BMP advocated the prophylactic prescription of a laxative on day one of admission (a stool softener with stimulant: Coloxyl® with Senna) with the addition of an osmotic laxative on day three if BNO (Movicol®: macrogol 3350 with electrolytes) and use of enemas as guided by results of a per rectum examination (PR exam) if laxative prescription has not instigated bowel movement. We discouraged the use of lactulose laxative preparations (osmotic laxative) as they have been associated with paralytic ileus and acute intestinal pseudo obstruction in critically ill patients (van der Spoel *et al.* 2007). The AGA position statement is not specific to the ICU and therefore had limited relevance for our BMP. Instead we were influenced by other ICU protocols (Dorman *et al.* 2004, Ferrie & East 2007, Hill *et al.* 1998, Knowles *et al.* 2010, McKenna *et al.* 2001) and studies of laxatives within an ICU setting (Patanwala *et al.* 2006, van der Spoel *et al.* 2007).

Unless contraindicated, all patients admitted to the study ICUs were commenced on the BMP. Contraindications for the BMP were a non-functioning gut due to either:

recent bowel or abdominal surgery; pancreatitis; known bowel obstruction/ileus; or inability to tolerate enteral or oral feeding.

Enteral feeding protocols that encouraged early commencement of feeding and the use of a nutrition formulation with included fibre were already in use within the study ICUs. Combined with these existing enteral feeding protocols, our new BMP addressed many of the key elements discussed by Ferrie and East (2007) in the development of their BMP. In particular our diarrhoea decision algorithm encouraged investigation of all other possible causes of diarrhoea before stopping or changing the enteral feeding formulation (Ferrie & East 2007).

Barriers assessment

Our developed BMP was reviewed by staff working in the study units at two focus groups where staff were given an opportunity to identify any perceived barriers to the BMPs implementation (Grol & Wensing 2004) and responses were considered in our implementation strategy design. Barriers raised by staff included staff needing a prompt to perform bowel function assessment for each shift, and staff being unclear whose responsibility it was to perform a PR exam on a patient. The remaining barriers identified mainly related to the content and structure of the developed BMP and changes were made accordingly (Table 6.1 on page 165).

Table 6.1 Staff review of BMP identified barriers and solutions

Potential barrier of BMP	Suggested solutions
Difficulty in conducting abdominal X-Ray or CT scans for some intensive care patients	• Liaise with radiology department about new BMP • Change wording for Day 5 if bowels not open from 'perform abdominal X-Ray or CT scan' to 'consider further investigations such as abdominal X-Ray or CT scan'
Staff unclear whose responsibility it is to perform a per rectum examination (PR exam)	• Provide clear statement about who is to perform PR exam; medical officer or registered nurse
Number of algorithms and repetition of some information	• Combine PR exam and Impaction algorithms
Bowel function assessment performance for each shift	• Create a stamp to appear on patient daily flowcharts to prompt nursing staff to conduct bowel assessment each shift (temporary measure until new flowcharts are designed to incorporate this)
Overflow from constipation or impaction incorrectly labelled as diarrhoea	• Add prompt at beginning of diarrhoea algorithm
Unclear link with existing enteral feeding protocols	• Refer to review and continuation of enteral feeding despite diarrhoea in algorithm

Implementation of the BMP

We developed an evidence-based multifaceted implementation intervention to optimize the uptake of the new BMP into practice within the study units (Grimshaw *et al.* 2004). Our multifaceted implementation intervention ran for a period of 5 months and consisted of three evidenced-based elements: education sessions (Grimshaw *et al.* 2004), printed educational material in the form of a fact sheet (Berenholtz *et al.* 2004), and reminders in the form of advertising, flowchart stamp, and paper reminders (Grimshaw & Eccles 2004, Grimshaw *et al.* 2004, National Health and Medical Research Council (Australia) 2000) (Table 6.2 on page 167). Our multifaceted implementation intervention included tailoring of the elements to specifically address identified barriers (Grimshaw *et al.* 2012).

Education sessions and fact sheets were the first two elements of our implementation intervention. We ran education sessions over a one month period to achieve a target of 80% attendance by nurses. However, we noticed that there was limited attendance at education sessions by doctors (only two doctors attended) and hence this element was supplemented with individual letters signed by the ICU Director sent to all doctors prior to introduction of the BMP. The letters highlighted the BMP was being implemented into the ICUs, it had been developed by a multidisciplinary team and the importance of bowel management for ICU patients. A copy of the fact sheet also was included.

Following the education sessions, the BMP was introduced into the ICUs with laminated A4 size copies of the BMP algorithms provided at each bedspace and the use of the Bowel Function Chart for all patients. Reminder stamps to patient flowcharts, acting as a prompt, indicated a designated spot for nurses to tick they had performed a bowel assessment each shift. Paper reminders commenced at the same time the BMP was introduced into the study units, with the first month of 'bedding down' period receiving a higher frequency of reminders (2 per week) than the following three months (1 per fortnight).

Table 6.2 Multifaceted implementation intervention elements

Education sessions

- 30 minute in-service education, delivered by the researcher (SK) conducted within the study units and open to all ICU staff
- Education sessions were standardized with Microsoft PowerPoint slides, and covered the following:
  - Importance of bowel management in ICU
  - Detailed explanation of the components of the new BMP
  - Case study of patient cared for in one of the study units exemplifying the potentially avoidable complications that can occur if bowel function of patients is not effectively managed by ICU clinicians
- Further informal education provided by researcher when requested
- Education session supplementation: Letters sent to doctors informing them the new BMP would be implemented soon with a copy of fact sheet

Printed educational material in the form of: A fact sheet (distributed during 1 month of education sessions)

- One page quick reference fact sheet, developed by the researcher (SK) was made available at in-services and copied made available to all staff
- Highlighted:
  - relevant literature for bowel management in ICU
  - causes and incidence of bowel dysfunction in ICU
  - possible complications associated with bowel dysfunction
  - evidence supporting use of medications for the treatment of bowel dysfunction in ICU
  - components of bowel assessment

Reminders

For duration of implementation strategy

- ***Advertising Posters*** promoting the arrival of the new BMP were placed on noticeboards within the study units
- The arrival of the new BMP was placed on the agenda of staff meetings and recorded in the minutes and became a standing item for future staff meetings
- ***Flowchart stamp*** was placed on all patient flowcharts designating a place for nursing staff to tick when bowel assessment completed each shift

Over a four month period – at randomly selected date and shift times

- ***Paper reminders*** on brightly coloured A5 size paper prompting staff to follow the new BMP were clipped to flowchart tables of all patients in the study units by either the researcher (SK) or the nurse team leader of the shift
- Frequency:
  - First 1 month of 'bedding down' period, 2 reminders per week
  - Remaining 3 months of implementation strategy, 1 reminder per fortnight

Study sites

We conducted our study within three metropolitan Australian ICUs, co-located at two hospitals; a tertiary referral public hospital and a Magnet private hospital. The ICUs were, 1) an eleven-bedded mixed medical and surgical general unit, including neurology (ICUGen) classified a Level III by the Joint Faculty of Intensive Care Medicine (JFICM), 2) a nine-bedded cardiothoracic surgery unit (ICUCT), classified Level III by JFICM, and 3) a twelve-bedded mixed medical and surgical private unit, with mainly surgical admissions, including cardiothoracic (ICUPrivate).

Audit Sample

The three month period of evaluation for the implementation strategy occurred directly after the one month 'bedding down' period to allow the BMP to become 'usual care'. Therefore, all patients admitted to the study ICUs during the three month period from the 20th October 2008 to 11th January 2009 were assessed for eligibility for the post-implementation data collection period. The pre-implementation data collection period was determined to be the same three month period in the preceding year (22nd October 2007 to 13th January 2008) to minimise seasonal patient acuity variation, and all patients admitted to the study ICUs during this period were assessed for eligibility. A list of all patients admitted to the study ICUs during the determined data collection periods was obtained from the local ICU databases manager.

Patients who had an ICU length of stay greater than 72 hours were considered for eligibility. We considered 72 hours an appropriate time period wherein ICU patients ought to have their bowel function assessed (Dorman *et al.* 2004, Mostafa *et al.* 2003).

Patients were excluded from data collection if their admission was directly following gastrointestinal surgery, their admission diagnosis was gastrointestinal perforation, obstruction or rupture, or their ICU length of stay was less than 72 hours. In addition, patients were excluded if at the time of medical record audit they were identified to be contraindicated to commencing the BMP for the following;

pancreatitis, known bowel obstruction or ileus, recent bowel or abdominal surgery, hepatic encephalopathy, or unable to tolerate enteral or oral feeding.

Assuming that a 20% decrease in the incidence of constipation is clinically significant and based on incidence rates from Mostafa (2003), to detect a reduction in constipation from 83% to 63% with a two sided 5% significance level and a power of 80%, a sample size of 86 per group was necessary.

Audit data collection

Retrospective medial record audits were undertaken by a research assistant using a form with standardised definitions and data documented prospectively by clinicians. Data were collected to address each of the hypotheses and included patient demographics; each episode of bowels open and type during ICU admission; documentation by clinicians, including location in medical record, content, evidence of bowel assessment; medication prescription and administration.

Statistical analysis

Data were analysed using SPSS version 17.0 (SPSS Inc., Chicago, IL, USA).

We calculated time to first and subsequent bowels open for each patient and determined if they were 1) constipated at 72 hours from ICU admission; 2) constipated at 96 hours from ICU admission; 3) constipated for duration of ICU admission (bowels not open during admission); and 4) constipated for one or more episodes during admission (bowels not open for 72 hours or greater).

A patient was deemed to have an episode of diarrhoea if they had four loose/liquid stools or the amount of stool was recorded as greater than 300mls for the day (one episode per day). We calculated the number of episodes and the percentage of admission days for which a patient had diarrhoea.

Admission bowel assessment documentation was determined for each patient. Daily assessment of bowel function was deemed to be present if there was documentation in the patient medical record or flow chart regarding the presence or absence of:

bowel movements, bowel sounds, flatus, distension, and/or tenderness. Daily assessment documentation was calculated as a percentage of the total number of admission days for each patient.

Chi-square and t-tests were performed to detect differences between variables in the pre-implementation and post-implementation patient groups.

Ethics approval

Ethical approval was obtained from the relevant hospitals Human Research Ethics Committee (HREC) and Australian Catholic University HREC to access patient medical records. Individual consent was not required as implementation of the BMP became standard practice within the ICUs for all patients admitted and information collected was de-identified.

Results

A total of 208 patients' medical records (101 pre-implementation, 107 post-implementation; 21% of admissions) were audited (Figure 6.1 and Figure 6.2 on pages 172 and 173 respectively). Patients' demographic characteristics are summarised in Table 6.3 on page 174. The two groups were comparable with the only significant difference detected between the pre-implementation and post-implementation patient groups being the APACHE II mean scores which were higher in the pre-implementation group.

There was no significant difference between the pre-implementation and the post-implementation patient groups for the following variables: constipated at 72 hours after ICU admission, constipated at 96 hours after ICU admission, constipated for duration of ICU admission, one or more episode of constipation during ICU admission, time to first bowels open, one or more episode of diarrhoea during ICU admission, and percentage of admission with diarrhoea (Table 6.4 on page 175-176).

There was a non-significant increase in the post-implementation patient group for the following variables: documentation of bowel assessment by a medical officer on admission to ICU, percentage of daily assessment completed by a medical officer,

percentage of daily assessment completed by a registered nurse, and prescription of Coloxyl® with Senna on day one of admission (Table 6.5 on page 177). There was no significant difference in the documentation of bowel assessment on ICU admission by a registered nurse between the pre-implementation and post-implementation patient groups (Table 6.5 on page 177). Only 43 patients (40%) had a Bowel Function Chart completed in the post-implementation patient group.

