Australian Critical Care xxx (xxxx) xxx

Contents lists available at ScienceDirect

Australian Critical Care

journal homepage: www.elsevier.com/locate/aucc

Review paper

A practical approach to establishing a critical care outreach service: An expert panel research design

Ged Williams, RN, MHA, LLM [a, b, *], Alison Pirret, NP, MA, PhD [c, d], Nicki Credland [e, f], Mandy Odell, RN, MA, PhD [g], Chris Raftery [h, i], Duncan Smith, RN, MSc, MN (hons) [j, k], Fiona Winterbottom, RN, DNP [l], Debbie Massey, RN, PhD [m, n]

[a] School of Nursing & Midwifery, Griffith University, Australia; [b] South Metropolitan Health Service, Perth, Australia; [c] Critical Care Complex, Middlemore Hospital, Auckland, New Zealand; [d] Massey University, Auckland, New Zealand; [e] Reader in Critical Care Education, University of Hull, United Kingdom; [f] Chair British Association of Critical Care Nurses (BACCN), United Kingdom; [g] Critical Care, Royal Berkshire Hospital, NHS FT, Reading, United Kingdom; [h] School of Nursing, Queensland University of Technology, Australia; [i] Gold Coast Health, Queensland, Australia; [j] City, University of London, Northampton Square, London, UK; [k] Honorary Charge Nurse – Patient Emergency Response & Resuscitation Team, University College London Hospitals NHS Foundation Trust, London, United Kingdom; [l] Critical Care Medicine, Ochsner Health, Louisiana, USA; [m] Southern Cross University, Australia; [n] Intensive Care Unit John Flynn Hospital, Tugun, Australia

ARTICLE INFORMATION

Article history:
Received 16 May 2021
Received in revised form
18 December 2021
Accepted 18 January 2022

Keywords:
Deteriorating patient
Critical care
Outreach nurse
Rapid response

ABSTRACT

Background: For over two decades, nurse-led critical care outreach services have improved the recognition, response, and management of deteriorating patients in general hospital wards, yet variation in terms, design, implementation, and evaluation of such services continue. For those establishing a critical care outreach service, these factors make the literature difficult to interpret and translate to the real-world setting.

Aim: The aim of this study was to provide a practical approach to establishing a critical care outreach service in the hospital setting.

Method: An international expert panel of clinicians, managers, and academics with experience in implementing, developing, operationalising, educating, and evaluating critical care outreach services collaborated to synthesise evidence, experience, and clinical judgment to develop a practical approach for those establishing a critical care outreach service. A rapid review of the literature identified publications relevant to the study. A modified Delphi technique was used to achieve expert panel consensus particularly in areas where insufficient published literature or ambiguities existed.

Findings: There were 502 publications sourced from the rapid review, of which 104 were relevant and reviewed. Using the modified Delphi technique, the expert panel identified five key components needed to establish a critical care outreach service: (i) approaches to service delivery, (ii) education and training, (iii) organisational engagement, (iv) clinical governance, and (v) monitoring and evaluation.

Conclusion: An expert panel research design successfully synthesised evidence, experience, and clinical judgement to provide a practical approach for those establishing a critical care outreach service. This method of research will likely be valuable in other areas of practice where terms are used interchangeably, and the literature is diverse and lacking a single approach to practice.

1. Introduction

Rapid response systems (RRSs) were developed in the early 2000s with the aim of reducing major adverse events[1,2] and improving patient outcomes. Major adverse events include in-hospital cardiac arrest, unplanned admission to the intensive care unit (ICU), and unexpected death.[3] The term RRS is used to describe the whole system responsible for detecting and responding to deteriorating patients regardless of location.[4] There are two limbs to the RRS: an afferent (detection) limb, which normally has a track and trigger component to help clinicians identify patient deterioration, and an efferent (response) limb, which provides an escalation response to the deteriorating patient.[4,5] Within the efferent limb of the RRS, the terms rapid response team (RRT), medical emergency team (MET), and critical care outreach are often used interchangeably, yet formal definitions exist. Lyon et al.[5] describe

* Corresponding author.
E-mail address: ged_williams@hotmail.com (G. Williams).

https://doi.org/10.1016/j.aucc.2022.01.008

an MET as commonly led by a physician, who can "prescribe critical care interventions, obtain central access and facilitate airway management" (p 3). Devita et al.[4] describe an RRT as a team that provides an intermediate or 'ramp up' approach and a critical care outreach service (CCOS) as a system that includes an RRS component and a focus on prevention. More recently, Lyon et al.[5] describe an RRT as usually being a nurse-led team, acknowledging that whether a team is physician led or nurse led may not affect mortality. This study uses the term CCOS to describe a nurse-led team.

The literature uses multiple terms to describe nurses working within a CCOS including critical care outreach nurses (CCONs),[6] intensive care outreach nurses, intensive care liaison nurses,[7–9] patient-at-risk team nurses,[10] or in some hospitals, the after-hours clinical team co-ordinator.[3] The composition of CCOSs also vary, ranging from typically critical care registered nurse responders through to advanced practice providers (APPs), such as nurse practitioners and nurse consultants.[5,6,11,12] Increasingly APPs are working within CCOSs and add value to the team by providing diagnostic and treatment expertise, facilitating transfer to the ICU, and improving team communication and education.[13]

Internationally, established CCOSs improve patient outcomes. Whilst methodological flaws exist in many studies,[14–16] research suggests CCOSs reduce admission to the ICU, ward cardiac arrests, and hospital mortality.[3,6,8,10] Delays in activation of the CCOS is associated with increased mortality[17,18] and an increased likelihood of ICU admission.[17] Allen et al.[19] highlight CCON's knowledge and clinical expertise prevent unnecessary delays through effective escalation and accelerated decision-making.

Along with the multiple terms used to describe CCOSs, there is limited uniformity and standardisation of how CCOSs are developed, implemented, or operationalised. For hospitals wishing to introduce a CCOS, the literature is diverse, is difficult to interpret, and lacks a clear and well-defined model to follow.[6] Furthermore, this diversity creates challenges in relation to design, education, research and evaluation, and difficulties in translating concepts to the real-world setting. By using a three-step process, this study aims to provide a practical approach for those establishing a CCOS, thereby creating a theory to practice bridge that supports and facilitates knowledge translation.

2. Method

2.1. Development steps

In this study, we outline a practical approach to developing a CCOS using a three-step process: (i) an expert panel, (ii) a rapid review of the literature, and (iii) a modified Delphi technique. Researchers have used similar processes to develop important position and consensus statements.[20–22] This process enabled relevant evidence to be presented in a structured but clinically useful method to guide development of CCOSs.

