Nurses' just-in-time training for clinical deterioration: Development, implementation and evaluation

Rick C. Peebles a,⁎, Imogen K. Nicholson b, Jordana Schlieff a, Amanda Peat c, David J. Brewster c, d

a Clinical Education Department, Cabrini Health, 154 Wattletree Rd, Malvern 3144, Victoria, Australia
b Central Clinical School, Faculty of Medicine, Nursing & Health Sciences, Monash University, Australia
c Cabrini Health, Victoria, Australia
d Central Clinical School, Faculty of Medicine, Nursing & Health Sciences, Monash University, Victoria, Australia

A B S T R A C T

Background: ‘Just-in-time training’ is an innovative approach to nursing education. It has demonstrated positive outcomes in other industries, such as manufacturing and aviation, but it has limited published application in the acute-care setting.

Objectives: We aimed to implement and evaluate a nursing ‘just-in-time training’ program for the recognition and response to patient deterioration.

Design: To promote consistency, one Clinical Deterioration Educator provided education to nursing staff in both recognising the need for escalation and providing subsequent care for the deteriorating ward patient. Nurses’ perception of the ‘just-in-time training’ program was determined using electronic questionnaire responses. Medical Emergency Team call prevalence and outcome data was compared before and after the program implementation for further evaluation.

Setting: The ‘just-in-time training’ program was implemented in a 508-bed acute metropolitan private hospital over a 12-month period. Education was provided in general medical and surgical wards, not specialty areas.

Participants: Nurses received the just-in-time training based on their patients’ perceived risk of deterioration, therefore, participants are not randomised.

Methods: A quantitative research study investigated nurses’ self-perceived confidence after receiving just-in-time training. Medical Emergency Team call frequency data was also examined to identify trends.

Results: The ‘just-in-time training’ program consisted of 534 bedside nursing encounters over 12 months. During the study, the need for the educator to recommend that nurses escalate care reduced in prevalence from 20% to 5.5%. Questionnaire responses demonstrated a self-perceived confidence following intervention of 4.32/5.0. Medical Emergency Team call prevalence, per 1000 patient bed days, increased from 13.6 pre-intervention to 15.4 post-intervention.

Conclusions: ‘Just-in-time training’ can be effectively implemented to educate ward nursing staff in recognising and responding to the deteriorating patient. The program is well received by nursing staff and leads to high self-perceived confidence to recognise and appropriately care for a deteriorating patient.

1. Introduction

‘Just-In-Time Training’ (JITT) has been utilised within numerous industries, with most success described in high-risk occupations such as defence, manufacturing, and aviation (Chueh and Barnett, 1997; Braga et al., 2015). This education modality facilitates the delivery of time-relevant and work-based education, with an increased emphasis on providing on-the-job teaching as it becomes required (Braga et al., 2015; McIntosh et al., 2009; Nishisaki et al., 2010; Liu et al., 2013). In healthcare, JITT has been previously utilised for staff training in quality improvement and high-risk, low-volume therapies (Helman et al., 2016). However, JITT has not previously been described in an acute-care setting for the recognition or response to patient deterioration.

The JITT approach for the recognition and response to patient deterioration has existing educational theoretical relevance in its design. The education occurs in the clinical setting using actual patient encounters to guide the content. This approach closely aligns with learning through practice theory described by Steven Billett (Billett, 2000). Billett advocates for workplaces as learning environments by proposing that “optimising the experiences health care workplaces provide, augmenting their potential for learning and promoting workers' engagement with them can, together, improve workers' ability to respond to future occupational challenges” (Billett, 2016). Billett's theory builds on historical constructivist and experiential learning theories.

Constructivism theory states that learning is active, context dependent with the learner constructing knowledge, rather than acquiring it, based on personal experience and the environment (Piaget, 2013; Ertmer and Newby, 1993; Vygotsky, 1980). This is applicable to the JITT model as the Clinical Deterioration Educator acts as a facilitator of this process to encourage reflection and mutually identified learning opportunities. The learner then constructs their own learning experiences.
experiences based on the clinical context they are exposed to and consolidates the learning through reflection.