Figure 6.1 Patient eligibility pre-implementation

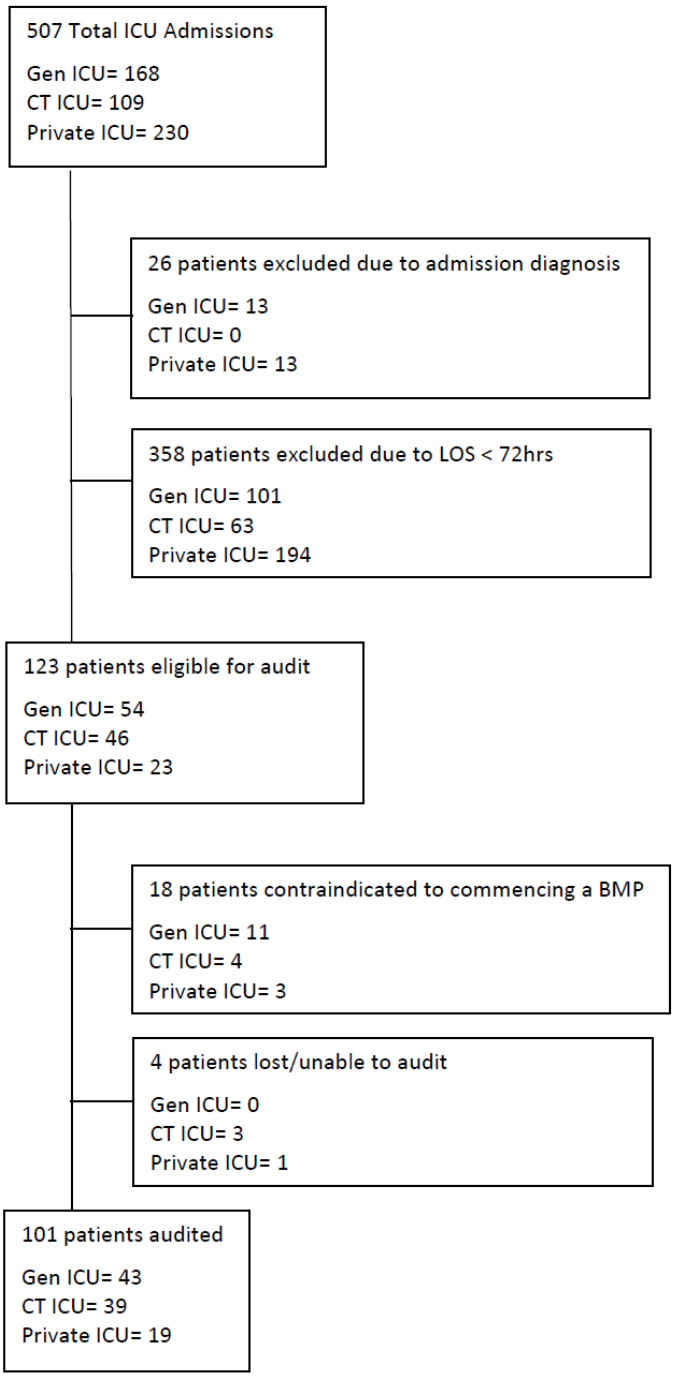

Figure 6.2 Patient eligibility post-implementation

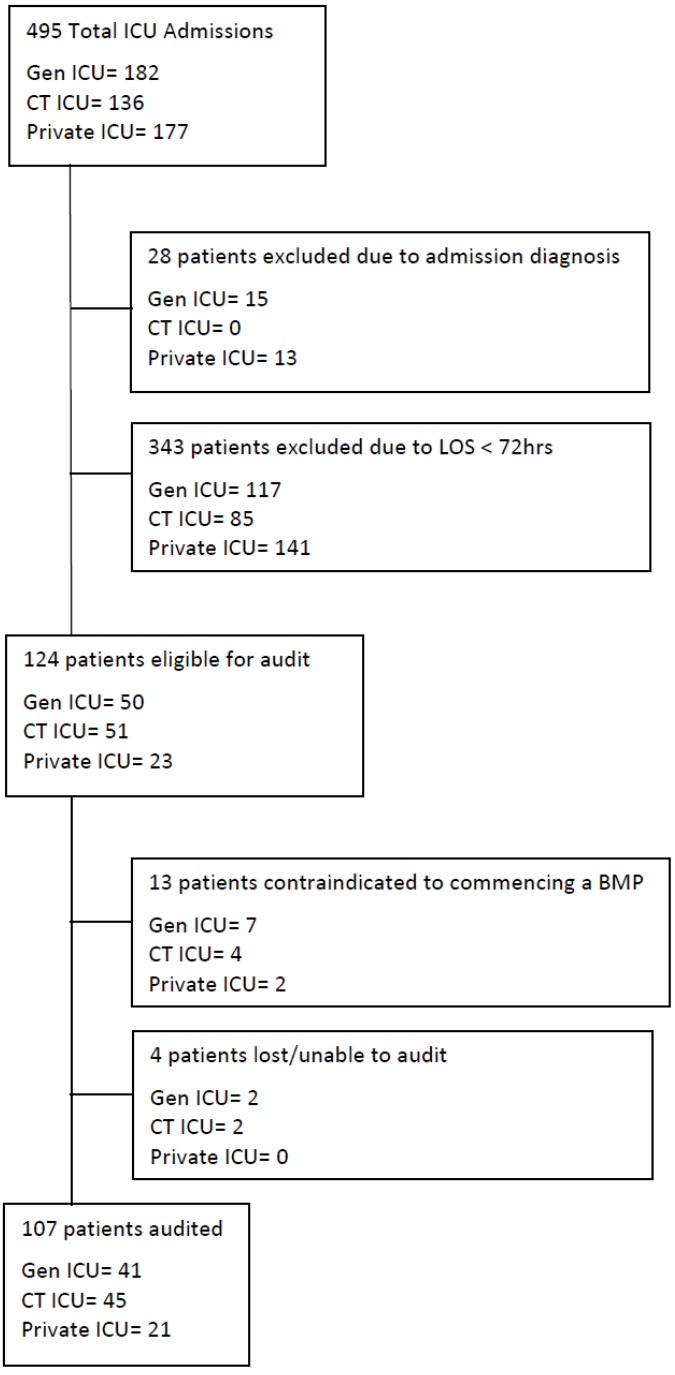

Table 6.3 Patient demographics

Demographic		Pre (N=101)		Post (N=107)		
		n (%)		n (%)		Test statistics
Gender	Female	29(29)		40(37)		x^2 =1.762, df=1, p = 0.184
	Male	72(71)		67(63)		
ICU admission type *	Elective	57(56)		52(49)		x^2 =1.464, df=1, p = 0.226
	Emergency	43(43)		55(51)		
Study Unit	ICUGen	43(42)		41(38)		x^2 =0.403, df=2, p = 0.817
	ICUCT	39(39)		45(42)		
	ICUPrivate	19(19)		21(20)		
		Mean (SD)	**range**	**Mean (SD)**	**range**	**Test statistics**
Length of ICU stay in hours (LOS)		174.3 (121.7)	72.5 to 629.3 hrs	166.1 (153.5)	72.3 to 978.5 hrs	t=-0.429, *df*=200.123, p=0.668
APACHE II scores*		20 (7.95)	5 to 44	17 (6.4)	4 to 35	t=2.34, *df*=175.749, p=0.02
Age		59.1 (17.28)	15 to 86 yrs	60 (18.1)	15 to 90 yrs	t=-0.351, *df*=206., p=0.726

* data were missing from the ICU database

Table 6.4 Constipation, Diarrhoea

		Pre (N=101)	Post (N=107)	
		n (%)	n (%)	Test statistics
Constipated at 72 hours		67 (66)	72 (67)	x^2 =0.021, *df*=1, *p* = 0.884
Constipated at 96 hours		56 (55)	60 (56)	x^2 =0.008, *df*=1, *p* = 0.927
Constipated for duration of ICU admission		28 (28)	37(36)	x^2 =1.137, *df*=1, *p* = 0.286
Episodes of constipation (BNO for >=72 hrs) during ICU admission	0	28 (28)	32 (30)	
	1	63 (62)	70 (65)	
	2	8 (8)	4 (4)	
	3	2 (2)	1 (1)	
Patient had 1 or more episode of constipation during ICU admission		73 (72)	75 (70)	x^2 =0.121, *df*=1, *p* = 0.728
Episodes of diarrhoea during ICU admission	0	85 (84)	86 (80)	
	1	6 (6)	15 (14)	
	2	5 (5)	3 (3)	
	3	2 (2)	1 (1)	
	4	0	1 (1)	
	5	2 (2)	1 (1)	
	8	1 (1)	0	

Table 6.4 Constipation, Diarrhoea (cont')

	Pre (N=101)		Post (N=107)		
	n (%)		n (%)		Test statistics
Patient had 1 or more episode of diarrhoea during ICU admission	16 (16)		21 (20)		x^2 =0.509, *df*=1, *p* = 0.476
	Mean (SD)	**range**	**Mean (SD)**	**range**	**Test statistics**
Time to first bowels open (in hours)	84.9 (57.6)	1 to 217 hrs	84.3 (54.8)	1 to 303 hrs	t=0.063, *df*=141.99, p=0.950
Percentage of admission with diarrhoea	3.76 (11.8)	0 to 71%	3.11 (7.5)	0 to 40 %	t=0.471, *df*=168.208, p=0.638

BNO, bowels not opened

Table 6.5 Bowel assessment documentation and compliance with BMP elements

	Pre (N=101)	Post (N=107)	
	n (%)	n (%)	Test statistics
Admission assessment documented by medical officer	48 (47)	64 (60)	x^2 =3.157, *df*=1, *p* = 0.076
Admission assessment documented by registered nurse	41 (41)	46 (43)	x^2 =0.123, *df*=1, *p* = 0.726
Bowel Function Chart completed on admission	N/A	43 (40)	N/A
BMP aperients prescription element met (Coloxyl® with Senna prescribed day 1)	25 (25)	36 (34)	x^2 =1.982, *df*=1, *p* = 0.159
	mean(SD)	**mean(SD)**	**Test statistics**
Daily assessment completed by registered nurse	88.1 (19.4)	91.9 (13.8)	t=-1.648, df=206, p=0.101
Daily assessment completed by medical officer	76.5 (24.1)	77.5 (25.4)	t=-0.286, df=205.997, p=0.775
Percentage of admission with aperients prescribed	46.2 (37.1)	54.7 (38.3)	t=-1.623, df=205.856, p=0.106

Discussion

Patients admitted to the study IUCs post the targeted implementation of our BMP were not significantly more likely to have lower incidence of constipation or diarrhoea during their intensive care admission. We also showed that nursing and medical clinicians were not significantly more likely to assess bowel function on admission or for the duration of admission for patients post-implementation of the BMP.

Minimising constipation and diarrhoea for critically ill patients, although not always high on clinical priorities when considered against the needs of stabilising a critically ill patient, is nevertheless important to reduce the risks of complications (Mostafa *et al.* 2003). Intensive care clinicians should be assessing patients' bowel function earlier in admission and commencing appropriate management.

A recent before and after audit by McPeake et al (2011) evaluating implementation of a BMP into one ICU showed a decrease in the incidence of constipation from 58% to 37%; however, they did not provide detail of the implementation strategies used, nor did they specify the time frame from introduction of the BMP into practice to audit of medical records. Ferrie and East (2007) observed a statistically significant decrease in diarrhoea from 36% to 23% of patients following introduction of their BMP into their ICU by prospective audit over a two year study with implementation at 12 months using posters and inservice education. Although our study detected no significant change in the incidence of constipation or diarrhoea for patients admitted post-implementation of our BMP, our incidence rates prior to implementation were not as high as those reported elsewhere (Ferrie & East 2007, Mostafa *et al.* 2003). However, this difference in incidence rates may be due, in part, to the fact that the definitions and time frames to measure constipation and diarrhoea in previous studies is varied and in some instances not well explained. For example, similar to our study, Mostafa et al (2003) looked at the entire admission to determine episodes of constipation; while Patanwala (2006) only considered the first 96 hours of admission; and in contrast to our classification of

diarrhoea on a daily basis, Ferris and East (2007) required patients to meet their definition of diarrhoea for two consecutive days to be classified as having diarrhoea.

In our study we noted that patients could still experience one or more episodes of constipation during their ICU admission despite not being constipated at 72 or 96 hours. This highlights the importance of evaluating a patients' entire admission to gather true incidence of constipation data.

Our BMP supported clinicians in making decisions regarding bowel management for critically ill patients and consists of a number of elements included in four decision algorithms. Due to this complexity, we found it difficult to assess compliance and consistent use for each patient; a limitation reflected in a previous study of BMP implementation (McPeake *et al.* 2011). We therefore selected a few key elements to measure compliance; admission assessment, Bowel Function Chart completion, daily assessment and prescription of Coloxyl® with Senna on day one of admission (day of admission is considered Day 0). Our results indicate that clinicians did not adhere to the key elements of our protocol. We detected a non-significant increase in the number of patients for whom Coloxyl® with Senna was prescribed in the post-implementation group, although this remained low at 34% of patients. As part of normal practice, nurses within our study units were able to administer nurse-initiated single doses of most of the medications included in our BMP and ongoing prescriptions were the responsibility of medical officers to prescribe.

Less than half of the patients (40%) in our post-implementation group had a Bowel Function Chart completed on admission. There was a non-significant increase in documentation of admission assessment by medical officers within the patient medical record (60% of patients) in our post-implementation group, although this is still a relatively low rate considering our protocol stipulated all patients were to have bowel function assessed on admission. The rate of admission assessment by registered nurses in the post-implementation group was low at 43% of patients. The percentage of admission days for which daily bowel assessment was completed in our study units prior

to implementation of our BMP was 88% by registered nurses and 76% by medical officers and we did not detect a significant increase post-implementation of our BMP. This high percentage of admission for which bowel assessment was documented in our study units is greater than Dorman et al (2004) reported prior to implementation of their protocol (17% of days audited) however, unlike our study, they detected an improvement in assessment post protocol introduction (95% of days audited).

Assessment is a necessary first step in effective bowel management for critically ill patients, and our protocol advocated that both registered nurses and medical officers regularly assess patients' bowel function. It also is possible that admission assessment of bowel function by a medical officer and/or a registered nurse occurred within our study units but was not documented within the patient medical record; however, if so this does not allow for effective communication with other members of the multidisciplinary team regarding bowel function. It is possible that because the percentage of admission for which daily assessment documentation occurred in our pre-implementation group was relatively high, it was harder to elicit a detectable significant change in the post-implementation group. Implementing change in the clinical setting is difficult and most often results in only small to moderate improvements (Grimshaw & Eccles 2004, Grimshaw *et al.* 2004); making it hard to achieve measurable improvements in patient outcomes. Our result of only a slight non-significant increase in admission assessment by medical officers seems to support others assertion that change takes time, though the reasons for this are not fully understood (Berwick 2003).

Content of guidelines has been associated with positive uptake and according to Gagliardi et al (2011) summaries of evidence should be included in guidelines. Our developed 'fact sheet' provided clinicians with a summary of evidence to support bowel management for critically ill patients. However, the use of education as an implementation strategy may not be effective for complex behaviours and has also been shown to have less effect when clinicians consider the outcomes less serious (Forsetlund *et al.* 2009). The effect of paper reminders on clinicians' performance of desired behaviours is currently the focus of a new Cochrane review (Pantoja *et al.* 2009), though

previous reviews have noted the positive use of reminders with other implementation strategies (Grimshaw *et al.* 2004).