The expert panel was initiated by the lead author (GW), and this internationally recognised panel included clinicians, managers, and academics from Australia, New Zealand, United Kingdom, and the United States, with experience in implementing, developing, operationalising, educating, and evaluating CCOSs. The panel provided international diversity[23] with a global perspective. Each panel member developed a key area within the study, enabling evidence, experience, and clinical judgement[24] to be applied to all aspects of establishing a CCOS. The purpose of this expert panel was to provide a balanced and objective practical approach for establishing a CCOS. The recommendations provided are a consensus opinion of the expert panel informed by evidence, experience, and clinical judgement.

A rapid review of the literature was undertaken by the second author (AP) to ensure appropriate evidence, if available, was considered and supported by the panel, an important process in undertaking a rapid review.[25] Whilst systematic reviews are regarded as the gold standard,[25–27] rapid reviews are a pragmatic and manageable way to synthesise research findings within a short timeframe, unlike systematic reviews that take a lot longer.[25,27,28] Whilst a single reviewer performing the rapid review introduces bias, an expert panel ensures the evidence is appropriate to the topic and relevant literature is not missed during the rapid review process.[25] As rapid reviews are not as broad as systematic reviews,[25] only two data bases were searched (Scopus and Web of Science) using the key words "critical care outreach", "intensive care outreach", intensive care liaison nurse", and "patient at risk team". Qualitative and quantitative articles, mixed-methods research, and discussion articles written in English and published between 2012 and 2021 (inclusive) were reviewed; no grey publications were included. References lists were reviewed to provide links to earlier studies that were relevant to the topic. Quality tools were not used to review the studies, which is not uncommon for rapid reviews owing to time restraints.[25]

The Delphi methodology is commonly used to create formal consensus statements and has also been used to describe numerous important nursing practices.[29,30] The Delphi methodology uses a structured process and is a scientific method for achieving expert consensus.[31] Common to all Delphi variations is the recruitment of a panel of informed experts. We used modified online Delphi technique to obtain expert panel consensus. Online methods reduce expense related to travel and possible biases related to panel member status or personality and enabled members to participate at a convenient time to them.[23]

All panel members reviewed the final manuscipt to agree on the important elements necessary to provide a practice approach to establishing a CCOS. This process enabled knowledge translation, which aims to reduce the gap between evidence generated and decisions being made in the clinical practice setting.[26,32]

3. Findings

The literature search identified 502 publications; 104 publications were relevant to the study and reviewed. The expert panel identified five components needed to establish a CCOS. These included the following: (i) approaches to service delivery, (ii) education and training, (iii) organisational engagement, (iv) clinical governance, and (v) monitoring and evaluation.

3.1. Approaches to service delivery

The key objectives of a CCOS are to avert ICU admission, enable timely ICU admission, facilitate ICU discharge, and share ICU skills with the ward interdisciplinary team.[12,33,34] Roles of nurses within a CCOS may be proactive, reactive, or a combination of both.[5] Proactive teams are often stand-alone teams that may use a variety of surveillance techniques to identify and prevent clinical deterioration, such as continuous vital sign monitoring and electronic risk stratification, or through other markers, such as reviewing patients after ICU discharge and proactive rounding.[5,35,36] Reactive teams, such as the MET, requires the patient to deteriorate before the team is activated.[35] In both models, CCONs need to have the ability to flex rapidly from one stressful situation to another throughout a workday as well as being broadly skilled and experienced to respond appropriately to the wide variety of cases, ages, comorbidities, presenting symptoms, and ward staff's experience levels on each occasion. In addition to clinical skill and experience, CCONs require good communication, problem-solving,

Please cite this article as: Williams G et al., A practical approach to establishing a critical care outreach service: An expert panel research design, Australian Critical Care, https://doi.org/10.1016/j.aucc.2022.01.008

and bedside teaching skills.[8,37] Our experience suggests CCOSs have incorporated different approaches to achieving these objectives dependent on the current needs within each organisation and the maturity of the CCOS. Approaches include implementing an early warning scoring system (EWSS), a nurse concern trigger, ICU discharge follow-up, patient and family activated call for concern, and proactive rounding, each of which will be briefly described.

3.1.1. Early warning scoring system

Commonly, an afferent limb (detection limb) uses an early warning score (EWS) to identify patients requiring a CCOS review or MET.[10,38] Although various EWSs exist internationally, the United Kingdom National Early Warning Score (NEWS) has been extensively researched and is mandated as a standard of care by the National Institute for Health and Clinical Excellence.[39,40] An EWSS is recommended in all hospitals to help guide bedside nurses to know when and how to escalate care to others, such as the CCOS.[41]

An EWSS has an associated escalation strategy (often referred to as a track-and-trigger system) and uses numerical scores to multiple vital sign parameters to trigger an alert. Vital signs commonly included are heart rate, blood pressure, respiratory rate, level of consciousness, and oxygen saturation. The more deranged the vital sign is, the higher the score becomes, leading to a graded escalation response (efferent limb of the EWSS).[10,38] Lack of an international EWS is likely related to the view that an EWS in one hospital may not be applicable in another owing to different patient characteristics, which suggests one single EWS may not meet the needs of unique patient populations.[40,42] This is reflected in hospitals that have developed their own EWS, such as a paediatric EWS,[43] or a modified EWS.[44]

3.1.2. Nurse concern

Nurse concern or 'worry factor' is an indication of clinical deterioration;[45] hence, a concern criterion is commonly added to an EWSS to enable nurses to escalate their concerns or intuition irrespective of vital signs.[46] Nurse concern is a subjective reason for concern irrespective of vital signs. Nurse concern increases with clinical experience,[47] which means inexperienced nurses have difficulty using this criterion to escalate deteriorating patients.[47]

Packaging information enables nurses to use more convincing language when escalating patients[47] and is more effective than an isolated vital sign.[48] However, the ability to 'package' clinical deterioration effectively to justify escalation depends on nurses' knowledge, confidence, and experience,[49] all factors that take time to develop. Douw et al.[50] identified nine indicators of concern that assist nurses with communicating concerns of patient deterioration to medical staff members. The Dutch-Early-Nurse-Worry Indicator Score combined with the EWS improved unplanned ICU admissions and unexpected mortality and was more predictive than the EWS or 'nurse worry' criteria alone.[51] Although "nurse concern" is recognised as an important factor in any escalation process, more studies are required to quantify the value nurse worry indicators add to an EWS.

3.1.3. ICU patient discharge follow-up

Jones et al.[35] and more recently McIntyre et al.[8] suggest a proactive and pre-emptive approach to clinical deterioration, such as follow-up of patients discharging from the ICU. For some CCOSs, ICU discharge is the most common reason for referral.[52–55] Discharging patients from the ICU to the ward is a vulnerable time for patients, exposing them to anxiety[56,57] and risk of adverse events,[58–60] including ICU readmission and death.[56,61] The CCOS plays a key role in advanced assessment, technical support, and communication by ensuring written transfer information is available and understood by the ward medical and nursing staff, and by being physically present to guide the ward staff after patient transfer to the ward,[62,63] all factors that reduce ward nurses' anxiety associated with receiving ICU patients.[64] Follow-up of patients discharged prematurely or out of hours during ICU bed demand may also play a role in reducing patient anxiety[65] and mortality.[62] Three systematic reviews and meta-analyses show ICU discharge follow-up with or without transition programmes reduce the risk of ICU readmission.[66–68] Although a recent systematic review suggests diverging evidence for other benefits of ICU discharge follow-up,[69] Nates et al.[70] in their evidence-based recommendations suggest ICU discharge follow-up reduces ICU discharge delays, ward adverse advents, mortality, and ICU readmission.