Additionally, Kolb’s experiential learning theory applies to JITT. Kolb (1984) asserts that a learning cycle occurs when learners are exposed to a concrete learning experience (education intervention in the clinical setting) with adequate support to observe, reflect, conceptualise and alter practice. The education intervention approach, JITT, mimics Kolb’s experiential learning cycle. Given there are theoretical frameworks which support the intervention design, the intention of this research would not need to prove these theories, but examine their effect from the participant’s perspective. By design, JITT should facilitate immediate acquisition of knowledge and clinical skills at the bedside and encourage self-directed learning with situation-appropriate content. As such, this model of learning should suit the time-critical nature of recognition and immediate management of the deteriorating patient.

The JITT program in this study focused on recognition and care of deteriorating patients. The international concern over delays or failure to recognise and escalate care for clinically deteriorating ward patients has led to the widespread implementation of a hospital-wide patient safety initiative known as the rapid response system (RRS), or Medical Emergency Team (MET) in acute hospitals (Australian Commission on Safety and Quality in Health Care, National Safety and Quality Health Service Standards, 2018). The Medical Emergency Team (MET) provides rapid clinical assessment and treatment to patients with physiological deterioration or other serious concerns. A ‘MET call’ provides an immediate response from the team, including qualified medical, nursing and support personnel. A MET call is an appropriate immediate response to clinical deterioration, once recognised on the wards by nursing staff. However, a 2014 epidemiology review of adult RRS patients in Australia revealed that close to 50% of the activations were delayed (Jones, 2014).

A recent, 2017, systematic review highlighted a significant range of factors that influence activation of the MET team (Buist et al., 1999). The review identified cognitive failure to recognise the need for MET activation, socio-cultural factors and professional hierarchies as factors that impact activation of the MET team (Buist et al., 1999; Daftarn et al., 1994; DeVita et al., 2004; Jones et al., 2006; Kitto et al., 2015; Shearer et al., 2012; Branzetti et al., 2017). Considering the broad range of factors that impact/influence MET activation, situating the JITT program in the clinical setting sought to apply an innovative flexible education model to address these barriers. As this was a new program within the health service, this study aimed to analyse staff confidence and perception of the JITT program to determine future directions. Coupled with this, the study enabled analysis of MET call prevalence to examine if the program had an impact.

Literature comparing outcomes from simulation-based learning and either JITT or bedside interventional education is equivocal (Braga et al., 2015). The potential efficacy of JITT as an educational tool for novel concepts and infrequently performed clinical procedures has been explored. Previous research demonstrated a marked reduction in adverse events, post-JITT, in high-risk, low-volume procedures, as well as an overall improvement in nurse competence (Helman et al., 2016). A follow-up nursing questionnaire demonstrated staff perceived JITT as resulting in a safer working environment and improved overall patient care (Helman et al., 2016).

The literature emphasises that clinical-based learning provides a medium to maximise education outcomes without compromising resources and budgets, and without removing staff from the workplace for solely educational purposes (Chueh and Barnett, 1997). Branzetti et al. (2017) propose that a well-designed JITT helps to facilitate best practice and shared knowledge among the healthcare team, further promoting patient safety. As a bedside education modality, JITT may provide cost effective ‘real-time’ learning that reflects the challenges encountered in the clinical setting. Bedside teaching is integrated with clinical care, enabling clinicians to learn in an authentic context, in a supportive, sustainable environment.

2. Methods

2.1. Program design and implementation

The JITT program was implemented at a 508-bed private tertiary metropolitan hospital over a twelve-month interval. The program was structured around one Clinical Deterioration Educator, specifically trained to operate on the bedside education, debriefing, reflective practice and JITT, who attended ward-based situations where patients were identified as being at risk of clinical deterioration. Supervisor staff (nurse in charge or nurse unit manager) would alert the Clinical Deterioration Educator of patients deemed at risk of deterioration. If no patient was identified, the Clinical Deterioration Educator would determine the at-risk patients. Common flags of concerns could include but are not limited to: recent discharge from the Intensive Care Unit or Emergency Department, modifications to MET call criteria and extensive comorbidities. These clinical flags are supported by Henrikson, Brabrand and Lassen who found that risk factors for deterioration may include old age, not for resuscitation orders, admission from the emergency department (Henrikson et al., 2014).