Protocols within intensive care need the support of key staff (Blackwood *et al.* 2004), and our BMP had support of both key medical and nursing staff from within the study units, including managers, educators and consultants. Using leadership and embedding change in organisational systems have been proposed as ways to facilitate and drive change over time (Caldwell *et al.* 2008, Greenhalgh & Wieringa 2011). Local opinion leaders as part of an implementation intervention have been shown to increase compliance with the desired practice (Flodgren *et al.* 2011). However, according to Rogers (1995) 'informal opinion leadership' is not necessarily a function of an individual's formal position and although we had the support of local opinion leaders in our study, we did not specifically aim to change organisational culture with our implementation strategy. Profession and type of ICU has been shown to effect clinicians' attitudes towards guidelines (Quiros *et al.* 2007) and may have influenced clinician practices in our study.

There are a number of limitations of our study that merit discussion. Although our developed BMP was reviewed by staff allowing for qualitative assessment of barriers, we did not undertake any quantitative barriers assessment to evaluate individual, organisational or system barriers (Cochrane *et al.* 2007, Légaré *et al.* 2008). Our results indicate that clinicians did not comply with elements of our protocol and this may be due to not all barriers being identified and addressed. The ICU specific framework recently developed by Cahill et al (2010) to conceptualise barriers and enablers to guidelines, could assist in undertaking a detailed barriers assessment in future studies similar to ours, however was not available at the time of our research.

Poor uptake of all elements of our BMP into practice likely accounts for the lack of improvement in patient outcomes of constipation and diarrhoea in our study. However, results from our study suggest that simply performing bowel function assessment does not translate into effective management strategies that decrease the incidence of

constipation and diarrhoea. It appears that non-adherence to our protocol cannot simply be explained as a 'know-do gap'; there must be further exploration to consider what influences individual clinicians' decision processes such as 'mindlines' (Greenhalgh & Wieringa 2011). A limitation of our study is that the cognitive processes underlying guideline use were not examined (Gagliardi *et al.* 2011).

Change takes time, and our study may have been strengthened by collection of data over different time points following our implementation strategy, however this was beyond the scope of our study (Wiltsey Stirman *et al.* 2012). In addition, another limitation of our study is that we did not collect data for patients once they were discharged from the study ICUs to other hospital ward areas; this may mean we failed to capture data regarding constipation related to their ICU admission that occurred post discharge from intensive care; again this was beyond the scope of our study. We were unable to stratify results according to patient acuity or type of ICU due to the small number of sites and limited sample size.

Our study provides valuable descriptive data regarding the incidence of constipation and diarrhoea for critically ill patients in ICU. To our knowledge, it is the first study to evaluate a targeted implementation strategy for the introduction of a BMP into intensive care.

Conclusion

Despite bowel management being an area in which intensive care clinicians are dissatisfied (Knowles *et al.* 2010) and in which they could improve their practice, initiating clinician behaviour change by evidence-based implementation of a protocol is difficult to achieve. Clinicians did not adhere to our protocol and there was no resulting decrease in the incidence of constipation and diarrhoea. However, further investigation into what influences clinicians' decision making processes in deciding to follow protocols is needed to fully explain adherence. In addition, research into what influences clinicians' behaviour intentions related to bowel management practices is warranted.

Relevance to clinical practice

Minimising complications associated with poor bowel management should be an essential part of intensive care clinicians practice. Protocols can offer a way to guide and standardise critically ill patients' bowel management and have been shown to be effective in other clinical specialties when introduced with evidence-based implementation strategies (Middleton *et al.* 2011). However, there are inherent difficulties in changing clinician behaviour and practices with the use of protocols. Bowel management is most often not a first order priority for ICU clinicians and it is also an area of practice with unpleasant connotations, which may in part explain clinicians' reluctance to address this area of practice (McPeake *et al.* 2011). There are still unanswered questions around implementation strategies that will effectively lead to clinician behaviour change in the intensive care, in specifically related to bowel management.

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6.3 Summary to accepted manuscript IV

The results of the retrospective medical record audit indicated there was no impact on clinician practices and patient outcomes of the targeted implementation strategy and BMP, these results were presented in this manuscript. In the final chapter of the thesis the key findings of the two studies are discussed and conclusions drawn in relation to the literature.

7 DISCUSSION AND CONCLUSIONS

7.1 Introduction

The following chapter briefly summarises the preceding chapters and revisits the key findings from the two studies of the research reported in this thesis. The results are discussed in comparison to previous research reported in the literature. The strengths, limitations and implications for policy and clinical practice are discussed. Recommendations for future research are presented. The chapter finishes with a summary and conclusions.

A discussion of the background and significance of the research provided an introduction to the thesis in chapter one. The research rationale, questions and methods for each of the studies and data collection methods of the research were presented.

The relevant literature to the thesis were discussed in chapter two, including, the current evidence-based practices in intensive care at the time of inception of the research, bowel management for critically ill patients, and the implementation and behaviour change literature, in particular the theory of planned behaviour (TPB) and evidence-based implementation strategies.

A published manuscript (manuscript I) was presented in chapter three. The manuscript discussed the methods and results from the first study of this research; a telephone survey of intensive care practices in NSW ICUs. Results from this study guided and justified the selection of bowel management as the practice area of focus for the remaining study presented in the thesis.

Manuscript II is currently under editorial review and reports the construction and testing of the questionnaire tool to measure TPB constructs in relation to bowel management for ICU patients. Manuscript II was presented in chapter four. The

developed questionnaire was used in the staff survey data collection method in study two.

A published manuscript (manuscript III) presents the methods and results of this nursing and medical staff survey aimed to determine knowledge, attitudes, beliefs and behaviour intentions for three bowel management practices in intensive care. This manuscript was presented in chapter five. Additional analysis of the survey results to determine predictors of behaviour intention were presented as an epilogue to this chapter.

The results of the before and after retrospective medical record audit to determine the impact of the developed implementation strategy and bowel management protocol (BMP) on patient outcome and clinician practice are presented in a manuscript accepted for publication (manuscript IV). Manuscript IV was presented in chapter six.

Combined, chapters three, four, five and six have provided detailed explanation of the two studies of the research. This final chapter provides a discussion bringing together the phases of the two studies and makes conclusions and recommendations.

7.2 Key findings

The first study in this doctoral research programme investigated the formal guideline use and informal routine practices for nine practice areas; namely enteral nutrition, parenteral nutrition, analgesia, sedation, thromboembolic prevention, head of bed elevation, ulcer prophylaxis, glucose control, and bowel management. Two additional practice areas were included in the survey as part of a collaboration with ICCMU; endotracheal tube stabilisation (ETT) and tracheostomy tube stabilisation.

There was an excellent response rate from eligible ICUs and HDUs (41 of 44; 93% response rate) and representation from all JFICM level ICUs and HDUs with capacity to provide ventilation. Results indicate that JFICM level II and III ICUs and those who employed a clinical nurse consultant (CNC) were more likely to have formal written

guidelines. There was no correlation to the number of formal guidelines and the employment of an area CNC or a nurse educator. No unit had formal guidelines for all eleven practice areas, but all had at least one and the most for any one unit was nine. Overall, for the 11 practice areas investigated, there was relatively low use of guidelines in NSW. There was a large proportion of units who were determined to have a 'protocol gap', that is no informal routine procedure when there was no written formal guideline for a practice area. Additionally, there were low rates of audits reported, indicating that clinicians' in NSW ICUs cannot be fully aware of practice levels.

Specifically, bowel management was the area of practice most frequently reported by participants to be thought of as a neglected area of critical care nursing practice (n=28, 86%). For those ICUs (n=13, 32%) with an existing BMP, only 54% reported it was 'highly likely' or 'likely' to be implemented for all patients. When there was informal procedures for bowel management, it was the least likely to be implemented for all patients. Bowel management was thus selected as the area of practice for the focus of study two of this research.

In response to these findings, the second study of this research developed a protocol for bowel management and a multifaceted targeted implementation strategy used to introduce the protocol. The protocol and implementation strategy were evaluated by determining their effect on staff, clinical practice and patient outcomes and comprised of two data collection methods conducted before and after implementation of the BMP: staff surveys and retrospective medical record audits.

The staff survey was developed expressly for this research, with some sections guided by the TPB. The items developed to measure TPB constructs were evaluated by conducting factor analysis and internal consistency analysis using responses from the pre-implementation survey. Overall, factor analysis of the eleven TPB items for each of the three bowel management practices did not consistently load items onto factors easily identifiable as theory constructs. Furthermore, internal consistency of items grouped according to factor analysis results did not produce favourable results. Internal

consistency analysis was best when items were grouped according to the TPB constructs each item was designed to measure. Adequate internal consistency was achieved for BI, Att, and SN for all three behaviours, and a three item PBC construct for two behaviours (PR examination and administration of enema). It was therefore deemed valid to use the items to measure the TPB constructs in the survey.

The pre and post-implementation staff survey evaluated the effect of the targeted implementation strategy and the BMP on clinician knowledge, attitudes, beliefs, self-reported past behaviour and behaviour intentions related to bowel management. It was surmised that the targeted implementation strategy would influence clinicians' attitudes, subjective norms and perceived behavioural control, in turn leading to greater behaviour intention related to three bowel management practices of interest. Overall, the response rate to the pre-implementation survey round was better than the post-implementation survey round (68% versus 50%). Most responders were nurses in both surveys (86% and 84% respectively), and response rates from medical officers was low in both rounds (less than 20% in each survey).

Following implementation of the BMP, there was a significant increase in overall knowledge scores, knowledge of medications that cause diarrhoea, and knowledge of general bowel management for participants. Knowledge was assumed to improve following the implementation strategy which included education as a key component in the form of in-service and fact sheets.

In general, there was not a consistently significant increase in the TPB construct scores (Attitude, Subjective Norm, Perceived Behavioural Control and Behaviour Intention) for all three behaviour sections post-implementation. Behaviour intention only significantly increased for behaviour three, administration of enema. Self-reported past behaviour scores and subjective norm scores only increased significantly for behaviour one; assessment of bowel function.

Attitude and perceived behaviour control construct scores did not significantly change for any of the three behaviours. Self-reported past behaviour scores remained low for both performing a PR examination and administration of enema.

In the section determining roles and responsibilities, most participants identified nurses as responsible for bowel function assessment, performing a PR exam, and administering an enema in both the pre-implementation and post-implementation group. There was a slight decrease in those indicating nurses in the post-implementation group where 'ICU Team' was offered as a response option.

Interestingly, responders' confidence in choosing the correct enema significantly increased in the post-implementation group and may be related to education received as part of the implementation strategy.

Further analysis of the pre-implementation survey responses was conducted to identify predictors of clinicians' behaviour intention for the three bowel management practices. The TPB constructs of attitude and subjective norm were predictors for all three behaviours. For behaviour one, assessment of bowel function, in addition to Att and SN, a single PBC item (I have complete control over performing) was identified as a predictor. The single item '*I have confidence in deciding when to perform a per rectum exam*' was included in the roles and responsibilities section was a predictor for behaviour two, performing a per rectum examination. In addition to Att and SN, the three item PBC construct was a predictor for behaviour intention for behaviour three, administration of enema. Therefore, clinicians in this study would be more likely to have greater behaviour intention if they had more positive attitudes towards the behaviours and if they felt social pressure from their peers to perform the behaviours.

The pre-implementation and post-implementation medical record audit evaluated the effect of the targeted implementation and the BMP on patient outcomes and clinician practices related to bowel management. Despite expectation that targeted implementation of the BMP would lead to improved patient outcomes and clinician practices related to bowel management for ICU patients, results from this audit did not

support this premise. The patient groups were comparable in all demographic characteristics except APACHE II mean scores (pre=20, post=17, p=0.02). There were no significant improvements in the incidence rates of constipation or diarrhoea post-implementation of the BMP. In fact, there were increases, although not significant, in the percentage of patients for the following outcomes; constipated at 72 hours after ICU admission (67% post, compared to 66% pre), constipated at 96 hours after ICU admission (56% post, compared to 55% pre), and constipated for duration of ICU admission (36% post, compared to 28% pre). There was a slight non-significant decrease in the percentage of patients who experienced one or more episode of diarrhoea during ICU admission (70% post, compared to 72% pre). There were non-significant increases in some of the clinician bowel management practices measured in this study, namely, the documentation of admission bowel assessment by a medical officer (60% post, versus 47% pre), the percentage for which assessment was completed daily by either a medical officer (mean 92 post, versus mean 88 pre) or a registered nurse (mean 77 post, versus mean 76 pre), and the prescription of Coloxyl® with Senna on day one of admission (34 % post, versus 25% pre). The percentage of admission for which bowel assessment was documented by either a registered nurses or medical officer was relatively low in the pre-implementation group and may be a consideration for the absence of significant increase. There were poor completion rates of the bowel function chart (n=43, 40%) implemented along with the BMP.

Overall, results from study two of this research indicate that targeted implementation of a BMP did not result in lower incidence of constipation or diarrhoea for patients admitted to the study ICUs, clinicians' practices did not significantly improve and staff did not increase their behaviour intention related to bowel management practices.

When the results from the staff survey and medical record audit are evaluated together there are some interesting points to note. The only practice area for which there was an increase in self-reported past behaviour scores was 'assessment of bowel function' and there was a non-significant increase in this practice area detected in the medical record audit. There was no increase in BI or past behaviour scores for the two other practice

areas, performing a PR exam and administration of enema. It is therefore not surprising that the audit did not detect an improvement in these practices.

7.3 Comparisons with the literature

The first study provided important data regarding the use of written formal protocols and informal routine procedures within NSW ICUs, and there were no previous studies within the Australian setting at the time. Bowel management emerged as a practice area where improvements could be made.