3.1.4. Patient and family activated call for concern

Although an EWSS is useful for detecting and escalating deteriorating patients, it is not always acted upon.[71] This has led to an increasing emphasis on enabling patients and families to escalate their concerns to the CCOS based on the premise that patients and families recognise their deterioration before the ward staff.[71–75] Dwyer et al.[75] identified an average of 2.5 activations per month over a 2-year period, with 35% resolved by communication alone, nearly half requiring some clinical intervention, and 15% needing transfer to a high level of care. While these services have improved service delivery to patients,[71] there are concerns the service may be used to respond to issues that are not related to deterioration.[73,74,76] Hence, more research is needed on the impact of this type of service on patient safety.

3.1.5. Proactive rounding

Proactive rounding may be a useful strategy when first establishing a CCOS or if the service is being underutilised.[77] It has been used as a tool to facilitate the 'worry factor' and escalate to the CCOS.[78] Identifying ward patients who are at high risk of deteriorating enables earlier intervention and prevents further deterioration.[78] Proactive rounding practices continue to evolve as automated artificial intelligence predictive models are developed.[79]

3.2. Education and training

Establishing a CCOS provides an opportunity to further develop clinical and interpersonal expertise that fosters support, teamwork, and collaboration.[11,37] Building trust and establishing a positive relationship with the ward team is key to the success of a CCOS.[80] The CCON must balance their critical care expertise with the immediate needs of the ward environment, working in collaboration with ward staff to navigate the approach taken to monitor and manage the patient. Being accessible, approachable,[16,81,82] friendly, and knowledgeable[16] enables CCONs to have key roles in supporting nurses' and junior doctors' decision-making by sharing their knowledge and skills[37,82,83] and building ward nurses' confidence in managing deteriorating patients.[81,83] Many interventions performed by the CCOS relate to communication and education[8,36] and include patient and family advocacy, which may comprise of assisting the team with early decision-making regarding patient treatment limitations and transition to end-of-life care.[80,84–87] Cross et al.[88] identified nurses new to CCOS need clinical supervision, role clarification, understanding how to deal with personal issues, dedicated time for reflection, and debriefing. Debriefing, managing emotional wellbeing and valuing individuals are identified as factors that reduce CCONs' moral distress and burnout.[89]

Identifying CCOS roles and responsibilities needs a structured approach. As CCOSs often combine proactive and reactive responsibilities in one role.[77] Table 1 provides a decision guide for CCOSs when facing competing priorities whilst functioning in a combined role. The CCOS can rapidly provide support to bedside

Please cite this article as: Williams G et al., A practical approach to establishing a critical care outreach service: An expert panel research design, Australian Critical Care, https://doi.org/10.1016/j.aucc.2022.01.008

staff reactively in clinical emergencies and also prevent emergencies through proactive clinical review, detection, and referral.

A specific competency programme based on the *Competences for Recognising and Responding to Acutely Ill Patients in Hospital*[90] and knowledge outlined in critical care nursing standards have been used to develop nurses new to CCOS roles.[10] Legislation and/or local policy may define CCON's scope of practice; therefore, it is necessary to also include what needs escalating to a critical care physician or APP.

An Australian study surveying a convenience sample of participants at an RRS conference showed CCONs attending MET calls considered interprofessional training, including clinical deterioration theory and skills, RRS governance, professionalism, and teamwork important.[91] An American before-and-after study demonstrated that a performance improvement–based inpatient resuscitation programme that included concepts of early recognition of clinical deterioration and closed-loop feedback communication decreased hospital mortality and increased survival to discharge.[92]

Planned study sessions provided to staff to fill knowledge gaps related to detecting, responding, and managing deterioration have been used successfully in some CCOS models.[10,36] Currey et al.[93] identified CCONs' theoretical knowledge, advanced assessment skills, and professional attributes as important in their role development.[93] Hence, sound clinical judgement, experience, and knowledge are an essential element of a CCOS.[37,94]

When implementing a CCOS, organisations need to determine which areas within the hospital will be supported by the CCOS, to better understand skillsets required. A CCON has specialist knowledge although it may be limited for some specialties.[95] There may be areas within the hospital, such as paediatric, obstetric,[96] or mental health, that may require the CCON to work outside their standard knowledge and skillset. It is therefore essential that the CCOS considers how they can contribute to patients in these specialty areas and consider knowledge and skill gaps that may need addressing.[91]

3.3. Organisational engagement

The period preceding the implementation of a CCOS can be used to engage and prepare key stakeholders. Failure to do this can result in nursing and medical staff resistance to the CCOS[97] and no improved patient outcomes.[98] Engagement activities will likely focus on ward-based registered nurses (RNs) as they frequently escalate to the CCOS[99] and junior medical staff who may also refer to the service.[100]

Initially, it may be preferable for the CCOS lead to deliver a more comprehensive presentation that provides ward staff with a detailed overview of the service. These presentations could be delivered at events such as ward meetings or grand rounds. If several CCOS members are responsible for delivering the information, a standardised presentation may ensure that key messages are consistent. Suggested content for this initial presentation is summarised in Table 2.

Many nurses favour approaching colleagues for information to inform their decision-making.[101] Consequently, if capacity for engagement work is limited by a lack of resources, prioritising senior and/or influential personnel within ward areas, such as charge nurses and nurse educators, for the more comprehensive presentation may be useful.

Some nurses find reviewing text-based sources of information 'daunting';[101] therefore, distributing simple-to-read materials with clear and concise information about the CCOS may be helpful. This information could be delivered using a range of media such as fliers, posters, and lanyard cards. Hand delivering these resources to the ward areas potentially provides further opportunities to deliver information 'bursts' about the service. The success of the service may be partly contingent on the beliefs that ward staff members hold about the consequences (positive or negative) of referring to the CCOS.[102] Hence, every interaction with ward staff prior to and after implementation should be an opportunity to increase credibility, build relationships, and establish trust. Digital information sources in the days immediately preceding the service can be used as prompts and cues for referral to the CCOS; this may be through computer screensavers, the staff intranet, or as part of the organisation's daily/weekly electronic bulletins.