Subsequently, the Clinical Deterioration Educator would prompt nursing staff to identify learning opportunities relating to the patient’s clinical context, in order to provide targeted education based on mutually identified needs. Nursing staff, in medical and surgical wards, would engage in discussion with the Clinical Deterioration Educator regarding the patient’s risk of deterioration, conceivable causes and appropriate immediate management. The Clinical Deterioration Educator and individual nurse would identify patient MET criteria and the appropriate pathways to escalate concerns regarding patient deterioration. The Clinical Deterioration Educator would formalise the learning through identification of skills for the staff member to utilise to detect patient deterioration earlier, plan for immediate management and escalate when appropriate. At the conclusion of the encounter the Clinical Deterioration Educator would advocate for self-reflection to identify further learning goals for the nurse. Where appropriate, the nurse was directed to engage with academic literature, organisational policies and eLearning courses to support increased knowledge acquisition.

2.2. Program analysis

During JITT implementation, the Clinical Deterioration Educator collected data to generate internal quarterly reports on total nursing encounters, the number of patients found to be in MET call criteria, the number of encounters escalated to a MET response and the learning opportunities by theme.

A post-intervention participant questionnaire was distributed, to assess nurses’ satisfaction and overall perceptions of the program, particularly in relation to the JITT method of the training. Three months following the completion of the programs 12-month pilot, nurses who had participated in the program were approached to voluntarily complete an electronic questionnaire. Potential questionnaire respondents were approached on the hospital wards by one research assistant not involved in the intervention. The questionnaire (Appendix 1) examined satisfaction with the JITT program, including aspects of nurse confidence, transferability of knowledge for future patients, personal behavioural changes, appreciation of education in clinical setting and the program’s overall promotion of patient safety.

Relevant hospital and patient statistical data was also collected from numerous sources to examine the potential impact of the JITT program. MET data was adopted from the intra-hospital live database which collated all MET call responses. The data was recorded live by MET teams which comprised of qualified medical, nursing and support personnel. Patient administration system software was utilised to review patient admission data, including hospital separations, total patient admissions and total patient bed-days, in order to analyse total MET
responses per 1000 patient bed-days. Data relating to MET responses and total hospital admissions was sourced for three specific six-month time periods to identify differences between periods before, during and after implementation of the JITT program.

3. Results

3.1. JITT program results

The JITT program consisted of a total of 534 bedside nursing encounters over the one-year implementation period. Table 1 summarises the referral sources of these encounters, the percentages of encounters where patients were already in MET criteria, and where escalation of care was advised by the Clinical Deterioration Educator. Prominent learning opportunity themes included patent assessment, cardiovascular pathophysiology, pharmacology and sepsis. The data captured by the Clinical Deterioration Educator also highlighted clinical policies that required revision which were actioned as a result of the data. Previous studies have highlighted the impact of sociocultural factors on activation of the MET team, unfortunately our study was not powered to detect these factors as the encounter data was focused on patient data rather than participant data.

Additionally, learning opportunities were categorised by theme to identify organisational trends. Prominent learning opportunity themes included patent assessment, cardiovascular pathophysiology, pharmacology and sepsis. Learning opportunity themes were utilised to inform the Clinical Education Department curriculum development priorities and de-identified JITT encounter data was able to inform development of case studies and content for education workshops.

3.2. Participant questionnaire results

Questionnaire results were collected over a two-month period, with a total of 71 responses submitted. A purposive sampling method was applied and nurses who received the JITT encounter were invited to complete the questionnaire. The overall response rate is unknown, as the 534 bedside encounters included repeated encounters with the same members of nursing staff. The questionnaire was administered at various times and days, across multiple wards, encompassing evening, weekend and part-time nurses, in order to sample as many of the program participants as possible. One research assistant provided the electronic questionnaire in person, to prevent repeated submissions. Participant data was not captured during the encounter, therefore, it is unknown precisely how much time elapsed between intervention and survey, however, time between intervention and survey would not be greater than 12 months.