The literature review chapter of this thesis highlighted bowel management is not always high on the clinical priorities when caring for critically ill patients when considered against the more immediate needs of stabilising a patient (see pages 18 to 22). Ilan et al (2007) discussed the potential for practice areas to be overlooked in ICU when clinicians are focused on core issues of resuscitation for critically ill patients. However, minimising constipation and diarrhoea is important to reduce the risks of complications. Therefore, intensive care clinicians should be assessing patients' bowel function early and for the duration of admission and commencing appropriate management. The importance of bowel assessment and management in clinical practice has continued to be highlighted, and is not just limited to the Australian setting. In the UK, the Royal College of Nursing has published a guidance document for the management of lower bowel dysfunction (Ness & Hibberts, 2012).

Subsequent to inception of this research, Bishop et al (Bishop et al., 2010) published results of a prospective audit of 44 patients in a single Australian ICU. Interestingly, the authors have moved away from the term 'constipation' in favour of 'non-defecation'. They argue there are distinct characteristics to constipation such as marked faecal loading on palpation, abdominal distension, a full rectum on rectal examination and being unable to defecate despite the desire to do so, that are not easily evaluated in mechanically ventilated patients. 'Non-defecation' may be a more appropriate term for use in ICU, however, it was not common to use this term at the time of this research.

Since development and implementation of the BMP during this research, there have been further reports in the literature of BMP development and evaluation within ICU (McPeake et al., 2011; Ring, 2011). One of these more recent studies assessing the effect of implementing a BMP into one ICU in Scotland found a decrease in the incidence of constipation (McPeake et al., 2011). This before and after retrospective medical record audit of 26 patients pre and 27 patients post-implementation, provided education sessions to the multidisciplinary team at the time of introducing the BMP into practice. This study reported constipation rates decreased from 58% prior to their BMP to 37% following implementation. However, this study is limited in that there are scant details provided about the implementation strategy used or the time frames between introduction of the BMP and audit of medical records. Others have found a significant decrease in the incidence of diarrhoea from 36% to 23% following introduction of a BMP into one ICU (Ferrie & East, 2007). In this study, medical record audit was conducted prospectively over a two year period (n= 656 patients) with implementation of the BMP at 12 months utilising posters and in-service education sessions to advertise and education staff regarding the protocol. Unlike these studies, incidence rates of constipation and diarrhoea did not decrease following implementation of the BMP in this research. However, compared to previous studies (Ferrie & East, 2007; Mostafa et al., 2003), the incidence rates of constipation and diarrhoea within study units in this research were lower prior to implementation of the BMP.

Differences in incidence rates may in part be due to variation in the definitions (often poorly defined) (Ring, 2011) and differing time frames used to measure constipation and diarrhoea. For example, Patanwala et al (2006) investigated only the first 96 hours of admission to determine episodes of constipation. While similar to this research, Mostafa et al (2003) considered the entire ICU admission when determining incidence rates of constipation. Results from this research highlight that patients could still experience one or more episodes of constipation despite not being defined as constipated at 72 or 96 hours. It would therefore appear that determining incidence rates for constipation in ICU patients must consider the entire admission if true incidence rates are to be obtained. Although Bishop et al (2010) report no bowel actions for 168 study days

(61.3%) of the observed 274 ventilation days, a seemly high incidence, direct comparison with this study is not possible as per patient rates of 'non-defecation' were not reported.

In the study conducted by Ferrie and East (2007) patients needed to meet criteria for two consecutive days to be defined as having diarrhoea. This is in contrast to the classification of diarrhoea used in this research where patients needed to meet the criteria for just one day and could be defined as having diarrhoea for a number of days during admission. Considering that patients did not need to meet criteria for two consecutive days, it could be assumed the number of patients defined as having diarrhoea in this research could have been higher than that reported by Ferrie and East (2007). However, the percentage of patients who had diarrhoea in this research was much lower than those reported by Ferrie and East (2007), both pre and post-implementation.

As supported by the literature, the implementation strategy elements used in this research were tailored to the study units, potential barriers were assessed during staff review of the developed BMP and a theory was used to guide development and evaluation (Baker et al., 2010; Michie & Johnston, 2012). Individual implementation strategy elements of education, reminders and advertising were chosen with evidence to support them as single interventions and then combined to form a multifaceted implementation strategy. Despite evidence to support implementation strategies within healthcare, there is still uncertainty about which strategies are most effective in changing behaviour in ICU (Sinuff, 2006). Multifaceted implementation strategies were supported in the literature at the time of inception of this research. There has since been further evaluation of multi-faceted strategies which has highlighted gaps in understanding (Grimshaw et al., 2006; Grimshaw et al., 2002). There still remains uncertainty about what aspects of multifaceted implementation strategies are effective (Grimshaw et al., 2006; Grimshaw et al., 2002). Additionally, there has even been some evidence to suggest multifaceted implementation strategies are not effective or at least that adding more elements does not increase the effect (Grimshaw et al., 2006). However, more recent research has demonstrated the value of a multifaceted

implementation strategy on patient outcomes and clinician behaviour for a nurse-led intervention in stroke (Middleton et al., 2011). More evidence is needed to support or refute the use of multifaceted interventions to effect clinician behaviour change.

Education may not be effective for complex behaviour change interventions and has been shown to have less effect when clinicians consider the outcomes less serious (Forsetlund et al., 2009). The education sessions and fact sheets that formed part of the implementation strategy in this research aimed to highlight the consequences of poor bowel management for ICU patients. Gagliardi et al (2011) assert that guidelines should include summaries of evidence. The developed 'fact sheet' provided clinicians with a summary of evidence and the BMP included a summary table of medications. Berenholtz and colleagues (2004) utilised a fact sheet as one of their components to increase compliance with ventilator bundle. They saw a significant increase in the number of days ventilated patients received all four care processes in their VAP bundle. Berenholtz et al (2002) also highlighted the importance of nurse education in ensuring uptake of evidence based practice. They further asserted that combined education sessions (medical and nursing) should be the preferred method. Education as part of the implementation strategy in this research was designed as combined nursing and medical sessions, however, there was poor attendance by medical staff to these education sessions and this may have contributed to the low level of medical engagement in the survey and resulting lack of practice change.

Reminders have been shown to have positive effects on behaviour change (Grimshaw et al., 2004b) and a subsequent Cochrane review to investigate the effect of paper reminders on clinicians performing desired behaviours is currently underway (Pantoja et al., 2009). The effect of reminders alone in this research is unclear, but as part of the multifaceted implementation strategy there was limited effect on clinician practices and patient outcomes.

Further to the specific implementation interventions that formed the multifaceted strategy, the BMP had support of both key medical and nursing staff, including

managers, educators and consultants, from within the study units as suggested in the literature (Blackwood, Wilson-Barnett, & Trinder, 2004). Use of local opinion leaders as part of an implementation intervention has been shown to increase compliance with the desired practice (Flodgren et al., 2011). Leadership and embedding change in organisational systems can facilitate and drive change over time (Caldwell, Chatman, O'Reilly, Ormiston, & Lapiz, 2008; Greenhalgh & Wieringa, 2011). Rogers (1995) points out that 'informal opinion leadership' is not necessarily a function of an individual's formal position and can merely be a characteristic of individuals. Although the BMP and implementation strategy had support of local opinion leaders there was no specific aim to change organisational culture with the implementation strategy.

Support of staff within the study units was sought for the conduction of this research and development of the BMP. Engaging with opinion leaders within the study units was considered an important aspect of the research in influencing clinicians' attitudes, beliefs and intentions. However, there was no formal structure to this engagement with staff or the use of opinion leaders to visibly promote the BMP and it was therefore not considered a part of the implementation strategy. It was proposed that the TPB constructs would be influenced in the following ways. Obtaining support from opinion leaders would create greater expectations for clinicians from their peers and colleagues to comply with behaviours necessary for protocol compliance, and in turn change social norms. Placing reminders so they were clearly visible to both nursing and medical staff would empower clinicians to instigate bowel management for patients, increasing clinicians' level of perceived behavioural control. The education sessions and fact sheet aimed to increase knowledge, highlighting the complications of poor bowel management for critically ill patients and to change attitudes towards bowel management. Positive attitudes towards guidelines have been associated with higher self-reported use of guidelines within the ICU in previous studies (Quiros, Lin, & Larson, 2007).

Previous studies of 'bundled' care in ICU identified the importance of establishing the desired behaviour as normal (Hatler et al., 2006). In addition, behavioural tendencies may be in favour of more routinized and familiar patterns when the behaviour has both

attractive and abhorrent qualities (Ouellette & Wood, 1998). Bowel management is a practice area with unpleasant connotations and a certain stigma associated with it (Spence, 2011). Therefore, the use of BMPs in promoting routinised practices could potentially allow clinicians to overcome barriers associated with negative views of bowel management.

The TPB was used in this research to structure the evaluation and interpretation of results. Davies, Walker and Grimshaw (2010) argue for more explicit use of theories in guideline development and implementation. Others have suggested the effectiveness of a behaviour change intervention is determined by the use of a theoretical basis, and not the number of interventions used (Michie & Johnston, 2012). However, Michie and Johnston (2012) claim there is still more work needed to link behaviour change techniques and theoretical constructs. Caution does need to be taken when evaluating theories; Ogden (2003) noted in a review of health behaviour theories that when results did not support the theory, the theory being incorrect was rarely given as the explanation.

The developed BMP was designed to support clinicians making decisions regarding bowel management for ICU patients. Four decision algorithms consisted of a number of elements, and due to this complexity, determining compliance and consistent use of the protocol was difficult. This problem has previously been reported in the literature in relation to a BMP implementation study (McPeake et al., 2011). For evaluation in this research, key components of the protocol were chosen to represent compliance with the BMP; admission assessment, Bowel Function Chart completion, daily assessment and prescription of Coloxyl® with Senna on day one of admission (day of admission is considered Day 0). The protocol advocated both registered nurses and medical officers regularly conduct assessment which is considered a necessary first step in effectively managing bowel function for critically ill patients. The frequency of assessments promoted was at least once every eight hours, which was in line with nursing staff shift pattern in the units. However, nurses within the study units were also able to choose to work 12 hour shift patterns. For pragmatic reasons, compliance with this component

was assessed with the presence of documented assessment at least once per day. This enabled comparison with other studies that report assessment as a percentage of days.

Prior to implementation of the BMP, the percentage of a patients' ICU admission for which a bowel function assessment was documented was relatively high; mean of 88.1 by a Registered Nurse and mean of 76.5 by a medical officer. However, only a small non-significant increase was detected in clinician practices regarding bowel assessment in the post implementation group. In contrast, Dorman et al (2004) reported documentation of bowel function as a gross percentage of all patient ICU admission days prior to implementation of their protocol; only 23% of days had documentation of either bowel sounds and/or palpation and 57% of days had some documentation regarding bowel function. Following protocol introduction, they detected an improvement in documentation of assessment; assessment occurred in 95% of days (Dorman et al., 2004). Consistent with results of no improvement in patient outcomes in this research, studies of nutrition guidelines in ICU have detected small changes in nutrition practices with no effect on patient outcomes (Cahill & Heyland, 2010). It is difficult to implement change in the clinical setting and is most likely to result in only small to moderate improvements (Grimshaw & Eccles, 2004; Grimshaw et al.). In this research, detecting a significant change following implementation was difficult because the percentage of admission for which assessment was documented was already relatively high pre-implementation (88%), and achieving full compliance becomes harder the closer it moves towards 100 percent. It is possible that the slight non-significant increase in admission assessment detected in the research supports the assertion that change takes time, the reasons for which are not fully understood (Berwick, 2003). However, caution should be taken when equating non-significant results with no effect (Berry, 1986).

In this research, nurses were the role identified by participants as responsible for the three bowel management practices of interest; namely, bowel function assessment, performing a PR examination and administration of enema. The influence of nurses on patients' bowel management has been previously highlighted in the literature (For example: Registered Nurses Association of Ontario, 2002; Richmond & Devlin, 2003).

However, with introduction of the BMP in this research, it was aimed that all staff would take responsibility for bowel management of ICU patients and a 'team' management approach would be encouraged to become part of routine care for this practice area. Participants' responses do not appear to support such perceptions within the ICUs.

Nurses knowledge of bowel management has been shown to improve following education sessions in previous studies (George et al., 1996; Vanderlaan & Kolodny, 1989), although these were not specific to ICU. The premise being that improved knowledge will influence clinicians' practices. In addition, Labeau et al (2007) claim that although knowledge may not ensure adherence to guidelines, clinicians' understanding of the relevant evidence can be important in their decision making. Overall, knowledge scores improved but this does not appear to have translated to an increase in behaviour intention or an improvement in clinical practice. Knowledge did not emerge as a predictor of behaviour intention in this study and others have highlighted the importance of other factors in influencing clinician behaviour (Cane, O'Connor, & Michie, 2012).

In specific relation to the testing of the TPB items, failure of factor analysis to group the items onto factors as the TPB dictates may be an indication of the heterogeneous nature of the sample for this survey, in particular that there were two distinct professional groups included (medical and nursing). However, when the factor analysis was repeated with only a sample of nurses the results improved only slightly. Given that adequate internal consistency was achieved for the TPB constructs of Behaviour intention, Attitude and Subjective norm when the items were grouped as the theory indicates, failure of the items to load during factor analysis may also be due to the sample size being inadequate for such analysis. The inadequate internal consistency results for the PBC construct using the four items or two item sub-constructs, appears to be consistent with other studies (Foy et al., 2007) and may also be an indication of the wider debate surrounding the dimensional structure of Perceived behavioural control as a construct (Ajzen, 2002; Sparks et al., 1997; Trafimow et al., 2002; Trafimow & Sheeran, 1998). Performing this analysis to test the utility of the TPB in measuring ICU clinicians' BIs

related to bowel management is an important questioning of the theory; “theories need questioners more than loyal followers” (Noar & Zimmerman, 2005).

