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Research paper

Nurses' recognition and response to clinical deterioration in the cardiac catheterisation laboratory

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ABSTRACT

Background: Patients presenting to the cardiac catheter laboratory for treatment of unstable acute coronary syndromes (ACS) experience a mismatch in myocardial oxygen supply and demand, causing vital sign abnormalities prior to neurological, cardiac and respiratory deterioration. Delays in detecting clinical deterioration and escalating care increases risk of adverse events, unplanned intensive care (ICU) admission, cardiac arrest, and in-hospital mortality.
Objectives: The objective of the study was to explore how nurses in the cardiac catheter laboratory (CCL) recognise and respond to clinical deterioration in patients with unstable ACS undergoing primary percutaneous coronary intervention (PCI).
Methods: A prospective exploratory descriptive design was used with 30 participants completing 10 written clinical scenarios. Participants scored their level of concern for each physiological cue and then then ranked their preferred immediate response based on the deterioration identified.
Results: Hypotension and the presence of pain were the physiological cues of highest concern. The most common responses to clinical deterioration were to increase vital sign assessment to 5-minutely intervals, administer pain relief or provide reassurance. Despite the presence of clinical deterioration fulfilling organisational escalation of care criteria, calling cardiac arrest or rapid response team (RRT) were not commonly selected responses.
Conclusion: Nurses most commonly use hypotension and the presence of pain to recognise clinical deterioration in patients presenting to the CCL with an unstable ACS. Once clinical deterioration is identified, interventional cardiac nurses delay the escalation of care to the RRT or cardiac arrest team, preferring to implement local nurse initiated interventions.

1. Introduction

In patients experiencing an unstable acute coronary syndrome (ACS), primary percutaneous coronary intervention (PCI) is the gold standard in reducing mortality and morbidity through timely reperfusion of the affected coronary artery.[1,2] Timely reperfusion is a class Ia recommendation for all patients experiencing unstable ACS where ischaemic symptoms have been present for less than 12 h, and ST-segment elevation persists on electrocardiography.[3,4] A worldwide strategy to minimise time to reperfusion therapy has been the implementation of systems of care, expediting patient transfer to the cardiac catheter laboratory (CCL).[3–5] Patients with unstable ACS are at risk of clinical deterioration[6] and timely recognition, and response to clinical deterioration is a key strategy to reduce mortality and morbidity in patients with unstable ACS.[7] However, the recognition of clinical deterioration is potentially difficult as compensatory mechanisms for acidosis have already triggered changes in the heart rate, respiratory rate, and blood pressure.[8]

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As systems of care for patients with unstable ACS have evolved, time to patient transfer from the emergency department (ED) to the CCL has decreased dramatically, and, in some instances, patients are transferred to the CCL by prehospital care providers, bypassing the ED. A consequence of rapid transfer to the CCL is the brevity of patient assessment before commencement of primary PCI.[5] As a consequence, there may be a lack of recognition of the early signs of clinical deterioration in patients with unstable ACS or the assumption that early signs of clinical deterioration will be corrected with reperfusion.

During primary PCI, haemodynamic support and the ability to anticipate, recognise, and respond to complications is a core nursing role and vital to support the technical execution and procedural success of PCI.[9] Accurate assessment and interpretation of physiological cues to inform nurses' recognition of clinical deterioration is well described in the literature in ward settings as research related to rapid response systems (RRSs) has gained momentum.[7,10–13] More recently, studies on recognition and response to clinical deterioration in areas not traditionally serviced by hospital rapid response systems, such as EDs, have emerged.[14,15] The CCL is also an area of the hospital that tends to manage deteriorating patients within their own resources. Despite nurses being vital to patient safety in the CCL, little is known about the physiological cues used by interventional cardiac nurses to recognise clinical deterioration in patients undergoing primary PCI for unstable ACS and how nurses in CCL respond to clinical deterioration once it is identified.

Understanding how nurses use physiological cues in the CCL setting will provide valuable insights into how nurses recognise and respond to clinical deterioration in patients at high risk of deterioration in a highly specialised area of practice.

2. Methods

2.1. Objectives

The objective of this study was to explore how nurses in the CCL setting recognise and respond to clinical deterioration in patients with unstable ACS undergoing primary PCI.