Questionnaire results demonstrated 95.8% of the nurses felt their learning during the JITT encounter was transferable to the care of future patients, with 77.1% of staff having altered their behaviour when escalating deteriorating patients after the program. Additionally, 95.8% of nurses appreciated the education occurring at the bedside, in the clinical setting and 98.6% wanted the program to be ongoing.

An analysis of the participants’ years of nursing experience was conducted, exploring any correlation between years of experience and questionnaire responses, with particular focus on post-implementation perceptions that the program increased confidence in confidence and behaviour changes. A one-way ANOVA demonstrated there was no statistical significance in responses between staff based upon level of nursing experience (Table 2).

Questionnaire participants also had the opportunity to provide recommendations for program improvement. The primary theme was an increase in contact and visibility of the Clinical Deterioration Educator, with participants requesting additional educational opportunities, particularly during and after MET calls.

3.3. MET results

MET prevalence and outcome data was obtained, for three six-month periods before, during and after the JITT program’s commencement (Table 3). Of note, the increase in MET call prevalence, per 1000 patient bed days, from 13.6 pre-intervention to 15.4 post-intervention supports nursing staff perceptions that the program increased their confidence in recognising deterioration and escalating care appropriately.

4. Discussion

The JITT approach facilitates the delivery of time-relevant and work-based education, with an increased emphasis on providing on-the-job teaching as it becomes required (Braga et al., 2015). JITT has demonstrated benefits in high-risk low-volume therapies but has not previously been described in an acute-care setting for the recognition or response to patient deterioration. This study sought to implement and
evaluate a nursing JITT program for the recognition and response to patient deterioration and contribute to the growing, but sparse, healthcare literature surrounding JITT. Current education modalities to address these gaps often require a compromise between allocating nurses time to gain experience on the wards and time off the ward to attend education, with subsequent impact to costs associated with study leave and back-fill. While simulation-based training can fill some of these deficits, the resources required (e.g. learner-instructor time, teaching space, training materials, teaching expertise) to support training of suitable quality and frequency may be prohibitive (Branzetti et al., 2017). A bedside JITT approach that supports knowledge and skill acquisition to promote recognition and appropriate response to acute deterioration could provide an important safety intervention.

To achieve consistency of method, one Clinical Deterioration Educator was trained in bedside education, debriefing, reflective practice and JITT. We propose this method could be expanded to a larger group of educators without losing the fidelity of the method. For evaluation of method and to contribute to a gap in the literature, the modality, participant satisfaction and perceived benefits were evaluated. This study demonstrated the JITT approach was well-received by nursing staff with 95.8% of nurses believing the learning that occurred during the intervention was also transferable to care of future patients. When evaluating staff satisfaction, 95.8% appreciated the education occurring at the bedside in a clinical setting and 98.6% wanted the program to be ongoing. Additionally, 77.1% of staff reported having altered their behaviour when escalating deteriorating patients after the program. This correlated with a significant reduction in the number of encounters which required the Clinical Deterioration Educator to intervene and recommend escalation of care. There was an increase in the total number of MET calls twelve months post-implementation of the JITT program. It is difficult to comment on the MET call data, given there is a significant amount of variables that impact on MET frequency. However, the rise in MET calls may demonstrate the improved ability of staff to recognise deteriorating patients and escalate care. A follow-up nursing questionnaire demonstrated staff perceived JITT resulted in a safer working environment and improved overall patient care (Helman et al., 2016).

The JITT program revealed a number of learning opportunity themes related to nursing knowledge and skills. Key organisational learning opportunity themes were then used to provide cohort-wide targeted education with a view to increase nursing knowledge and skill, and improve patient outcomes. Prominent themes included: patient assessment, cardiovascular pathophysiology, pharmacology and sepsis. The data captured by the Clinical Deterioration Educator also highlighted policies that may need review or revision which were actioned as a result of the data. Literature highlights socio-cultural factors and professional hierarchies are reasons that impact activation of the MET team (Dafurn et al., 1994; DeVita et al., 2004; Jones et al., 2006), unfortunately, our study was not powered to detect these factors as the encounter data was focused on patient data rather than participant data.