As junior members of the patient's primary medical team respond to a deteriorating patient alongside an external responder, such as the CCOS,[103] establishing relationships with ward-based physicians is important. Building these relationships can be helpful for the CCOS when they are assisting junior medical staff to navigate the often complex hierarchies that can exist within hospitals.[104]

An international study of RRTs showed more than 25% of patients reviewed by a CCOS have new limitations of treatment initiated, such as a do not attempt cardiopulmonary resuscitation.[105] Consequently, engaging with the organisation's palliative

Table 1
Critical care outreach nurse responsibilities.

Priorities	Routine activities	Rationale/measure
Responding to ward emergencies takes immediate priority over all other CCOS activities		Expert staff to lead & coach during high-risk events
1. Ward emergencies	• Attend each event & monitor	Trained staff at each event[93]
	• Assist team leader & coach staff	Documentation completed
	• Ensure event documentation completion	Safety issues immediately rectified
	• Identify safety issues & rectify/escalate if needed	Hospital-wide safety support[4,111]
CCOS referrals	• Attend each referral	Trained staff at each event[93]
	• Collaborate with interdisciplinary team	Early intervention for high-risk patients (e.g. antibiotics for sepsis)
	• Follow practice protocols	Triage patients to right level of care[111]
	• Ensure prescribed orders are completed	Complete documentation[77]
	• Ensure appropriate patient transfer or discharge	
	• Ensure referrals are documented[111]	
	• Escalate to critical care physician on APP as needed	
Proactive rounding	• Review overnight emergencies	Early intervention for patients at high risk of further deterioration.
	• Ensure CCOS review is documented in patient record	High-risk patients (e.g., IV access, BiPAP)[77,78,111]
	• Follow-up on patients with emergency events overnight	Prevent patient deterioration
		Triage patients to right level of care
		Build relationships between units[81,82]
		Liaise with patient flow coordinators

*This table is based on the work of Winterbottom et al.[111] and has been used with permission of the lead author.
CCOS, critical care outreach service; BiPAP, Bi-level postive airway pressure.

Please cite this article as: Williams G et al., A practical approach to establishing a critical care outreach service: An expert panel research design, Australian Critical Care, https://doi.org/10.1016/j.aucc.2022.01.008

Table 2
Suggested content for a comprehensive service overview presentation.

Item	Minimum suggested content to hospital staff	Additional content
Who	Introduce the CCOS team members.	Consider including photographs of team members to help ward staff recognise who is who (this may be particularly useful if there are different team members with different roles/skillsets, e.g., RNs, APPs).[5]
What	Provide an overview of the expertise provided by team members (both in terms of knowledge and skills).	Emphasise what the team members can provide and, if appropriate, what they cannot. Consider aligning these points to CCON service standard operating procedures.[112]
Where	Describe the remit and boundaries of the team i.e. where they will attend calls and, if appropriate, where they will not.	Address any variant procedures that may be used to escalate care in more remote clinical areas, e.g., satellite units, outpatient departments.
When	Outline the circumstances in which a referral to the team can be made. This is likely to include information on objective referral criteria (including EWS).	Address expectations relating to staff behaviour if there is concern or 'worry' about a patient[51] in the absence of an elevated EWS. Delineate referral to the CCON from existing escalation pathways already used within the organisation, e.g., calling a ward emergency – If the CCON is to provide additional services (e.g., following up patients who have been stepped down from a critical care area or supporting ward staff caring for patients with a tracheostomy; receiving noninvasive ventilation; nasal high-flow oxygen therapy) consider outlining these services too.
How	Provide information about the practicalities of referral including mobile or pager numbers if relevant. Be clear and precise about the 'go live' date and when staff can expect a response if they call.	– Clarify if arrangements are different at night or during a weekend. – If a mechanism is going to be provided for patients and/or the relatives to contact CCON directly,[72] this may also be introduced.

APP, advanced practice provider; EWS, early warning score; CCOS, critical care outreach service; CCON, critical care outreach nurse; RN, registered nurse.

care clinicians to agree on referral pathways for patients who initially trigger a CCOS review but whose ongoing needs are best served through palliative care may be useful.[87]

3.4. Clinical governance

There are limited studies describing or testing clinical governance models to oversee CCOS implementation, despite the need for administration and governance of RRS being identified as important factors.[106] Nevertheless, building a coalition of key leaders to guide change is necessary to get the CCOS strategy approved and implemented. When planning for a CCOS, a strong rationale including good data demonstrating the magnitude and impact of the current problem and how a CCOS may solve this problem is needed.[36] Data commonly used to support the need for a CCOS include the numbers of ward cardiac arrests, ICU readmissions, MET escalations,[10,12] and patient events related to failure to escalate. Other relevant measures could include a staff survey to identify the perceived benefits of a CCOS.[36,82]

Establishing a steering committee to lead and provide oversight of the RRS is recommended. This steering committee could include a nursing and medical lead for the hospital, an ICU medical and nursing lead, members of the CCOS, and nursing/medical education department representatives. Expertise from other departments could be seconded as needed, such as the hospital communication department to develop a communication strategy, the hospital informatics department to assist with a data/information strategy, or the afterhours nursing supervisor team to assist with aligning and supporting the service.

A written draft CCOS model, ideally as part of a multidisciplinary team approach, is recommended.[35] Significant consultation and debate during this development are critical to ensure the model is fit for purpose, robust, and accepted. The model must meet the needs of the organisation; hence, there will be some variation of models between organisations, for instance, not all CCONs come from the ICU, and in some organisations, a two-tiered approach is more desirable.[10,16,107] Major activities, action plans, responsible person, and timelines in a Gantt chart format are useful to ensure disciplined and transparent project management. Finally, a communication plan is essential including a written draft summary of the model and expectations of the CCOS and how staff will access and utilise the service. Included in the draft model will be how the CCOSs escalate their concerns to the parent team or critical care APP or physician and how adverse events are managed.[108] Following establishment of the service, CCOS representation at a hospital-wide deteriorating patient forum would ensure the CCOS is embedded as part of the organisation's permanent RRS.

3.5. Monitoring and evaluation

RRSs have a comprehensive set of measures to evaluate the effectiveness of the services that have been developed and tested over time by various organisations and professional groups.[109] Before establishing a CCOS, there needs to be clear objectives as to what the service is aiming to achieve. Using national or international recommendations to establish an RRS[4] may not be enough to convince individual organisations; hence, local data can be instrumental in supporting business cases and service development requests. Point prevalence surveys of vital sign recording practice may be used to highlight gaps in patient care[110] and make the case for implementing a CCOS. In addition to more objective patient outcome measures, surveys of CCOS team members and end users of the CCOS after implementation of the CCOS can monitor the effectiveness of the service, enabling experience and feedback to improve components of the service.[36,82]

How CCOSs are evaluated will depend on several factors, such as organisational context, model of service, staff expertise, administration resources, information technology (IT) availability, staffing resource, and organisational objectives. A list of the measures commonly used to evaluate the service is found in Box 1; these can be adapted according to the organisation's specific objectives and service model. Collected monthly, the data can give an overview on how the CCOS is being utilised and how work patterns may be affected by hospital admissions, ICU occupancy, seasonal affects, and systemic organisational changes. Data should be collected for at least 12 months to determine the impact of the CCOS on patient care and experience. By measuring the CCOS service activity and outcomes, a foundation can be established on which to build improvements that not only effect patient care, outcome, and experience but can also be shared with other organisations.