The main predictors of behaviour intention identified in this research, attitude and subjective norm, were not specifically targeted for change through the implementation strategy. However, some effect from the implementation strategy on these predictors was assumed. In other studies using the Theory of Reasoned Action (TRA), such as that conducted by Bernaix (2000), knowledge, along with attitudes, was found to be a direct predictor of actual behaviour. In this research, knowledge increased but was not a predictor of BI and consequential there was no increase in BI following the implementation strategy.

7.4 Strengths and limitations of the research

This research contributes to further understanding the incidence of constipation and diarrhoea for critically ill patients in ICU, for which there was relatively sparse data available. There were no previous evaluations of a well explained targeted implementation strategy for introducing a BMP into intensive care. There were also no previous studies utilising the TPB to investigate intensive care clinicians’ behaviour intention related to bowel management practices.

Study two evaluated the effect of both the multifaceted implementation strategy and a BMP on patient outcomes, clinician practices and clinician behaviour intentions. Multiple data collections methods used in this research provides a more comprehensive picture of the impact of the implementation strategy and BMP, than medical record alone. Complimentary data collection enables inferences about the lack of improvements in patient outcomes and clinician practices determined by medical record audit in relation to clinicians’ attitudes, beliefs and behaviour intentions as determined by the TPB survey. In addition, clinicians’ limited compliance with elements of the BMP likely accounts for the lack of improvement in incidence rates of constipation and diarrhoea.

Results from this research suggest that clinicians' performance of bowel function assessment does not translate into effective management strategies that decrease the incidence of constipation and diarrhoea. An increase in clinicians' knowledge did not translate into practice. It appears that non-adherence to the BMP cannot simply be explained as a 'know-do-gap' and simply determining a patients' bowel function status does not mean clinicians will act appropriately. Greenahalgh and Wieringa (2011) assert there needs to be further exploration of the influences on individual clinicians' decision making processes and results from this research align with this.

The developed BMP was reviewed by staff prior to implementation which facilitated qualitative assessment of barriers. However, there was no quantitative barriers assessment conducted to evaluate individual, organisational or system barriers (Cochrane et al., 2007; Légaré, Ratté, Gravel, & Graham, 2008) and the implementation strategy was not specifically designed to overcome barriers. Not identifying and addressing all barriers may have influenced results that show clinicians did not comply with elements of the protocol. Since inception of this research, an ICU specific framework has been developed which may have been of assistance in undertaking a detailed barriers and enablers of guidelines assessment (Cahill, Suurdt, Ouellette-Kuntz, & Heyland, 2010). In addition, an assessment of barriers to determine if they were overcome was not conducted as suggested by Baker et al (2010). However, much of this implementation science research has been published subsequent to conduct of this research and, hence, was not available at the time to inform this research.

At the time of commencement of this research, the TPB was the 'most widely used social cognition model for health behaviour' (Godin et al., 2008). However, use of the TPB to investigate clinicians' attitudes, subjective norms, perceived behavioural control and behaviour intention, although useful in understanding results of no improvement identified in the retrospective audits, could have been strengthened with the inclusion of additional theoretical constructs. For example, moral norm can influence behaviour intention (Côté et al., 2012; Godin, Conner, & Sheeran, 2005).

There is now a wide view that exploring constructs from a number of theories may offer the best understanding of the knowledge transfer process in the varied context of healthcare (Francis et al., 2012; Michie & Johnston, 2012), however use of a single theory was more consistent with the practice at the time the research was conducted. The TDF provides synthesis of constructs from a number of psychological theories and has been further critiqued by Francis and colleagues (2012) since completion of the PhD research. This framework may have provided a more comprehensive evaluation of factors that influence implementation. The TPB has been shown to be a good predictor of behaviour, however including constructs from other theories has been shown to increase the prediction of intention (Godin et al., 2008).

In addition, this research could have been strengthened by a closer alignment of implementation strategy elements with the TPB constructs or other constructs identified in TDF (Francis et al., 2012; Michie, 2008; Michie & Johnston, 2012; Michie, Webb, & Sniehotta, 2010). Since inception of this research, there has been increased discussion within the literature regarding the use of theory to underpin implementation research. The implementation strategy elements and methods of this research were closely aligned with linear models of knowledge transfer, however Best and Holmes (2010) recently argued that linear models are best applied in instances of low complexity behaviour change.

Study two was conducted in three ICUs at two co-located hospitals, and so the sample size was limited to the number of staff working within the units and patients admitted during the time frame. Although the research included both nursing and medical staff, due to low numbers and limited response rates from medical staff, determination of the effect of professional group was not possible. Previous studies have highlighted that profession can have an effect on guideline use (Kortteisto et al., 2010) and behaviour intention (Walker et al., 2003). The sample size in this research for the TPB survey was not in line with that suggested by Godin (2008), but was similar to that reported by Rashidian et al (2006). It was also not possible to stratify results according to patient acuity or type of ICU due to the small number of sites and limited sample size.

Profession and the speciality of ICU have been shown to effect clinicians' attitudes towards guidelines (Quiros et al., 2007; Scott et al., 2012). Implementation strategies can imp act differently on various health care professionals (Kortteisto et al., 2010; Scott et al., 2012). It was also not practical to follow one sample of staff to assess the effect of the implementation strategy on individual clinicians. Instead the survey aimed to determine responses for the majority of clinicians working in the units at the time of the survey.

A limitation of study two was that medical record audits were for a three month period only and occurred while the reminder phase of the implementation strategy was still running. The sustainability of the BMP was not assessed by looking at patient records over different time points from the implementation strategy as suggested in the literature (Wiltsey Stirman et al., 2012). In addition, data was not collected for patients once they were discharged from ICU to other ward areas and this may mean that data regarding constipation that occurred post ICU discharge but related to their ICU admission was not captured. These restrictions were necessary due to the time limiting component of doctoral scholarship. Retrospective medical record audit is also limited by the quality of the clinical documentation examined. Specifically in this research, if there was no documentation of bowel assessment or bowel function this was taken to indicate this was not done or the patient did not have a bowel motion. It is possible that this may in fact not be what happened in clinical practice, however due to the nature of the data collection method, there is no way of determining this. There is evidence that for certain clinical practice areas, documentation compared to direct observation is inaccurate; for example pressure ulcers (Gunningberg & Ehrenberg, 2004).

It is important to acknowledge that the surveys in this research were not administered in a manner that would preclude participants from colluding with colleagues or consulting the literature to maximise correct responses to the knowledge items. Richmond and colleagues (2003), administered their survey to determine nurses knowledge of bowel management practices by directly asking participants the series of questions, thus minimise collusion amongst participants. However, the knowledge items were only one

section of the surveys used in this research and it would have been inappropriate to ask other items in such a controlled manner. Hence, some degree of caution might be applied to the knowledge scores obtained in this study.

The self-reported nature of questionnaire items, including the TPB items, does need to be acknowledged. While the reliability of self-report for nurses in relation to work tasks has been shown to be poor (Ampt, Westbrook, Creswick, & Mallock, 2007), in their systematic review of studies of clinical behaviour, Eccles et al (Eccles et al., 2006) have shown there is good correlation between self-reported behaviour intention and actual behaviour. In this research, clinicians' self-reported past behaviour and behaviour intention was not matched with data from the medical record audits due to impracticalities. A previous study of physicians' guideline compliance matched chart audits to clinicians and their survey responses, which strengthened the validity of BI in relation to the behaviour investigated (Maue et al., 2004). There are no previous studies of BI related to bowel management and it is therefore not understood how strong the correlation is between BI and actual behaviour for this practice area. Behaviour intention and self-reported past behaviour does not necessarily replace objective measures of behaviour (Hrisos et al., 2009; McEachan et al., 2011) and further investigation to determine clinicians' actual bowel management practices in intensive care would increase understandings of this important area.

A limitation of study two was that, despite selecting key elements of the protocol to measure compliance, it was not possible to determine if clinicians accurately and consistently used the BMP for each patient. Others have also reported such limitations in studies of BMP (McPeake et al., 2011). Selecting key elements as measures of protocol compliance has been reported in the literature for other practice areas (Middleton et al., 2011). However, there are no standard rules when selecting key elements as measures of compliance and appears to be predominantly a subjective decision on the part of researchers. Because compliance in study two was measured by medical record audit and not direct observation, clinicians' use of the BMP to guide their practice may not have been captured. Protocols and guidelines, as well as providing best available

evidence, should allow clinicians to be flexible in their application of guideline elements to meet the needs of individual patients, and this is important in the case of bowel management protocols. This inherently leads to difficulties in determining compliance, despite choosing key elements as measures.

7.5 Implications for policy, clinical practice and future research

Although results of this research did not detect an improvement in patient outcomes or clinician practices, it does not necessarily follow that using a BMP for ICU patients is not needed. This area of practice is one where complications that have the potential to impact on patient outcomes can be reduced if management is improved, and in turn reduce the costs associated with care.

Minimising complications associated with poor bowel management should be an essential part of intensive care clinicians' practice. Protocols for bowel management can guide and standardise clinicians' care for critically ill patients. Unfortunately, bowel management is a practice area not considered a first order priority for critically ill patients and can therefore often be forgotten. Bowel management also has unpleasant connotation associated with it which may also impact on clinicians' reluctance to address this area of practice (McPeake et al., 2011). There are still unanswered questions around implementation strategies that will effectively lead to clinician behaviour change in the intensive care, in particular in relation to bowel management. Further investigation of implementation strategies in the ICU is needed, in particular those designed to affect change in predictors of BI.

Results of this research begin to provide some evidence about how to improve clinician practices in ICU. This is an important area of investigation given that other areas of practice in the ICU have been identified as overlooked (Ilan et al., 2007). It is therefore important to continue to evaluate ways clinician practices in these areas, regardless of

more pressing concerns, can be improved and how clinicians can be encouraged to raise the perceived importance allocated to practices currently overlooked.

In addition, results from study two have highlighted the importance of reviewing a patient's entire admission to obtain incidence rates for constipation, as patients could still experience constipation during admission despite not being constipated at either 72 or 96 hours. Future studies should consider this in designing data collection points.

Although BMPs have been associated with improvements in patient outcomes in previous studies, there is still little understanding of the elements of the protocols responsible for this improvement in practice. Further clinical trials of the effect of prophylactic administration of medications and also non-pharmacological measures in the ICU setting are needed.

Surveys based on the TPB can provide useful insights into factors that influence clinicians' intentions to perform behaviours and are also useful in evaluating the effectiveness of implementing BMPs within the intensive care. Further refinement of items to measure clinicians' perceptions of roles and responsibilities regarding bowel management in the intensive care would allow greater insight into their influence on behaviour intention. Ensuring the uptake of BMPs into clinician practice will require further investigation to better understand what influences clinicians' clinical decisions and behaviours in relation to bowel management. Future investigation into the factors that influence opinion leaders and organisational culture in relation to bowel management may shed light on reasons for the minimal change in clinicians' behaviour intentions.

7.6 Summary

Despite clinicians identifying bowel management as an area of practice for which improvements could be made and for which they were dissatisfied, initiating behaviour change was difficult to achieve. Previous assumptions regarding knowledge and clinicians' practices were not evidenced in this research. An increase in knowledge did

not translate into improvements in practice and patient outcomes. Knowledge was not a predictor of BI. There were some improvements to clinicians practices observed, however, these were not statistically significant.

The TPB is useful in measuring clinicians' behaviour intentions and identifying predictors of behaviour intention. It can be easily used to evaluate the effectiveness of implementation strategies.

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RESEARCH PORTFOLIO APPENDICES

1. **Publications**
2. **Statement of contribution of others**
3. **Additional publication and conference presentations**

Research Portfolio Appendices 1
Publications

Manuscript I

Knowles, S., Rolls, K., Elliott, D., Hardy, J., & Middleton, S. (2010). Patient care guidelines: A telephone survey of intensive care practices in New South Wales. *Australian Critical Care, 23*(1), 21-29. doi:10.1016/j.aucc.2009.10.001

Australian Critical Care (2010) **23**, 21–29

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RESEARCH PAPER

Patient care guidelines: A telephone survey of intensive care practices in New South Wales

Serena Knowles RN, BN(Hons), GradCertClinNurs[a,c], Kaye Rolls RN, BAppSc, Acute Care Cert[b,d], Doug Elliott RN, PhD[d], Jennifer Hardy RN, PhD[e], Sandy Middleton RN, PhD[a,f,*]

[a] *National Centre for Clinical Outcomes Research (NaCCOR) Nursing & Midwifery, Australia*
[b] *NSW Intensive Care Coordination & Monitoring Unit (ICCMU), Australia*
[c] *St. Vincent's Hospital, Sydney, Australia*
[d] *Faculty of Nursing, Midwifery & Health, University of Technology, Sydney, Australia*
[e] *University of Sydney, Australia*
[f] *St. Vincents & Mater Health Sydney, Australia*

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KEYWORDS
Guidelines;
Intensive care

Summary
Background: There are a number of practice areas highlighted in the literature as important for the care of critically ill patients. However, the current implementation of evidence into clinical practice for these areas is largely unknown. The development of clinical practice guidelines can translate the current evidence into useful tools to guide clinicians in providing evidence based care.
Aim: To identify existence of current guidelines and informal routine procedures and clinicians' views of same within New South Wales (NSW) Intensive Care Units (ICUs) and High Dependency Units (HDUs) for 11 practice areas, namely, bowel management, endotracheal tube (ETT) stabilisation, tracheostomy tube stabilisation, feeding, analgesia, sedation, thromboembolic prevention, head of bed elevation, ulcer prophylaxis and glucose control.
Method: A telephone survey conducted with a representative from NSW ICUs and HDUs.
Results: There was variation in the number of guidelines and informal routine procedures reported for the 11 practice areas within the study units. Larger ICUs (Joint Faculty of Intensive Care Medicine Level II and Level III) and those who employed an onsite CNC were significantly more likely to have formal guidelines in place. Overall, there were very few audits reportedly conducted for the 11 practice areas. Bowel