While every effort was made to ensure research rigour, this study is not without its limitations. To demonstrate a confidence improvement as a result of the JITT intervention a pre-intervention confidence questionnaire could have been utilised. This would have strengthened the evaluation of confidence before and after the intervention to inform impact. In addition, possible recall bias could be present in the results as the evaluations were administered greater than three months post-intervention. Furthermore, as a single-centre study, it is difficult to comment whether findings could be generalised to other organisations. However, as a large tertiary hospital, it is likely to be relevant to many other Australian hospitals. In addition, as the evaluation focused on perceived confidence rather than actual performance improvement it was not feasible to interview nurses after a MET activation to determine if the JITT created a behaviour change.

The JITT program requires significant support from healthcare administration, nurse leaders and bedside staff to be successfully implemented, which may be a valid alternative to more expensive educational programs. As this approach is grounded in clinical education theory, it is proposed this approach could be expanded to multiple educators without losing the fidelity of the teaching method. The ad hoc nature of the interventions, as patients at risk of deterioration arose, lends the role to a clinical based clinician. The JITT program allowed educators and managers to balance these factors, by keeping nurses in the clinical setting, whilst still providing authentic learning experiences for nurses.

This study demonstrates the efficiency of a JITT program in a large private hospital setting. This education modality, and subsequent outcomes, would be relevant to hospital administrators addressing requirements of the National Safety and Quality Health Service (NSQHS) Standards (Australian Commission on Safety and Quality in Health Care, National Safety and Quality Health Service Standards, 2018). There is the possibility for further research with larger sample sizes and ongoing follow-up to assess the long-term outcomes of this training methodology. Recommendations for future studies include collecting demographic data on individual JITT interactions, to establish the total number of individual nurses educated and allow every participant to receive follow-up questionnaires. Participants' individual responses would then be able to be compared pre- and post-implementation to explore individual, as well as cohort-wide, results. In addition, aims of future studies will be to examine the interaction between clinician and the consumer during JITT. As the education intervention occurs at the bedside, consumer perception and involvement is crucial and there is a dearth of literature studying consumer perceptions of JITT. It would also be the aim of future research to investigate the relationship between patient outcomes in relation to JITT for recognition and care of the deteriorating patient.

5. Conclusion

The JITT program was implemented effectively to allow the education of ward nursing staff in recognising and appropriately responding to the patient deterioration. The program, as an education modality, is well received by nursing staff and leads to an improvement in staff confidence and patient safety which may improve nurses' ability to recognise deterioration, escalate care and appropriate immediate management. There was strong support for the program within our hospital.

Funding source

Funding was kindly provided by Cabrini Senior Medical Staff Association Research Scholarship to support Imogen Nicholson’s time to administer the questionnaire, no additional funding was received.

Ethical approval

Cabrini Human Research Ethics Committee approval (reference
number 12-30-10-17) was granted for this project.

Declaration of competing interest

None declared.

Appendix 1

Questionnaire

Part 1

Questionnaire options: strongly disagree; disagree; neither agree nor disagree; agree; strongly agree.

1. The following survey relates to any impact the Clinical Deterioration Educator (CDE) Program may have had on your clinical practice.
2. Prior to receiving ‘point-of-care’ CDE I felt confident in identifying and responding to the deteriorating patient.
3. My learning that occurred in the ‘point-of-care’ education session will be transferable to future patients.
5. The Clinical Deterioration Educator Program should be offered ongoing.
6. I am satisfied with the CDE program.
7. Please specify any additional comments.

Part 2

1. If you were responsible for the CDE program what changes, if any, would you make to the program?
2. Please indicate your years of nursing experience (years) since graduation.
3. Please indicate your age (range).

References

Australian Commission on Safety and Quality in Health Care, National Safety and Quality Health Service Standards, August 2018. Sydney. ACSQHC 2018.