The specific research questions were the following:

i) What were the physiological cues used by CCL nurses to recognise clinical deterioration?
ii) What were CCL nurses' preferred responses once clinical deterioration had been identified?

2.2. Design and setting

A prospective exploratory descriptive design was used to conduct the study. A survey of CCL nurses was used to collect study data. The investigation conforms with the principles outlined in the Declaration of Helsinki.[16] Participants were recruited from a major metropolitan public hospital in Melbourne, Australia, and the largest national member-based organisation of registered nurses working in CCLs in Australia and New Zealand. Ethical approval was obtained from the human research and ethics committee of the participating hospital and Deakin University. The national member-based organisation accepted the ethical approval from the participating hospital and did not require a separate application for ethical approval.

2.3. Sample

Convenience sampling was used to recruit 30 registered nurses, with a minimum of 3-month CCL experience in Australia or New Zealand, and who worked a minimum of at least 10 h a week. Nurses who did not meet these requirements were excluded to ensure participants had relevant clinical experience.

2.4. Data collection

Data collection was performed using an electronic survey constructed in the online programme SurveyGizmo™. The survey had two parts. In Part A (see Appendix A), participants' demographic data were collected. Part B (see Appendix B) consisted of 10 clinical scenarios reflecting clinical deterioration in CCL. Participants were asked to rate each physiological cue in the scenario according to their level of concern using a 10-point Likert scale (0 = no concern, 10 = maximum concern). Participants were then asked to rank in order their immediate response to any clinical deterioration identified. There were seven nurse-initiated response options and three options to escalate care. Participants were required to rank the response options from 1 (highest priority) to 10 (lowest priority). To ensure all possible responses were considered, participants were asked to mark any responses they considered did not apply with a zero (0).

The clinical scenarios were developed after an extensive literature review to identify common clinical features of clinical deterioration for patients undergoing primary PCI for unstable ACS to ensure the scenarios were reliable and representative of clinical deterioration in CCL practice. The scenarios were reviewed by a panel of six clinical experts. The panel comprised two interventional cardiologists each with more than 20 years primary PCI experience, two CCL nurse educators each with more than 10 years of primary PCI experience, and two professors of nursing with critical care backgrounds and with extensive research and educational expertise in clinical deterioration. All scenarios were presented in the same standardised format to ensure consistency of information. Consistent language was used to minimise the risk of variation in scenario interpretation. To ensure reliability of questions and clinical scenarios, the scenarios were piloted in the CCL of a major metropolitan hospital similar to the participating hospital. Minor changes were made to improve format and presentation, increase clarity, and facilitate participant ease of completion after the pilot testing. Ensuring validity and reliability meant that the clinical scenarios were, as much as practicably possible, an authentic representation of real-life CCL scenarios.

2.5. Data analysis

Participant responses provided quantitative data that were exported from SurveyGizmo™ programme to Microsoft Excel. Data were cleaned to ensure accuracy and consistency and then imported into Statistics Package for Social Sciences (SPSS), version 20.0, for statistical analysis.[17] Data were summarised using descriptive statistics such as frequencies and percentages. Ratings of concern for physiological cues and responses to deterioration were analysed using measures of central tendency, spread, and dispersion. Where data were normally distributed, means and standard deviations are presented, and medians and interquartile ranges (IQRs) are presented when data were skewed.[17]

3. Results

Thirty interventional cardiovascular nurses participated in the study. The majority (93.4%) of participants were employed in Australian CCLs (Table 1). Participants had a median of 15-year experience as registered nurses (IQR 7.3, 22.3), with a median of 9-year experience as CCL nurses (IQR 4.3, 15.0). Participants held a number of different positions within CCLs with the largest cohorts being registered nurses (36.6%) and clinical nurse specialists (33.3%;

Table 1
Participant characteristics (N = 30).

Location	*n*	%
Victoria, Australia	20	66.6
Queensland, Australia	5	16.6
South Australia, Australia	2	6.6
North Island, New Zealand	2	6.6
New South Wales, Australia	1	3.3
Current nursing role	***n***	**%**
Registered nurse	11	36.6
Clinical nurse specialist	10	33.3
Associate nurse unit manager or nurse unit manager	7	23.3
Clinical nurse educator	2	6.6
Highest level of education	***n***	**%**
Graduate certificate	13	43.3
Registered nurse	7	23.3
Graduate diploma	6	20.0
Masters	3	10.0
Doctor of Philosophy	1	3.3
Graduate certificate specialisation	***n***	**%**
Cardiac care	5	16.6
Interventional cardiac	3	10.0
Emergency	3	10.0
Intensive care	2	6.7

Table 1). Most participants held a postgraduate certificate in cardiac nursing or a related speciality (43.3%; Table 1).