Please cite this article as: Williams G et al., A practical approach to establishing a critical care outreach service: An expert panel research design, Australian Critical Care, https://doi.org/10.1016/j.aucc.2022.01.008

Box 1
Metrics used to evaluate a CCOS.

- Number of ward patients to determine
  - number of CCOS referrals[8,9,52] per 1000 admissions
  - number of CCOS reviews[8,9] per 1000 admissions
  - number of ward cardiopulmonary arrests per 1000 admissions[4,77]
  - number of MET calls per 1000 admissions.[4,77]
- Analysis of the CCOS referrals to identify workload that may include:
  - day of week, time of day, specialty, and ward.
  - CCOSs response times according to agreed criteria based on the acuity of the patient[77]
  - The number of patients discharged from critical care to the ward and/or followed up within 24 h[11]
  - CCOS activities such as taking and analysing blood gas samples, intravenous line insertion[8,9,52]
- Review of ward cardiac arrest patients to identify potential delays in escalation.[4,52,77]
- Number of patient or family activations to the CCOS[46,50,77]
- Number of serious incidents related to sub-optimal care of a deteriorating patient.[52,77]
- The number of readmissions to ICU within a specified period of time (such as 48 h).[11][112]

An electronic database rather than a paper-based system is better for the CCOS data collection; hence, the reason why early discussion with IT services when developing the CCOS is useful. Regular feedback of the data to governance bodies will establish a basis for service development, staffing levels, areas of concern, and where patient care and experience have seen an improvement.

4. Conclusion

The interchangeable terms and lack of a single model for a CCOS means research is difficult to interpret in the real-word setting. In addition, limited research into the most effective or appropriate administrative and governance arrangements for an RRS and CCOS required the expert panel–modified Delphi approach to inform commentary; further research into these elements of a CCOS is recommended. Using an expert panel, a rapid review of the literature and a modified Delphi technique to combine evidence, experience, and clinical judgment effectively developed a practical approach to establishing a CCOS. Five key components needed to establish a CCOS were identified and included approaches to service delivery, education and training, organisational engagement, clinical governance, and monitoring and evaluation.

The expert panel research design successfully synthesised evidence, experience, and clinical judgement to provide a practical approach for those establishing a CCOS, thereby reducing the evidence to clinical practice gap. This method of research will likely be valuable in other areas of practice where terms are used interchangeably, and the literature is diverse and lacking a single approach to practice.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of interest

The authors have no known conflict of interest associated with this work.

CRediT authorship contribution statement

Ged Williams: design and work allocation of the article, responsible for at least one section each and worked collaboratively to integrate the article into a whole, Writing – review & editing. **Alison Pirret:** responsible for at least one section each and worked collaboratively to integrate the article into a whole, Writing – review & editing. **Nicki Credland:** responsible for at least one section each and worked collaboratively to integrate the article into a whole, Writing – review & editing. **Mandy Odell:** responsible for at least one section each and worked collaboratively to integrate the article into a whole, Writing – review & editing. **Chris Raftery:** responsible for at least one section each and worked collaboratively to integrate the article into a whole, Writing – review & editing. **Duncan Smith:** responsible for at least one section each and worked collaboratively to integrate the article into a whole, Writing – review & editing. **Fiona Winterbottom:** responsible for at least one section each and worked collaboratively to integrate the article into a whole, Writing – review & editing. **Debbie Massey:** responsible for at least one section each and worked collaboratively to integrate the article into a whole, Writing – review & editing.

References

[1] Cretikos MA, Chen J, Hillman KM, Bellomo R, Finfer SR, Flabouris A. The effectiveness of implementation of the medical emergency team (MET) system and factors associated with use during the MERIT study. Crit Care Resusc: J Aust Acad Crit Care Med 2007;9:206–12.
[2] Bellomo R, Goldsmith D, Uchino S, Buckmaster J, Hart G, Opdam H, et al. Prospective controlled trial of effect of medical emergency team on post-operative morbidity and mortality rates. Crit Care Med 2004;32:916–21.
[3] Massey D, Aitken LM, Chaboyer W. The impact of a nurse led rapid response system on adverse, major adverse events and activation of the medical emergency team. Intensive Crit Care Nurs 2015;31:83–90.
[4] Devita MA, Bellomo R, Hillman K, Kellum J, Rotondi A, Teres D, et al. Findings of the first consensus conference on medical emergency teams. Crit Care Med 2006;34:2463–78.
[5] Lyons PG, Edelson DP, Churpek MM. Rapid response systems. Resuscitation 2018;128:191–7.
[6] Garry L, Rohan N, O'Connor T, Patton D, Moore Z. Do nurse-led critical care outreach services impact inpatient mortality rates? Nurs Crit Care 2019;24:40–6.
[7] Lynch J, Cope V, Murray M. The intensive care unit liaison nurse and their value in averting clinical deterioration: a qualitative descriptive study. Intensive Crit Care Nurs 2021;63.
[8] McIntyre T, Taylor C, Bailey M, Jones D. Differences in the characteristics, treatment, and outcomes of patient groups reviewed by intensive care liaison nurses in Australia: a multicentre prospective study. Aust Crit Care 2019;32:403–9.
[9] Alberto L, Zotárez H, Cañete Á, Niklas JE, Enriquez JM, Gerónimo MR, et al. A description of the ICU liaison nurse role in Argentina. Intensive Crit Care Nurs 2014;30:31–7.
[10] Pirret AM, Takerei SF, Kazula LM. The effectiveness of a patient at risk team comprised of predominantly ward experienced nurses: a before and after study. Intensive Crit Care Nurs 2015;31:133–40.
[11] Olsen SL, Søreide E, Hillman K, Hansen BS. Succeeding with rapid response systems – a never-ending process: a systematic review of how health-care professionals perceive facilitators and barriers within the limbs of the RRS. Resuscitation 2019;144:75–90.
[12] Pirret AM. The role and effectiveness of a nurse practitioner led critical care outreach service. Intensive Crit Care Nurs 2008;24:327–84.
[13] Kapu AN. Addition of acute care nurse practitioners to medical and surgical rapid response teams: a pilot project. Crit Care Nurse 2014;34:51–9.