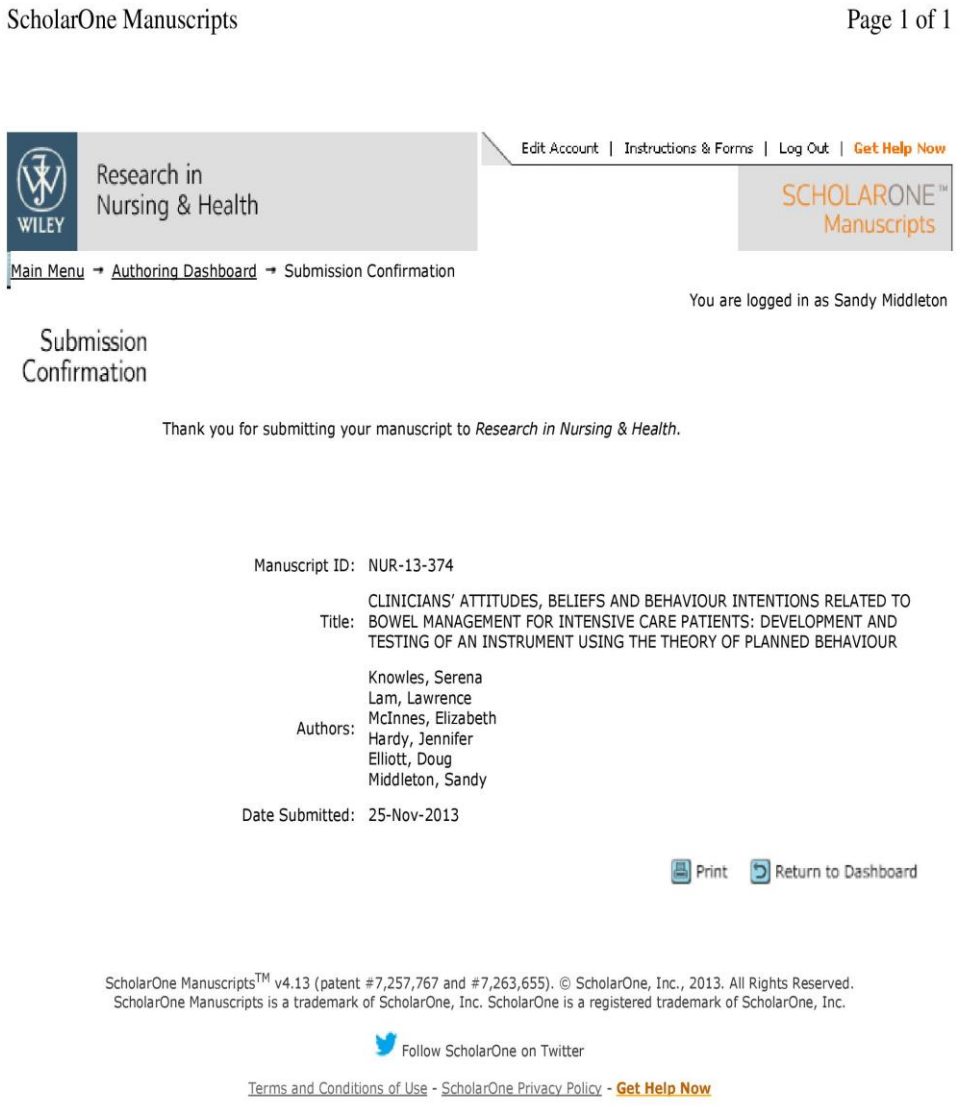
* Corresponding author at: St. Vincents & Mater Health Sydney, Nursing Research Institute, St. Vincent's Hospital, Victoria St. Darlinghurst, NSW 2010, Australia. Tel.: +61 02 8382 3794.
E-mail address: sandy.middleton@acu.edu.au (S. Middleton).

doi:10.1016/j.aucc.2009.10.001

Manuscript II

Knowles S, Lam L, McInnes E, Hardy J, Elliott D & Middleton S. Clinicians' attitudes, beliefs and behaviour intentions related to bowel management for intensive care patients: development and testing of an instrument using the Theory of Planned Behaviour.

Submitted 2013 to: *Research in Nursing and Health*.



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Title: CLINICIANS' ATTITUDES, BELIEFS AND BEHAVIOUR INTENTIONS RELATED TO BOWEL MANAGEMENT FOR INTENSIVE CARE PATIENTS: DEVELOPMENT AND TESTING OF AN INSTRUMENT USING THE THEORY OF PLANNED BEHAVIOUR

Authors: Knowles, Serena
Lam, Lawrence
McInnes, Elizabeth
Hardy, Jennifer
Elliott, Doug
Middleton, Sandy

Date Submitted: 25-Nov-2013

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Manuscript III

Knowles S, Lam LT, McInnes E, Elliott D, Hardy J & Middleton S. Knowledge, attitudes, beliefs and behaviour intentions for three bowel management practices in intensive care: effects of a targeted protocol implementation for nursing and medical staff.

Submitted 2013 to: *BMC Nursing*.

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Manuscript IV

Knowles S, McInnes E, Elliott D, Hardy J & Middleton S Evaluation of the implementation of a bowel management protocol in Intensive care: Effect on clinician practices and patient outcomes. In press

Accepted for publication 2013: *Journal of Clinical Nursing*

Status update to your article in Journal of Clinical Nursing - JOCN12448

JOCN@wiley.com <JOCN@wiley.com> 31 July 2013 04:48
Reply-To: JOCN@wiley.com
To: serenaknowles28@gmail.com

JCN Journal of Clinical Nursing

Dear Ms Serena Knowles,

Journal: *Journal of Clinical Nursing*

Article title: "Evaluation of the implementation of a bowel management protocol in intensive care: effect on clinician practices and patient outcomes"

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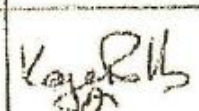
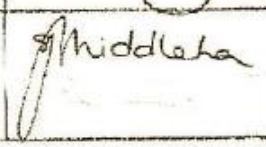
Research Portfolio Appendices 2

Statement of contribution of others

For each of the four manuscripts presented as part of the thesis, the candidate wrote the first and subsequent drafts and final copy with editing and structural guidance from the co-authors. The percentage of contribution of the other authors is included in a signed statement for each of the manuscripts in the following research portfolio appendix.

Declaration of contributions: Manuscript I

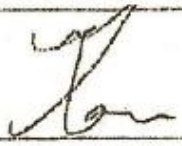
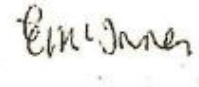
> Knowles, S., Rolls, K., Elliott, D., Hardy, J., & Middleton, S. (2010). Patient care guidelines: A telephone survey of intensive care practices in New South Wales. *Australian Critical Care, 23*(1), 21-29. doi:10.1016/j.aucc.2009.10.001

Author	Contribution statement	%	Signature
Serena Knowles	Study design, tool development, data collection and analysis, manuscript preparation	50	
Kaye Rolls	Tool development, data collection, manuscript revisions	35	
Doug Elliott	Supervised Manuscript revision	5	
Jennifer Hardy	Supervised Manuscript revision	5	
Sandy Middleton	Supervised Manuscript revision	5	

Declaration of contributions: Manuscript II

Knowles S, Lam L, McInnes E, Hardy J, Elliott D & Middleton S. Clinicians' attitudes, beliefs and behaviour intentions related to bowel management for intensive care patients: development and testing of an instrument using the Theory of Planned Behaviour.

Submitted to: *Research in Nursing and Health*.

Author	Contribution statement	%	Signature
Serena Knowles	Study design, data collection and analysis, manuscript preparation	75	
Lawrence T Lam	Assistance with data analysis and interpretation	5	
Elizabeth McInnes	Supervised Manuscript revision	5	
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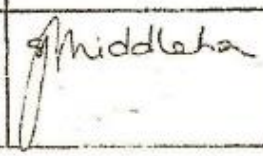
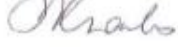
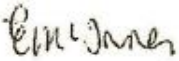
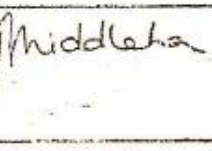
Doug Elliott	Supervised Manuscript revision	5	
Sandy Middleton	Supervised Manuscript revision	5	

Declaration of contributions: Manuscript III

Knowles S, Lam LT, McInnes E, Elliott D, Hardy J & Middleton S. Knowledge, attitudes, beliefs and behaviour intentions for three bowel management practices in intensive care: effects of a targeted protocol implementation for nursing and medical staff.

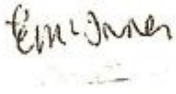
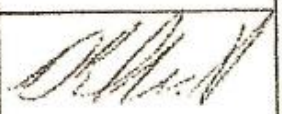
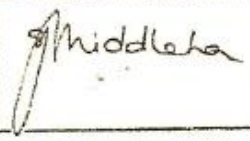
Submitted to: *BMC Nursing*.

Author	Contribution statement	%	Signature
Serena Knowles	Study design, data collection and analysis, manuscript preparation	75	
Lawrence T Lam	Assistance with data analysis and interpretation	5	
Elizabeth McInnes	Supervised Manuscript revision	5	
Jennifer Hardy	Supervised Manuscript revision	5	
Doug Elliott	Supervised Manuscript revision	5	
Sandy Middleton	Supervised Manuscript revision	5	

Declaration of contributions: Manuscript IV

Knowles S, McInnes E, Elliott D, Hardy J & Middleton S Evaluation of the implementation of a bowel management protocol in Intensive care: Effect on clinician practices and patient outcomes

Accepted for publication 2013: *Journal of Clinical Nursing*

Author	Contribution statement	%	Signature
Serena Knowles	Study design, data collection and analysis, manuscript preparation	80	
Elizabeth McInnes	Supervised project Manuscript revision	5	
Doug Elliott	Supervised project Manuscript revision	5	
Jennifer Hardy	Supervised project Manuscript revision	5	
Sandy Middleton	Supervised project Manuscript revision	5	

Research Portfolio Appendices 3
Additional publication and conference presentations

Knowles, S., Rolls, K., Burrell, A., Kowal, D., Hewson, K., Elliott, D., Hardy, J., & Middleton, S. (2006). *Use of guidelines: a survey of NSW intensive care unit (ICU) practices demonstrated varied existence and implementation*. Paper presented at the Australian and New Zealand Annual Scientific Meeting on Intensive Care, Hobart, Tasmania.

Knowles, S., Rolls, K., Burrell, A., Kowal, D., Hewson, K., Elliott, D., Hardy, J., & Middleton, S. (2006). *Use of guidelines: a survey of NSW ICU practices demonstrated varied existence and implementation*, published abstract. Australian Critical Care, 19(4), 156.

Knowles, S., Lam, L. T.-M., McInnes, E., Hardy, J., & S, M. (2013). *Predictors of intensive care clinicians' behaviour intention for three bowel management practices*. Paper presented at the Australian and New Zealand Annual Scientific Meeting on Intensive Care, Hobart, Tasmania.

APPENDICES

1. **Ethics Approval**
2. **Funding**
3. **Permission from ICCMU to use data**
4. **Additional information from manuscripts**

Appendix 1 Ethics Approval

Australian Catholic University
Brisbane Sydney Canberra Ballarat Melbourne

ACU National

Human Research Ethics Committee

Committee Approval Form

Principal Investigator/Supervisor: Professor Sandy Middleton Nth Sydney Campus

Co-Investigators: Dr Jennifer Hardy, Ms Serena Knowles, Dr Bob Wright (St Vincent's Hospital) Nth Sydney Campus

Student Researcher:

Ethics approval has been granted for the following project:
Multi-disciplinary implementation of an evidence-based practice: collaborative quality improvement in Intensive Care Unit (ICU) patient care. (Evidence-based practice in ICU)

for the period: 29 November 2007 to 30 June 2009

Human Research Ethics Committee (HREC) Register Number: N200708 11

The following standard conditions as stipulated in the *National Statement on Ethical Conduct in Research Involving Humans* (2007) apply:

(i) that Principal Investigators / Supervisors provide, on the form supplied by the Human Research Ethics Committee, annual reports on matters such as:
- security of records
- compliance with approved consent procedures and documentation
- compliance with special conditions, and

(ii) that researchers report to the HREC immediately any matter that might affect the ethical acceptability of the protocol, such as:
- proposed changes to the protocol
- unforeseen circumstances or events
- adverse effects on participants

The HREC will conduct an audit each year of all projects deemed to be of more than low risk. There will also be random audits of a sample of projects considered to be of negligible risk and low risk on all campuses each year.

Within one month of the conclusion of the project, researchers are required to complete a *Final Report Form* and submit it to the local Research Services Officer.

If the project continues for more than one year, researchers are required to complete an *Annual Progress Report Form* and submit it to the local Research Services Officer within one month of the anniversary date of the ethics approval.

K. Pashley.

Signed: Date: 29 November 2007
(Research Services Officer, McAuley Campus)

(Committee Approval.dot @ 31/10/06) Page 1 of 1

150 years 1857 – 2007

St Vincent's Hospital
Charity, Care & Compassion

A facility of
St. Vincents & Mater Health Sydney

St. Vincent's Hospital Sydney Ltd
ABN 77 054 038 872
390 Victoria Street
Darlinghurst NSW 2010 Australia

T +61 2 8382 1111
F +61 2 9332 4142
www.stvincents.com.au

24 September 2007

Prof Sandy Middleton
School of Nursing
ACU National
PO Box 968
North Sydney NSW 2059

Dear Sandy

HREC Reference Number: 07/SVH/52
Study Title: Multi-disciplinary implementation of an evidence-based practice: Collaborative quality improvement in Intensive Care Unit (ICU) patient care.