3.1. Physiological cues used to recognise clinical deterioration

The common physiological cues nurses identified as a concerning indicators of clinical deterioration are presented in descending order in Table 2. Blood pressure (67.0%) was the most concerning physiological cue, followed by the presence of pain (58.3%) and heart rhythm (54.6%). Pain in every clinical scenario referred to chest pain, except scenario 2 which referred to pain around the access site and scenario 6 which included abdominal pain. Chest auscultation (31.3%), heart sounds (15.0%), and temperature (4.3%) were noted to be the physiological cues CCL nurses were least concerned about as indicators of clinical deterioration.

3.2. Nurses' preferred responses to clinical deterioration

Participants' preferred responses to clinical deterioration are presented in Table 3 in descending order. Increasing vital sign assessment to 5-min intervals was the most common response by participants (22.6%) followed by administering pain relief (18.6%) and reassuring the patient (17.3%). All these responses were considered nurse-initiated local responses.

There were seven scenarios (1, 2, 3, 4, 5, 6, and 7) in which the 'patient' clearly fulfilled rapid response team (RRT) call criteria. As such, escalating care through an RRT or cardiac arrest team call would have been an appropriate response. In these scenarios, nurses preferred a nurse-initiated response nearly two-thirds of the time (61.0%). A preference for medically escalating care via an RRT call or cardiac arrest team call or requesting anaesthetic assistance occurred over one-third of the time (39.0%) in these seven scenarios. In the three scenarios (8, 9, and 10) where the 'patient' did not fulfil the RRT criteria, nurses most commonly elected to administer pain relief (36.6%) or increase vital sign assessments (14.4%). Appropriately for these three scenarios, nurses did not elect to escalate medical care through a call to the RRT or cardiac arrest team or call for anaesthetic assistance.

Table 2
Summary of physiological cues rated as concerning indicators of deterioration.

Physiological cues	Scenario 1 (N = 30)		Scenario 2 (N = 30)		Scenario 3 (N = 30)		Scenario 4 (N = 30)		Scenario 5 (N = 30)		Scenario 6 (N = 30)		Scenario 7 (N = 30)		Scenario 8 (N = 30)		Scenario 9 (N = 30)		Scenario 10 (N = 30)		Total (N = 300)	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Blood pressure	22	73.3	26	86.6	27	90.0	28	93.3	27	90.0	26	86.6	29	96.6	6	20.0	6	20.0	4	13.3	201	67.0
Pain	17	56.6	27	90.0	16	53.3	12	40.0	16	53.3	23	76.6	23	76.6	24	80.0	22	73.3	18	60.0	175	58.3
Heart rhythm	15	50.0	9	30.0	20	66.6	27	90.0	17	56.6	12	40.0	25	83.3	13	43.3	16	53.3	10	33.3	164	54.6
Respiratory rate	26	86.6	6	20.0	29	96.6	5	16.6	28	93.3	9	30.0	27	90.0	3	10.0	4	13.3	2	6.6	139	46.3
Conscious state	21	70.0	6	20.0	29	96.6	11	36.6	19	63.3	12	40.0	18	60.0	4	13.3	5	16.6	9	30.0	134	44.6
SpO_2	6	20.0	9	30.0	29	96.6	5	16.6	26	86.6	11	36.6	29	96.6	4	13.3	4	13.3	3	10.0	126	42.0
Heart rate	5	16.6	11	36.6	10	33.3	26	86.6	9	30.0	9	30.0	29	96.6	4	13.3	8	26.6	3	10.0	114	38.0
Chest auscultation	18	60.0	6	20.0	20	66.6	5	16.6	15	50.0	7	23.3	18	60.0	3	10.0	2	6.6	0	0.0	94	31.3
Heart sounds	7	23.3	3	10.0	9	30.0	4	13.3	4	13.3	2	6.6	12	40.0	2	6.6	1	3.3	1	3.3	45	15.0
Temperature	1	3.3	0	0.0	4	13.3	2	6.6	4	13.3	1	3.3	1	3.3	0	0.0	0	0.0	0	0.0	13	4.3

SpO2 is peripheral capillary oxygen saturation

Table 3
Nurses' preferred responses to clinical deterioration.