Please cite this article as: Williams G et al., A practical approach to establishing a critical care outreach service: An expert panel research design, Australian Critical Care, https://doi.org/10.1016/j.aucc.2022.01.008

[14] So HM, Yan WW, Chair SY. A nurse-led critical care outreach program to reduce readmission to the intensive care unit: a quasi-experimental study with a historical control group. Aust Crit Care 2019;32:494–501.
[15] Kovacs C. Outreach and early warning systems for the prevention of intensive care admission and death of critically ill adult patients on general hospital wards. Int J Nurs Pract 2016;22:523–5.
[16] Aitken LM, Chaboyer W, Vaux A, Crouch S, Burmeister E, Daly M, et al. Effect of a 2-tier rapid response system on patient outcome and staff satisfaction. Aust Crit Care 2015;28:107–14.
[17] Tillmann BW, Klingel ML, McLeod SL, Anderson S, Haddara W, Parry NG. The impact of delayed critical care outreach team activation on in-hospital mortality and other patient outcomes: a historical cohort study. Can J Anesth 2018;65:1210–7.
[18] Pattison N, Eastham E. Critical care outreach referrals: a mixed-method investigative study of outcomes and experiences. Nurs Crit Care 2012;17:71–82.
[19] Allen E, Elliott D, Jackson D. Recognising and responding to in-hospital clinical deterioration: an integrative review of interprofessional practice issues. J Clin Nurs 2017;26:3990–4012.
[20] Haugland H, Rehn M, Klepstad P, Krüger A, Albrektsen GE, Berlac PA, et al. Developing quality indicators for physician-staffed emergency medical services: a consensus process. Scand J Trauma Resusc Emerg Med 2017;25.
[21] Khangura S, Konnyu K, Cushman R, Grimshaw J, Moher D. Evidence summaries: the evolution of a rapid review approach. Syst Rev 2012;1.
[22] Keeney S, Hasson F, McKenna HP. A critical review of the Delphi technique as a research methodology for nursing. Int J Nurs Stud 2001;38:195–200.
[23] Khodyakov D, Hempel S, Rubenstein L, Shekelle P, Foy R, Salem-Schatz S, et al. Conducting online expert panels: a feasibility and experimental replicability study. BMC Med Res Methodol 2011;11.
[24] Coulter I, Elfenbaum P, Jain S, Jonas W. SEaRCH™ expert panel process: streamlining the link between evidence and practice. BMC Res Notes 2016;9.
[25] O'Leary DF, Casey M, O'Connor L, Stokes D, Fealy GM, O'Brien D, et al. Using rapid reviews: an example from a study conducted to inform policy-making. J Adv Nurs 2017;73:742–52.
[26] Haby MM, Chapman E, Clark R, Barreto J, Reveiz L, Lavis JN. What are the best methodologies for rapid reviews of the research evidence for evidence-informed decision making in health policy and practice: a rapid review. Health Res Pol Syst 2016;14.
[27] Aronson JK, Heneghan C, Mahtani KR, Plüddemann A. A word about evidence: 'rapid reviews' or 'restricted reviews'? BMJ Evidence Based Med 2018;23:204–5.
[28] Campbell F, Booth A, Weeks L, Kaunelis D, Smith A. A scoping review found increasing examples of rapid qualitative evidence syntheses and no methodological guidance. J Clin Epidemiol 2019;115:160–71.
[29] Gill FJ, Kendrick T, Davies H, Greenwood M. A two phase study to revise the Australian practice standards for specialist critical care nurses. Aust Crit Care 2017;30:173–81.
[30] Bloomer MJ, Ranse K, Butler A, Brooks L. A national position statement on adult end-of-life care in critical care. Aust Crit Care 2021.
[31] Hohmann E, Brand JC, Rossi MJ, Lubowitz JH. Expert opinion Is necessary: Delphi panel methodology facilitates a scientific approach to consensus. Arthrosc J Arthrosc Relat Surg 2018;34:349–51.
[32] Gainforth HL, Hoekstra F, McKay R, McBride CB, Sweet SN, Martin Ginis KA, et al. Integrated knowledge translation: guiding principles for conducting and disseminating spinal cord injury research in partnership. Arch Phys Med Rehabil 2021;102:656–63.
[33] Ball C. Critical care outreach services–do they make a difference? Intensive Crit Care Nurs 2002;18:257–60.
[34] Story DA, Shelton AC, Poustie SJ, Colin-Thome NJ, McIntyre RE, McNichol PL. Effect of an anaesthesia department led critical care outreach and acute pain service on postoperative serious adverse events. Anaesthesia 2006;61:24–8.
[35] Jones DA, Dunbar NJ, Bellomo R. Clinical deterioration in hospital inpatients: the need for another paradigm shift. Med J Aust 2012;196:97–100.
[36] Williams G, Rotering L, Samuel A, Du Plessis J, Abdel Khaleq MHA, Crilly J. Staff's perception of the intensive care outreach nurse role: a multisite cross-sectional study. J Nurs Care Qual 2019;34:352–7.
[37] Hession CA, Meaney T. Ward nurses' experiences and perceptions of the critical care outreach service: a qualitative study undertaken in a large teaching hospital in the West of Ireland. Nurs Crit Care 2022;27:19–26.
[38] Odell M, Victor C, Oliver D. Nurses' role in detecting deterioration in ward patients: systematic literature review. J Adv Nurs 2009;65:1992–2006.
[39] Fang AHS, Lim WT, Balakrishnan T. Early warning score validation methodologies and performance metrics: a systematic review. BMC Med Inf Decis Making 2020:20.
[40] Oglesby KJ, Sterne JAC, Gibbison B. Improving early warning scores – more data, better validation, the same response. Anaesthesia 2020;75:149–51.
[41] Liu VX, Lu Y, Carey KA, Gilbert ER, Afshar M, Akel M, et al. Comparison of early warning scoring systems for hospitalized patients with and without infection at risk for in-hospital mortality and transfer to the intensive care unit. JAMA Netw Open 2020;3:e205191.