Thank you for submitting the above project for single ethical and scientific review. The project was first considered by the St Vincent's Hospital HREC at its meeting held on 21 September 2007. This lead HREC has been accredited by NSW Department of Health as a lead HREC under the model for single ethical and scientific review.

This lead HREC is constituted and operates in accordance with the National Health and Medical Research Council's *National Statement on Ethical Conduct in Research Involving Humans* and the *CPMP/ICH Note for Guidance on Good Clinical Practice*.

I am pleased to advise that the Committee at a meeting on 21 September 2007 has granted ethical approval of the above quality assurance project.

The following documentation has been reviewed and approved by the HREC:
- Protocol Version 1 dated 5 September 2007.

Please note the following conditions of approval:

1. The Co-ordinating Investigator will immediately report anything which might warrant review of ethical approval of the project in the specified format, including unforeseen events that might affect continued ethical acceptability of the project.

2. Proposed changes to the research protocol, conduct of the research, or length of HREC approval will be provided to the HREC for review, in the specified format.

3. The HREC will be notified, giving reasons, if the project is discontinued before the expected date of completion.

4. The Co-ordinating Investigator will provide a progress report, in the specified format, annually to the HREC as well as at the completion of the study.

HREC approval is valid for 5 years from the date of this letter.

Investigators holding an academic appointment (including conjoint appointments) at the University of New South Wales are required to provide a copy of the application form, all approved documents and a copy of this letter to the UNSW HREC for ratification. These documents should be sent to UNSW, Ethics Secretariat, Research Services, Rupert Myers Building, 3rd floor, Kensington 2052.

You are reminded that this letter constitutes ethical approval only. You must not commence this research project at a site until separate authorisation from the Chief Executive or delegate of that site has been obtained.

Should you have any queries about your project please contact the Executive Officer – Research Office, Tel: 8382-2075, email research@stvincents.com.au. The HREC Terms of Reference, Standard Operating Procedures, membership and standard forms are available from the St Vincent's Hospital website:
http://wwwsvh.stvincents.com.au/researchoffice/ReschOffice/

Please quote **07/SVH/52** in all correspondence.

The HREC wishes you every success in your research.

Yours sincerely

Sarah Charlton
Executive Officer
Research Office

07.svh.52.1

ST VINCENT'S HOSPITAL
HUMAN RESEARCH ETHICS COMMITTEE

MEMBER	ACADEMIC QUALIFICATION	COMMITTEE STATUS	PROFESSIONAL STATUS	AS AT JUL2007
Prof Jo-anne Brien	BPharm,BS(Pharm),PharmD,MPS.MRPharmaS.RPh	Pharmacy/Chairman	SVH Pharmacy Research	Feb-01
Prof Gavin Andrews	MD	Care/counselling/treatment	Director, CRUFAD	Nov-90
Dr Winston Liauw	MBBS, MmedSci, FRACP	Clinical Research	Clinical Trials Registrar, Medical Oncologist, Clin Pharm	Dec-03
Dr Keith Fay	MBChB, FRACP, FRACPA	Clinical Research	Staff Specialist Haematology	Nov-04
Prof Peter Macdonald	MBBS, PhD, FRACP	Clinical Research	Senior Staff Specialist, Cardiology	Feb-03
Dr Maxwell Coleman	MBBS,FRAES,FRCS	Clinical Research	Visiting Medical Officer, General Surgery SVH	Jun-83
Dr Handan Wand	PhD	Research	Statistician, NCHECR	Jan-07
Ms Linda Hotong	BPharm	Pharmacy	Clinical Research Pharmacist, SVH	Sep-99
Fr Laurie Christie		Religious Representative	Catholic Priest	May-02
Mr Michael Britt	BSc,BE(Hons),M Eng Sc,MBA	Layperson	Group Manager, Strategy & Business Development	Mar-92
Ms Mary-Rose Williams	RN	Layperson	Foster parent for physically disabled children	Aug-97
Ms Sally Crawford	BA(Hons)	Layperson	Radio & Print Book Reviewer	Aug-97
A/Prof Peter Dwyer	MScSoc., PhC., Dip.Law, MPS, MRPharmS	Lawyer	Barrister-at-Law	Nov-84
Dr Claire Vajdic	BOpt, PhD	Research	NHMRC Postdoctoral Fellowship	Jan-06
A/Prof Chris Hayward	BMedSc, MD, FRACP, FCSANZ	Clinical Research	Staff Specialist, Cardiology	Jan-06
Ms Julie French	M.HealthSc., GradDip. GeneticCounselling, RN	Clinical Research	Project Manager	Nov-06
Dr Fabian Sack	BA(Hons), M Phil, PhD	Layperson	Environment Governance	Mar-07
Ms Nana Howard	LLM, LLB, MEd, DipEd, BA	Lawyer	Assistant Dean of Law, Uni of Notre Dame	May-07
Mr Richard Norris	RN , BN, MBA	Clinical Research	Clinical Trials Unit Coordinator	Jul-07

I certify that the above is a true an accurate record of the current St Vincents Hospital Human Research Ethics Committee.

Sarah Charlton
Executive Officer
Dated: 27/9/07
Study Number: 07/SVH/52

Appendix 2 Funding

Funding body	Grant/scholarship	Year	Amount
St. Vincent's Clinic Foundation, Sydney Australia	Multi-Disciplinary Patient Focussed Research Grant	2007	$25,000
St. Vincent's Clinic Foundation, Sydney Australia	Multi-Disciplinary Patient Focussed Research Grant	2009	$19,500
NSW Nurses and Midwives Board	Category 6 scholarship	2008	$17,500
National Centre for Clinical Outcomes Research (NaCCOR), Australian Catholic University	NaCCOR Research PhD completion scholarship	2009	$15,000
Curran Foundation, Sydney	ICU Nursing Research Grant	2010	$15,000

Appendix 3 Permission from ICCMU to use data

Serena Knowles

From: Kaye Rolls [Rollsk@wahs.nsw.gov.au]
Sent: Tuesday, 23 June 2009 12:01
To: Serena Knowles
Cc: Sandy Middleton
Subject: Re: reporting ETT/Trache data in thesis

HI Serena
please use this email as evidence of my permission. Look forward to seeing the final results cheers k

Kaye Rolls CNC
Intensive Care Coordination and Monitoring Unit

Honorary Associate Faculty of Nursing, Midwifery and Health University of Technology, Sydney

Tel: (02) 4734 1489
Mobile: 0423607735
Fax: (02) 4734 1586
Rollsk@wahs.nsw.gov.au
ICCMU Website Access:
http://intensivecare.hsnet.nsw.gov.au
OR
CIAP: Clinical Resources - Speciality Websites - Intensive Care - ICCMU NSW Health Intranet - Quick links -
ICCMU Access to closed sections:
username: iccmu
password: Icu41585
NB THESE ARE BOTH CASE SENSITIVE

Postal Address
ICCMU
Nepean Hospital
PO Box 63
Penrith NSW 2751

>>> Serena Knowles <Serena.Knowles@acu.edu.au> 23/06/2009 11:53:00 am
>>>
Dear Kaye,

As per your telephone conversation with Professor Sandy Middleton, and following discussion with Doug Elliott regarding progress of my thesis, I would like your permission to present some of the ETT and Trache data from the telephone survey conducted in 2006 in my thesis.

This would of course be done with acknowledgement of your and ICCMUs involvement in the project.
These results are currently presented together in the manuscript recently resubmitted to ACC and is under editorial review.

The questions we are proposing I include in my thesis are the same questions asked for the other 9 practice areas:
Question items

Description of content

11) a - h & 12) a - h,

ETT and Trache guideline existence

16) a-d

Satisfied with management and view as neglected area of critical care nursing practice

17) a - e & 18) a- e

Audit practices

19) a

Aware of systematic review by Gardner et al.

Answers to these questions provide important data that add to the significance of the findings.
I do not intend to report any of the specific questions you asked regarding methods of stabilisation.

Thank you for agreeing to this.

Regards,

Serena

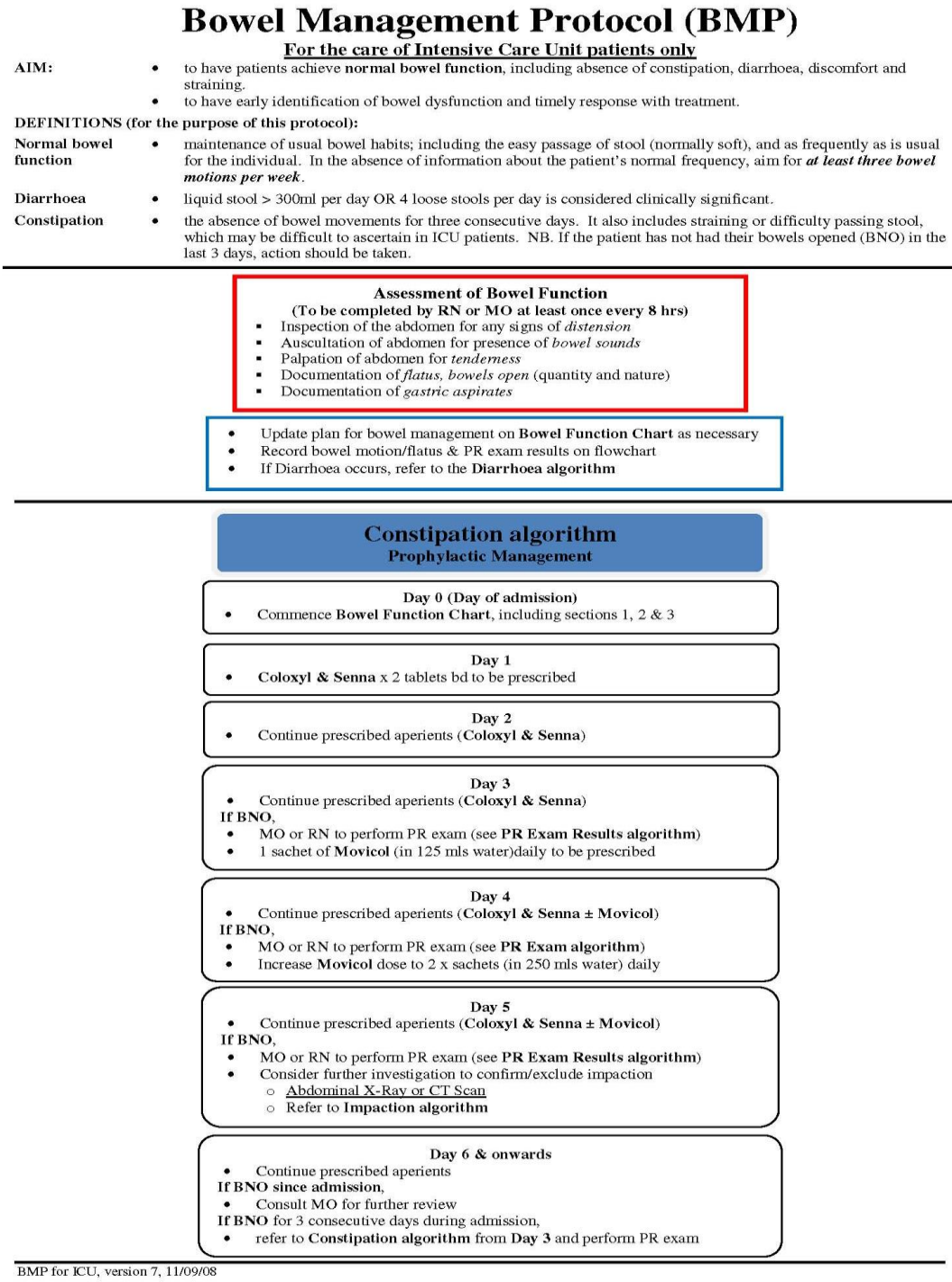
Serena Knowles
PhD Candidate
School of Nursing (NSW and ACT)
ACU National
PO Box 968
NORTH SYDNEY
NSW
2059

Tel: 02 9739 2432
Fax: 02 9739 2132

Email: serena.knowles@acu.edu.au<mailto:serena.knowles@acu.edu.au>

Appendix 4 Additional information from manuscripts

BMP algorithms



Bowel Management Protocol (BMP)

For the care of Intensive Care Unit patients only

AIM:
- to have patients achieve **normal bowel function**, including absence of constipation, diarrhoea, discomfort and straining.
- to have early identification of bowel dysfunction and timely response with treatment.

DEFINITIONS (for the purpose of this protocol):

Normal bowel function – maintenance of usual bowel habits; including the easy passage of stool (normally soft), and as frequently as is usual for the individual. In the absence of information about the patient's normal frequency, aim for ***at least three bowel motions per week***.

Diarrhoea – liquid stool > 300ml per day OR 4 loose stools per day is considered clinically significant.

Constipation – the absence of bowel movements for three consecutive days. It also includes straining or difficulty passing stool, which may be difficult to ascertain in ICU patients. NB. If the patient has not had their bowels opened (BNO) in the last 3 days, action should be taken.