Preferred response	Scenario 1 (N = 30)		Scenario 2 (N = 28)		Scenario 3 (N = 30)		Scenario 4 (N = 30)		Scenario 5 (N = 30)		Scenario 6 (N = 30)		Scenario 7 (N = 30)		Scenario 8 (N = 30)		Scenario 9 (N = 30)		Scenario 10 (N = 30)		Total (N = 298)	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
5 minutely observations	11	36.6	9	30.0	7	23.3	14	46.6	6	6.6	6	16.6	2	6.6	7	23.3	5	16.6	1	3.3	68	22.6
Pain relief	3	10.0	5	16.6	1	3.3	2	6.6	5	16.6	4	13.3	3	10.0	16	53.3	11	36.6	6	6.6	56	18.6
Reassure patient	1	3.3	4	13.3	5	16.6	5	16.6	2	6.6	8	26.6	1	3.3	3	3.3	8	26.6	15	50.0	52	17.3
Cardiac arrest team call	3	10.0	0	0.0	8	26.6	0	0.0	5	16.6	5	16.6	11	36.6	0	0.0	0	0.0	0	0.0	32	10.6
RRT call	3	10.0	8	26.6	3	10.0	4	13.3	4	13.3	1	3.3	7	23.3	0	0.0	0	0.0	0	0.0	30	10.0
More nursing resources	3	10.0	2	6.6	1	3.3	7	23.3	3	10.0	2	6.6	3	10.0	1	3.3	1	3.3	5	16.6	28	9.3
Anaesthetic assistance	5	16.6	0	0.0	5	16.6	0	0.0	5	16.6	1	3.3	3	10.0	0	0.0	0	0.0	0	0.0	19	6.3
15 min observations	0	0.0	0	0.0	0	0.0	1	3.3	0	0.0	0	0.0	0	0.0	2	6.6	4	13.3	3	10.0	10	3.3
Maintain silence	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	3.3	0	0.0	1	3.3
Do nothing	1	3.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	3.3

RRT, rapid response team.

Scenario 1 was the only scenario with clinical data that fulfilled one single RRT criterion. From 30 immediate responses chosen, 11 nurses (36.6%) increased observations to 5-min intervals, five nurses (16.6%) requested anaesthetic assistance, three nurses (10.0%) administered pain relief, three nurses (10.0%) called the cardiac arrest team, three nurses (10.0%) called an RRT call, three nurses (10.0%) requested more nursing resources, one nurse (3.3%) reassured the patient and one nurse (3.3%) did nothing. In each of these six scenarios (scenarios 2, 3, 4, 5, 6, and 7), clinical data showed various combinations of numerous physiological cues, fulfilling the RRT call criteria. These scenarios included two instances of tachypnoea (RR > 30 breaths per min), one of tachycardia (HR > 140 beats per min), four of hypotension (systolic blood pressure <90 mmHg), one of hypertension (systolic blood pressure >180 mmHg), four of agitation, and one of decreased conscious state. In scenarios with multiple physiological cues fulfilling the RRT criteria, 50.0% of responses were to initiate a nursing intervention and not to escalate care. These responses included increased observations to 5-min intervals (24.7%, n = 44), reassuring the patient (14.0%, n = 25) and administering pain relief (11.2%, n = 20). In these same scenarios, 39.3% (n = 70) of nurses responses escalated care by calling the cardiac arrest team (16.2%, n = 29), the RRT (15.1%, n = 27), or anaesthetic assistance (7.8%, n = 14).