[42] Pirret AM, Kazula LM. Removing modifications to the New Zealand Early Warning Score- does ethnicity matter? A multimethod research design. Intensive Crit Care Nurs 2021:103141.
[43] Zachariasse JM, MacOnochie IK, Nijman RG, Greber-Platzer S, Smit FJ, Nieboer D, et al. Improving the prioritization of children at the emergency department: updating the Manchester Triage System using vital signs. PLos One 2021;16.
[44] Pirret AM, Kazula LM. The impact of a modified New Zealand Early Warning Score (M–NZEWS) and NZEWS on ward patients triggering a medical emergency team activation: a mixed methods sequential design. Intensive Crit Care Nurs 2021;62:102963.
[45] Romero-Brufau S, Gaines K, Nicolas CT, Johnson MG, Hickman J, Huddleston JM. The fifth vital sign? Nurse worry predicts inpatient deterioration within 24 hours. JAMIA Open 2019;2:465–70.
[46] Kalliokoski J, Kyngas H, Ala-Kokko T, Merilainen M. Insight into hospital ward nurses' concerns about patient health and the corresponding medical emergency team nurse response. Intensive Crit Care Nurs 2019;53:100–8.
[47] Cioffi J, Conwayt R, Everist L, Scott J, Senior J. 'Patients of concern' to nurses in acute care settings: a descriptive study. Aust Crit Care 2009;22:178–86.
[48] Andrews T, Waterman H. Packaging: a grounded theory of how to report physiological deterioration effectively. J Adv Nurs 2005;52:473–81.
[49] Massey D, Chaboyer W, Aitken L. Nurses' perceptions of accessing a medical emergency team: a qualitative study. Aust Crit Care 2014;27:133–8.
[50] Douw G, Schoonhoven L, Holwerda T, Huisman-de Waal G, van Zanten ARH, van Achterberg T, et al. Nurses' worry or concern and early recognition of deteriorating patients on general wards in acute care hospitals: a systematic review. Crit Care 2015;19.
[51] Douw G, Huisman-de Waal G, van Zanten ARH, van der Hoeven JG, Schoonhoven L. Nurses' 'worry' as predictor of deteriorating surgical ward patients: a prospective cohort study of the Dutch-Early-Nurse-Worry-Indicator-Score. Int J Nurs Stud 2016;59:134–40.
[52] Alberto L, Gillespie BM, Green A, Martínez MDC, Cañete A, Zotarez H, et al. Activities undertaken by intensive care unit liaison nurses in Argentina. Aust Crit Care 2017;30:74–8.
[53] Pedersen A, Psirides A, Coombs M. Models and activities of critical care outreach in New Zealand hospitals: results of a national census. Nurs Crit Care 2016;21:233–42.
[54] Elliott S, Chaboyer W, Ernest D, Doric A, Endacott R. A national survey of Australian intensive care unit (ICU) liaison nurse (LN) services. Aust Crit Care 2012;25:253–62.
[55] Green A, Jones D, McIntyre T, Taylor C, Chaboyer W, Bailey M. Characteristics and outcomes of patients reviewed by intensive care unit liaison nurses in Australia: a prospective multicentre study. Crit Care Resusc 2015;17:244–52.
[56] Wong DJN, Wickham AJ. A survey of intensive care unit discharge communication practices in the UK. J Intensive Care Soc 2013;14:330–3.
[57] Cuzco C, Delgado-Hito P, Marín Pérez R, Núñez Delgado A, Romero-García M, Martínez-Momblan MA, et al. Patients' experience while transitioning from the intensive care unit to a ward. Nurs Crit Care 2016. https://doi.org/10.1111/nicc.12697.
[58] van Sluisveld N, Hesselink G, van der Hoeven JG, Westert G, Wollersheim H, Zegers M. Improving clinical handover between intensive care unit and general ward professionals at intensive care unit discharge. Intensive Care Med 2015;41:589–604.
[59] Elliott M, Page K, Worrall-Carter L, Rolley J. Examining adverse events after intensive care unit discharge: outcomes from a pilot questionnaire. Int J Nurs Pract 2013;19:479–86.
[60] Elliott M, Page K, Worrall-Carter L. Factors associated with post-intensive care unit adverse events: a clinical validation study. Nurs Crit Care 2014;19:228–35.
[61] Li P, Boyd JM, Ghali WA, Stelfox HT. Stakeholder views regarding patient discharge from intensive care: suboptimal quality and opportunities for improvement. Can Respir J 2015;22:109–18.
[62] Pirret A. How well do we transition patients from ICU to the ward? Let our patients tell us. Intensive Crit Care Nurs 2020;58.
[63] Peters JS. Role of transitional care measures in the prevention of readmission after critical illness. Crit Care Nurse 2017;37:e10–7.
[64] Kauppi W, Proos M, Olausson S. Ward nurses' experiences of the discharge process between intensive care unit and general ward. Nurs Crit Care 2018;23:127–33.
[65] McCairn AJ, Jones C. Does time of transfer from critical care to the general wards affect anxiety? A pragmatic prospective cohort study. Intensive Crit Care Nurs 2014;30:219–25.
[66] Tanner J, Cornish J. Routine critical care step-down programmes: systematic review and meta-analysis. Nurs Crit Care 2021;26:118–27.
[67] Niven DJ, Bastos JF, Stelfox HT. Critical care transition programs and the risk of readmission or death after discharge from an ICU: a systematic review and meta-analysis. Crit Care Med 2014;42:179–87.
[68] Österlind J, Gerhardsson J, Myrberg T. Critical care transition programs on readmission or death: a systematic review and meta-analysis. Acta Anaesthesiol Scand 2020;64:870–83.
[69] Wibrandt I, Lippert A. Improving patient safety in handover from intensive care unit to general ward: a systematic review. J Patient Saf 2020;16:199–210.
[70] Nates JL, Nunnally M, Kleinpell R, Blosser S, Goldner J, Birriel B, et al. ICU admission, discharge, and triage guidelines: a framework to enhance clinical operations, development of institutional policies, and further research. Crit Care Med 2016;44:1553–602.
[71] Odell M. Patient- and relative-activated critical care outreach: a 7-year service review. Br J Nurs 2019;28:116–21.