Assessment of Bowel Function
(To be completed by RN or MO at least once every 8 hrs)
- Inspection of the abdomen for any signs of *distension*
- Auscultation of abdomen for presence of *bowel sounds*
- Palpation of abdomen for *tenderness*
- Documentation of *flatus, bowels open* (quantity and nature)
- Documentation of *gastric aspirates*

- Update plan for bowel management on **Bowel Function Chart** as necessary
- Record bowel motion/flatus & PR exam results on flowchart
- If Diarrhoea occurs, refer to the **Diarrhoea algorithm**

Constipation algorithm
Prophylactic Management

Day 0 (Day of admission)
- Commence **Bowel Function Chart**, including sections 1, 2 & 3

Day 1
- **Coloxyl & Senna** x 2 tablets bd to be prescribed

Day 2
- Continue prescribed aperients (**Coloxyl & Senna**)

Day 3
- Continue prescribed aperients (**Coloxyl & Senna**)

If BNO,
- MO or RN to perform PR exam (see **PR Exam Results algorithm**)
- 1 sachet of **Movicol** (in 125 mls water)daily to be prescribed

Day 4
- Continue prescribed aperients (**Coloxyl & Senna ± Movicol**)

If BNO,
- MO or RN to perform PR exam (see **PR Exam algorithm**)
- Increase **Movicol** dose to 2 x sachets (in 250 mls water) daily

Day 5
- Continue prescribed aperients (**Coloxyl & Senna ± Movicol**)

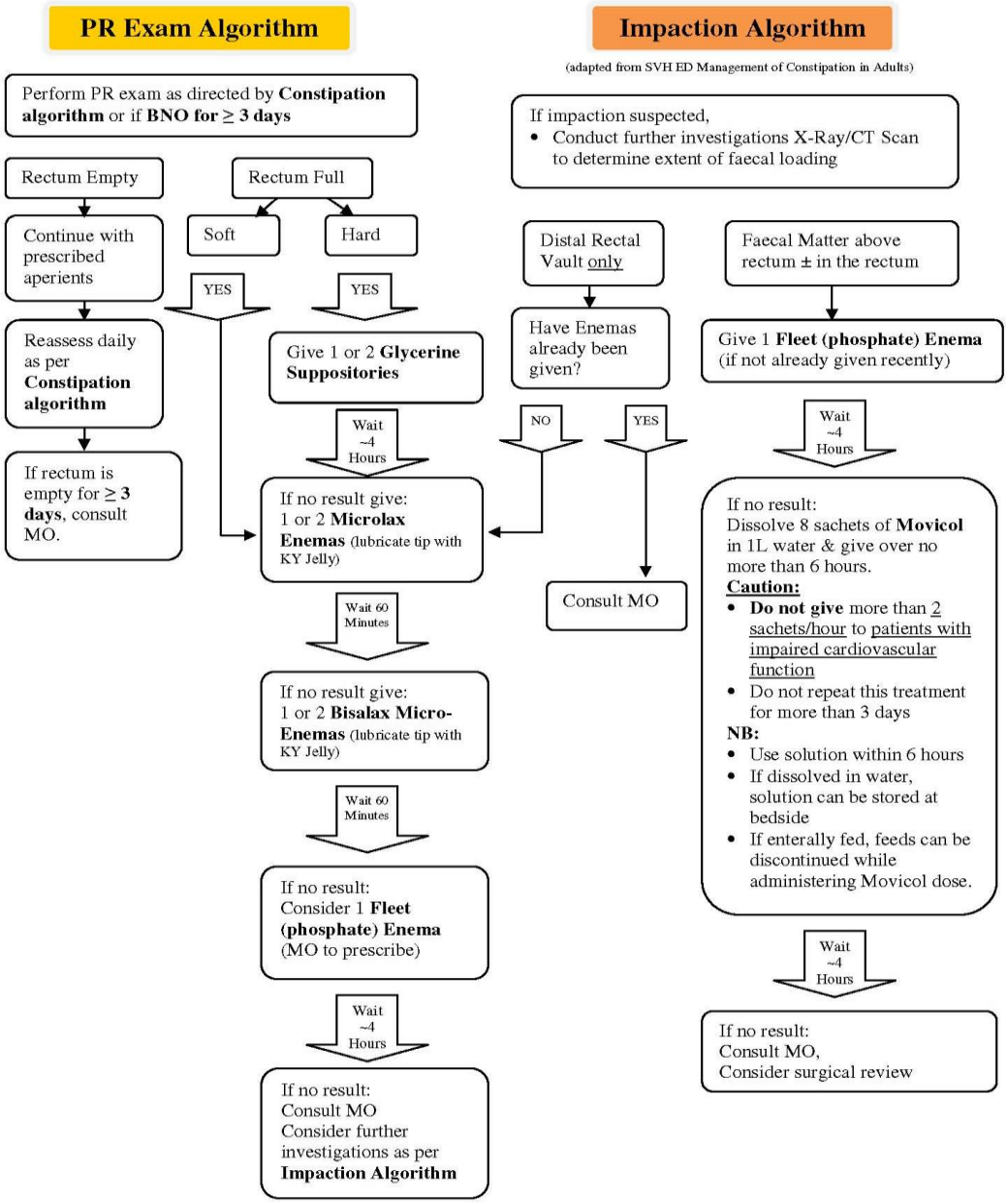
If BNO,
- MO or RN to perform PR exam (see **PR Exam Results algorithm**)
- Consider further investigation to confirm/exclude impaction
  - Abdominal X-Ray or CT Scan
  - Refer to **Impaction algorithm**

Day 6 & onwards
- Continue prescribed aperients

If BNO since admission,
- Consult MO for further review

If BNO for 3 consecutive days during admission,
- refer to **Constipation algorithm** from **Day 3** and perform PR exam

BMP for ICU, version 7, 11/09/08



N.B.
DO NOT USE *Repeated* or *Frequent* Fleet enemas (ie. Sodium phosphate preparations)
- These agents cause large fluid and electrolyte shifts, particularly of sodium, potassium, calcium and phosphate
- Arrhythmias, collapse, and fatalities have occurred

Diarrhoea Algorithm

(Adapted from SVH Enteral Tube Feeding Guideline, ICU Clinical Practice Manual)

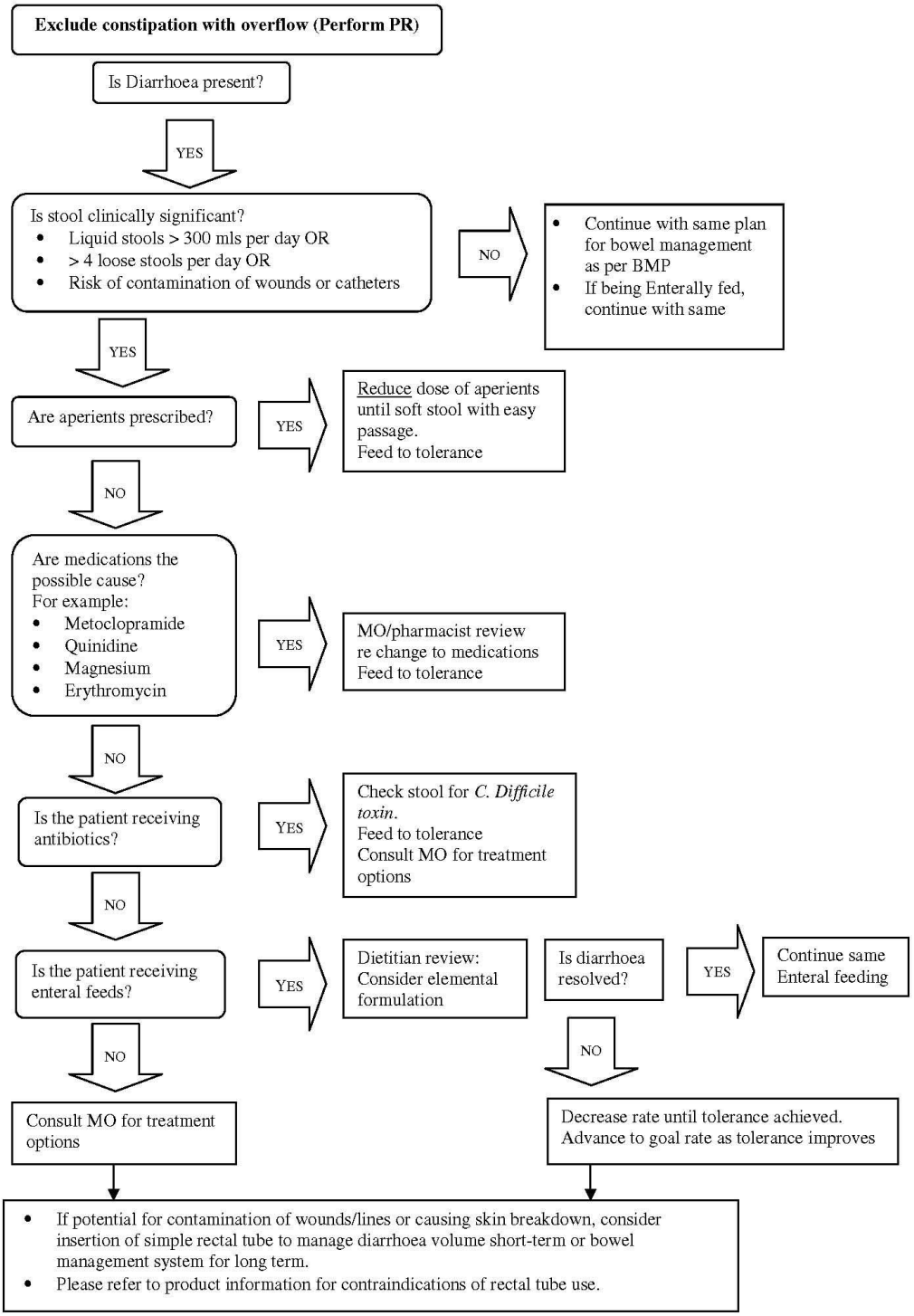


Table of oral and rectal laxatives for treatment of constipation

Recommended Oral Laxatives				
Medication	**Action**	**Indication**	**Side effects and precautions**	**Time to action**
Coloxyl with senna (docusate sodium; sennosides A and B)	Faecal softening agent plus stimulant laxative.	Relief of constipation or for prophylaxis of constipation.	• Colic or cramping • Prolonged use may lead to diarrhoea, with associated loss of water and electrolytes • Long term use may cause atonic, non-functioning colon	6 – 12 hours
Movicol (Macrogol 3350; Potassium chloride; Sodium bicarbonate; Sodium chloride)	Macrogol 3350 has an osmotic effect. The electrolytes ensure there is no net loss of sodium, potassium or water.	Relief of constipation or to resolve faecal impaction.	• Abdominal distension and pain, 'rumbling' due to gas movement and nausea; due to the expansion of the contents of the intestinal tract • Allergic reactions are a possibility ***Patients with impaired cardiovascular function.*** **No more than 2 sachet per hour.**	Up to 6 hours
Recommended Rectal Laxatives				
Medication	**Action**	**Indication**	**Side effects and precautions**	**Time to action**
Microlax enema (Sodium citrate; Sodium lauryl sulfoacetate; Sorbitol)	Faecal softener leading to gentle defecation.	Relief of rectal constipation and part of the preparation for gastrointestinal examination/procedures.	• A slight rectal burning sensation has occasionally been reported.	Evacuation should occur 30 minutes after administration.
Glycerol suppositories (glycerin)	Lubricant & mild stimulant	Relief of acute and temporary constipation.		15 to 60 minutes
Bisalax micro-enema (Bisacodyl)	A contact laxative and acts by stimulating an increase in peristaltic contractions of the colon	Relief of constipation. May be employed satisfactorily in patients with ganglionic blockage or spinal cord damage (e.g. paraplegia, poliomyelitis).	• Bisacodyl is well tolerated and side effects are rare. • Side effects in the form of diarrhoea, local rectal irritation, proctitis, slight indisposition, epigastralgia, tenesmus and nausea are, however, described.	5 to 15 minutes
Fleet (sodium phosphate)	Osmotic effect by increasing fluid retention in the lumen of the small intestine, which in turn produces and promotes peristalsis.	Relief of constipation and faecal impaction. As part of the preparation for gastrointestinal examination/procedures.	• Life threatening dehydration and/or electrolyte disturbances may occur ***Caution:*** **Use with caution in patients with paralytic ileus; faecal impaction; bowel obstruction.**	30 minutes May take as long as 6 hours.
Other Oral Laxatives				
Medication	**Action**	**Indication**	**Side effects and precautions**	**Time to action**
Duphalac (Lactulose)	Osmotic laxative & reduction of faecal pH leading to reduced ammonia absorption (important in *Portal-systemic encephalopathy)*	Treatment of acute, and prevention and treatment of chronic, portal-systemic encephalopathy, including the stages of hepatic precoma and coma. Treatment of chronic and habitual constipation.	• If sugars reach the colon then bacterial breakdown causes hydrogen production and can lead to accumulation of hydrogen gas	Can take 24 to 48 hours before normal defaecation occurs.
Glycoprep-C (Ascorbic acid; Macrogol 3350; Potassium chloride; Sodium chloride; Sodium sulphate)	Macrogol 3350 has an osmotic effect. The electrolytes ensure there is no net loss of electrolytes or water.	Relief of constipation and as part of preparation for gastrointestinal examination/procedures.	• Nausea, abdominal fullness and bloating • Cramps, vomiting and anal irritation. ***Caution:*** **Use with caution in patients with severe ulcerative colitis, impaired renal function, pre-existing electrolyte disturbances, congestive heart failure, diabetics, dehydration, <18 years and in the elderly.**	Watery diarrhoea within 1 hour and removes the bowel contents by 4 hours.
Picolax (Sodium picosulfate)	A stimulant laxative.	Relief of occasional constipation and as part of the preparation for gastrointestinal examination/procedures.	***Contraindications:*** **.DO NOT USE in patients with:** • **dehydration** • **electrolyte disturbances** • **significant renal dysfunction** • **congestive heart failure (CHF)** • **other conditions in which significant fluid shifts would be detrimental,** • **patients aged < 18 years or > 60 years**	Within 3 hours.

Rossi S, managing editor. Australian Medicines Handbook online. Adelaide: Australian Medicines Handbook Pty Ltd [via Clinical Information Access Program]; last revision July 2008. Accessed 25 Aug 2008

Donohoo E, editor. MIMS Online version 1.1. Sydney: MIMS Australia [via Clinical Information Access Program]; 2008. Accessed 25 Aug 2008