4. Discussion

This study had two major findings. First, CCL nurses were inconsistent in their recognition of clinical deterioration and relied heavily on hypotension, the presence of pain, and the presence of changes in heart rhythm to recognise clinical deterioration. Hypotension, pain, and changes in the heart rhythm were preferenced over tachypnoea, tachycardia, and conscious-state changes. Second, CCL nurses preferred to initiate nursing responses to clinical deterioration. This preference occurred even if physiological changes met the internationally accepted medical emergency team criteria, whereby an RRT call or cardiac arrest team call is identified as the desired response.[7,10–13]

The physiological cues prioritised by CCL nurses to recognise clinical deterioration were hypotension (67.0%), the presence of pain (58.3%), and changes in the heart rhythm (54.6%). Hypotension, changes in the heart rhythm, and the presence of pain are key physiological indicators of myocardial ischaemia,[18] particularly for patients with unstable ACS,[4,6] who require time-critical treatment.[1,5] It is not surprising that CCL nurses recognised hypotension, rhythm changes, and presence of pain as concerning indicators of clinical deterioration as these clinical findings have a strong clinical association with myocardial ischaemia, cardiogenic shock, and subsequent cardiac failure in this cohort.[18–20]

Tachypnoea is the earliest and most sensitive indicator of clinical deterioration.[11,21] Yet, tachypnoea (46.3%) and tachycardia (38.0%) were less commonly used as indicators of clinical deterioration by CCL nurses. The lack of attention to tachypnoea is particularly concerning. Tachypnoea is an indicator of serious illness and is known to be one of the earliest compensatory mechanisms triggered in acidosis.[10,11,13,21] Thus, nurses' inattention to these cues may mean that an opportunity for early intervention may be missed.

Other cues that are important to assess in patients having primary PCI for unstable ACS are lung and heart sounds. Fine crackles on chest auscultation may indicate the left ventricular impairment. Auscultation of heart sounds may identify systolic murmurs in the setting of valvular insufficiency or ventricular septal defect,[22,23] and muffled heart sounds may indicate fluid filling the pericardial space in the case of cardiac tamponade with the left ventricular free wall rupture.[23] Increasing the physiological cues acquired during patient assessment increases diagnostic accuracy when identifying the cause of clinical deterioration.[24] Acquisition and analysis of multiple cues is a behaviour identified in highly skilled and expert clinicians.[25] While education programmes must be provided to develop nurses with such knowledge and behaviours, it is also important to support developing CCL nurses with a framework that guides cue acquisition and interpretation to enable early recognition of clinical deterioration.

A significant proportion of CCL nurses did not recognise either conscious-state changes (44.6%), cardiac arrhythmias (54.6%), or decreased peripheral oxygen saturation (42.0%) as physiological indicators of clinical deterioration. A lack of recognition of these cues is concerning as CCL nurses may not recognise clinical deterioration until a failure to compensate occurs. By this stage, the deterioration may be too advanced to avoid significant mortality or morbidity. Fixation error is when a practitioner concentrates solely on a single aspect of a scenario to the detriment of other relevant aspects.[26] Judgement analysis of cardiac nurses' risk assessments in critical events has shown that a significant proportion of nurses' decisions could be attributed to just one cue that they fixated on during the decision-making process.[27] Nurses in the CCL setting may be fixating on hypotension as a single physiological cue, despite the clear relationship between other physiological cues such as tachypnoea, tachycardia, decreased conscious state, and clinical deterioration.[8,10–13,15,18] Fixating on hypotension to the detriment of recognising other physiological cues may lead to a lack of recognition of the cause of clinical deterioration, increasing patient risk and the potential for increased mortality and morbidity.[26]

An overall preference for nurse-initiated responses, rather than escalation to medical care using the RRT or cardiac arrest team is concerning, given that the use of organisational systems such as RRTs have a clear relationship with improving patient mortality and morbidity.[10–12,14,28,29] Clinical deterioration in primary PCI patients can lead to cardiac arrest,[3,4,8,18–20] and current Australian and New Zealand data show that the mortality rate of in-hospital cardiac arrest is approximately 75%.[30] Therefore, the preference for nurse-initiated responses over escalation to medical care has significant implications for patient safety.

Nurses' preferences for nurse-initiated responses rather than formally escalating care in the CCL setting may be due to multiple factors. Frequent experiences of common physiological cues such as hypotension and pain occurring in unstable ACS may create a false sense of clinical normality and therefore, trigger less aggressive responses such as increasing observations rather than calling the RRT.[26,31] Other factors that may affect CCL nurses' escalation of care responses may be authority gradients and the lack of clarity about the role of RRTs in the CCL setting. An authority gradient is when a difference in experience, perceived expertise, or authority results in a failure to communicate effectively in a stressful situation.[32] Authority gradients are a well-documented reason for failure to speak up or to indicate or correct errors.[33] Thus, it may be that CCL nurses are reluctant to escalate care by calling the RRT or cardiac arrest team or for anaesthetic assistance, when there is an interventional cardiologist performing primary PCI.