Please cite this article as: Williams G et al., A practical approach to establishing a critical care outreach service: An expert panel research design, Australian Critical Care, https://doi.org/10.1016/j.aucc.2022.01.008

[72] Odell M, Gerber K, Gager M. Call 4 concern: patient and relative activated critical care outreach. Br J Nurs 2010;19:1390–5.
[73] Gill FJ, Leslie GD, Marshall AP. The Impact of implementation of family-initiated escalation of care for the deteriorating patient in hospital: a systematic review. Worldviews Evidence-Based Nurs 2016;13:303–13.
[74] Thiele L, Flabouris A, Thompson C. Acute clinical deterioration and consumer escalation in the hospital setting: a literature review. Resuscitation 2020;156:72–83.
[75] Dwyer TA, Flenady T, Kahl J, Quinney L. Evaluation of a patient and family activated escalation system: Ryan's Rule. Aust Crit Care 2020;33:39–46.
[76] Strickland W, Pirret A, Takerei S. Patient and/or family activated rapid response service: patients' perceptions of deterioration and need for a service. Intensive Crit Care Nurs 2019;51:20–6.
[77] Kara A, Dean DF, Johnson CS, Hui SL. The impact of proactive rounding on rapid response team calls: an observational study. Hosp Pract 2019;47:42–5.
[78] Guirgis FW, Gerdik C, Wears RL, Williams DJ, Kalynych CJ, Sabato J, et al. Proactive rounding by the rapid response team reduces inpatient cardiac arrests. Resuscitation 2013;84:1668–73.
[79] Winterbottom FA. The role of tele-critical care in rescue and resuscitation. Crit Care Nurs Clin N Am 2021;33:357–68.
[80] Pattison N, McLellan J, Roskelly L, McLeod K, Wiseman T. Managing clinical uncertainty: an ethnographic study of the impact of critical care outreach on end-of-life transitions in ward-based critically ill patients with a life-limiting illness. J Clin Nurs 2018;27:3900–12.
[81] McIntyre T, Taylor C, Eastwood GM, Jones D, Baldwin I, Bellomo R. A survey of ward nurses attitudes to the intensive care nurse consultant service in a teaching hospital. Aust Crit Care 2012;25:100–9.
[82] Wood T, Pirret A, Takerei S, Harford J. Staff perceptions of a patient at risk team: a survey design. Intensive Crit Care Nurs 2017;43:94–100.
[83] Prinsloo C. Self-Leadership in a critical care outreach service for quality patient care. Afr J Nurs Midwifery 2020;22.
[84] Hyde-Wyatt J, Garside J. Critical care outreach: a valuable resource? Nurs Crit Care 2020;25:16–23.
[85] Pattison N, O'Gara G, Wigmore T. Negotiating transitions: involvement of critical care outreach teams in end-of-life decision making. Am J Crit Care 2015;24:232–40.
[86] Pattison N, O'Gara G. Making appropriate decisions about admission to critical care: the role of critical care outreach and medical emergency teams. Nurs Crit Care 2014;19:4–6.
[87] King A, Botti M, McKenzie DP, Barrett J, Bloomer MJ. End-of-life care and intensive care unit clinician involvement in a private acute care hospital: a retrospective descriptive medical record audit. Aust Crit Care 2021;34:452–9.
[88] Cross WM, Moore AG, Sampson T, Kitch C, Ockerby C. Implementing clinical supervision for ICU outreach nurses: a case study of their journey. Aust Crit Care 2012;25:263–70.
[89] Pattison N, Droney J, Gruber P. Burnout: caring for critically ill and end-of-life patients with cancer. Nurs Crit Care 2020;25:93–101.
[90] Department of Health. Competences for recognising and responding to acutely ill patients in hospital. 2008. London.
[91] Currey J, Massey D, Allen J, Jones D. What nurses involved in a medical emergency teams consider the most vital areas of knowledge and skill when delivering care to the deteriorating ward patient. A nurse-oriented curriculum development project. Nurse Educ Today 2018;67:77–82.
[92] Davis DP, Graham PG, Husa RD, Lawrence B, Minokadeh A, Altieri K, et al. A performance improvement-based resuscitation programme reduces arrest incidence and increases survival from in-hospital cardiac arrest. Resuscitation 2015;92:63–9.
[93] Currey J, McIntyre T, Taylor C, Allen J, Jones D. Critical care nurses' perceptions of essential elements for an intensive care liaison or critical care outreach nurse curriculum. Aust Crit Care 2021.
[94] Athifa M, Finn J, Brearley L, Williams TA, Hay B, Laurie K, et al. A qualitative exploration of nurse's perception of critical outreach service: a before and after study. Aust Crit Care 2011;24:39–47.
[95] Alzghoul MM. The experience of nurses working with trauma patients in critical care and emergency settings: a qualitative study from Scottish nurses' perspective. Int J Orthop Trauma Nurs 2014;18:13–22.
[96] Sultan P, Arulkumaran N, Rhodes A. Provision of critical care services for the obstetric population. Best Pract Res Clin Obstet Gynaecol 2013;27:803–9.
[97] Jeddian A, Lindenmeyer A, Marshall T, Howard AF, Sayadi L, Rashidian A, et al. Implementation of a critical care outreach service: a qualitative study. Int Nurs Rev 2017;64:353–62.
[98] Jeddian A, Hemming K, Lindenmeyer A, Rashidian A, Sayadi L, Jafari N, et al. Evaluation of a critical care outreach service in a middle-income country: a stepped wedge cluster randomized trial and nested qualitative study. J Crit Care 2016;36:212–7.
[99] Smith D, Cartwright M, Dyson J, Hartin J, Aitken LM. Patterns of behaviour in nursing staff actioning the afferent limb of the rapid response system (RRS): a focused ethnography. J Adv Nurs 2020;76:3548–62.
[100] Chua WL, Legido-Quigley H, Jones D, Hassan NB, Tee A, Liaw SY. A call for better doctor–nurse collaboration: a qualitative study of the experiences of junior doctors and nurses in escalating care for deteriorating ward patients. Aust Crit Care 2020;33:54–61.
[101] Marshall AP, West SH, Aitken LM. Preferred information sources for clinical decision making: critical care nurses' perceptions of information accessibility and usefulness. Worldviews Evidence-Based Nurs 2011;8:224–35.
[102] Smith D, Cartwright M, Dyson J, Hartin J, Aitken LM. Barriers and enablers of recognition and response to deteriorating patients in the acute hospital setting: a theory-driven interview study using the Theoretical Domains Framework. J Adv Nurs 2021;77(6):2813–44. https://doi.org/10.1111/jan.14830.
[103] Rihari-Thomas J, Digiacomo M, Phillips J, Newton P, Davidson PM. Clinician perspectives of barriers to effective implementation of a rapid response system in an academic health centre: a focus group study. Int J Health Pol Manag 2017;6:447–56.
[104] McGaughey J, O'Halloran P, Porter S, Blackwood B. Early warning systems and rapid response to the deteriorating patient in hospital: a systematic realist review. J Adv Nurs 2017;73:2877–91.
[105] Bannard-Smith J, Lighthall GK, Subbe CP, Durham L, Welch J, Bellomo R, et al. Clinical outcomes of patients seen by rapid response teams: a template for benchmarking international teams. Resuscitation 2016;107:7–12.
[106] Allen J, Jones D, Currey J. Clinician and manager perceptions of factors leading to ward patient clinical deterioration. Aust Crit Care 2018;31:369–75.
[107] Williams G, Hughes V, Timms J, Raftery C. Emergency nurse as hospital clinical team coordinator - shining a light into the night. Australas Emerg Nurs J 2012;15:245–51.
[108] Jones D, Warrillow S. Clinical deterioration in cancer patients-the role of the rapid response team. Crit Care Med 2014;42:997–8.
[109] Subbe CP, Bannard-Smith J, Bunch J, Champunot R, DeVita MA, Durham L, et al. Quality metrics for the evaluation of rapid response systems: proceedings from the third international consensus conference on rapid response systems. Resuscitation 2019;141:1–12.
[110] Chellel A, Fraser J, Fender V, Higgs D, Buras-Rees S, Hook L, et al. Nursing observations on ward patients at risk of critical illness. Nurs Times 2002;98:36–9.
[111] Winterbottom FA, Webre H. Rapid response system restructure: focus on prevention and early Intervention. Crit Care Nurs Q 2021;44:424–30.
[112] Son YJ, Kim GO, Lee YM, Oh M, Choi J. Predictors of Early and Late Unplanned Intensive Care Unit Readmission: A Retrospective Cohort Study. J Nurs Scholarsh 2021;53:400–7.

Please cite this article as: Williams G et al., A practical approach to establishing a critical care outreach service: An expert panel research design, Australian Critical Care, https://doi.org/10.1016/j.aucc.2022.01.008