Originally, RRTs were developed to empower nurses in ward environments to escalate care to a specialist team of clinicians who are experts in the management of critical illness.[10] Although RRTs are well established in acute care hospital ward environments and have improved patient outcomes,[29,34,35] many critical care areas such as EDs, intensive care units, coronary care units, and CCLs do not use organisational RRTs. Instead, clinicians use their discretion to recognise clinical deterioration and respond to deteriorating patients within their own local resources.[36]

Previous work has highlighted a lack of clinical support, lack of clinical experience, overwhelming workload, and limited

consolidation of patient assessment skills as factors influencing the preparedness of inexperienced and experienced nursing staff to effectively identify and manage clinical deterioration.[37,38] Clinical environments vary from tertiary referral centres with multiple CCLs to regional and remote centres with no cardiothoracic backup. As such, in CCLs, there is limited governance over workforce composition and specialty practice training compared with that seen in other specialist critical care areas.[39] The lack of governance means skill mix and staffing levels vary between CCLs, with poorly defined roles of clinicians. For instance, nurses, cardiac physiologists, and radiographers all perform haemodynamic monitoring and documentation roles, despite the core responsibility residing with nurses.[40] This lack of clear role definition may contribute to nurses feeling clinically unsupported. A lack of training and experience in clinical deterioration specifically may also contribute to the finding that nurses preferenced nurse-initiated responses and did n't escalate care. Another potential contributing factor for preferencing nurse-initiated responses may be a perceived reluctance by the interventional consultant to escalate care (i.e., nurses second guessing the consultant). Furthermore, a lack of specialist knowledge within RRT members regarding interventional procedures could result in conflicting priorities that may delay the procedure.[41]

More work is needed to understand how to best integrate RRTs into the CCL environment and how the interventional cardiology team can be supported to improve recognition and response to acute clinical deterioration in patients who already have multiple vital signs falling outside the medical emergency team criteria. It is possible that patient safety could be improved with greater integration of the RRT into the CCL as this will allow the interventional cardiologist to focus on performing the primary PCI. It is likely open communication between both teams about these issues would be ideal to progress these ideas. The expectation that a clinician can safely perform a complex procedure and simultaneously make decisions regarding the management of an acute episode of deterioration may be unreasonable, given the high cognitive loads of both decision foci.[24] A lack of integration of the RRT into the CCL divides the clinician's attention and may place the patient at risk of undermanaged clinical deterioration or procedural error or both.

4.1. Limitations and strengths

Although the use of case scenarios is not always representative of actual performances by nurses in clinical practice, the use of scenarios in this study provided valuable information about nurses' recognition and response to clinical deterioration in CCLs for patients with ACS. The scenarios went through rigorous development and review to ensure they represented typical patients presenting to CCL. Owing to the design of this study, findings cannot be generalised. However, participants were from numerous CCLs in Australia and New Zealand where contemporary ACS management is practiced, thus adding value to the use of these findings for nursing practice. Furthermore, findings may be used to inform conversations in CCLs about the structure and processes in place for managing clinical deterioration. Observations of practice and gaining perspectives of clinicians from CCL and members of hospital RRTs are recommended in future research to inform safe patient care in CCL for patients with ACS. The sample size of the study, while small, is reflective of the discrete nature of interventional cardiac nursing as a newly appreciated specialist practice domain.[39]

5. Conclusions

Clinical deterioration of patients with ACS is a likely clinical event, but there is scant understanding of nurses' practices of recognising and responding to these events in CCLs. Using case scenarios based on literature and expert panel evaluation, this study found that nurses most commonly use hypotension and the presence of pain to recognise clinical deterioration in patients presenting to the CCL with an unstable ACS. Hypotension and presence of pain were preferenced over earlier and more sensitive indicators of clinical deterioration such as tachypnoea suggesting that opportunities for improved responses to clinical deterioration may be being missed. Results also showed that once clinical deterioration was identified, nurses in the CCL delayed the escalation of care to the RRT or cardiac arrest team, instead preferring to implement local nurse-initiated interventions. Further work is needed to understand why nurses in the CCL prefer local nurse-initiated interventions and if better integration of the RRT would improve patient safety and response to clinical deterioration in the CCL setting.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.aucc.2018.09.006.

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