Managing Deteriorating Patients

Editors:
Rick Chalwin
Daryl Jones
Alex Psirides
Sam Radford

1st edition
2018

ISBN 978-0-473-45375-6
Typeset in Helvetica Neue, Futura & Droid Sans

The latest version of this book will always be available to download at:
https://rrthandbook.org

Contact: **info@rrthandbook.org**

MANAGING DETERIORATING PATIENTS

A Quick Bedside Guide for Rapid Response Team Members

Rick Chalwin
Daryl Jones
Alex Psirides
Sam Radford

Editors (listed alphabetically)

Dr. Rick Chalwin
MBChB FCICM MPH
Staff Specialist, Intensive Care Unit, Lyell McEwin Hospital, South Australia
Senior Lecturer, Adelaide Health Simulation, University of Adelaide
PhD Candidate, School of Public Health, University of Adelaide

A/Prof Daryl Jones
BSc (Hons) MB BS FRACP FCICM MD PhD
Intensive Care Specialist, Austin Health, Melbourne
Associate Professor SPHPM, Monash University
Adjunct Associate Professor, University Melbourne
Medical Director Critical Care Outreach, Austin Hospital
Twitter: jones_daza

Dr. Alex Psirides
BSc (Hons) MB BS FCICM
Intensive Care Specialist, Wellington Regional Hospital
Senior Clinical Lecturer, University of Otago
Clinical Lead, National Deteriorating Patient Programme, HQSC, New Zealand
Twitter: @psirides

Dr. Sam Radford
B.Med Sci (Hons) MBBS (Hons) FRACP FCICM GCHPE
Intensive Care Specialist, Austin Health, Melbourne
Honorary Lecturer, Melbourne University
Deputy State Medical Director, DonateLife Victoria

PREFACE

In 2017, the president of the College of Intensive Care Medicine of Australia and New Zealand challenged the rapid response community to develop a reference text for Rapid Response Team (RRT) members. This handbook is a response to that challenge.

It is intended to be a concise primer for those new to the RRT but may also provide useful insights for more experienced clinicians too. The content has been written for all front-line clinicians attending RRT calls, and should be applicable to staff from any discipline or department.

This is intentionally *not* a comprehensive, didactic textbook. Chapters can be read in any order, or in isolation. Additional sources and reference documents are listed at the end of each chapter for those seeking more information.

For this first edition, we have described approaches to the management of general, adult in-patient deterioration. A future edition may be expanded to address specific patient groups such as paediatrics, obstetrics and mental health.

This book is provided to the rapid response system community as a free resource in the hope that it will be useful for responders. **To enable us to track downloads, please share the website link rather than this file.**

Feedback and comments are welcomed and can be sent to info@rrthandbook.org

INDEX

(select page number to move to relevant chapter)

01. INTRODUCTION

Daryl Jones

The profile of hospitals and the patients they manage are changing. Advances in medical treatments, increasing life expectancy, societal and clinician expectations, and improved anaesthetic and surgical techniques have resulted in older patients receiving more complex, often multiple, treatments. Concurrently, there are pressures on hospital occupancy, resource utilisation, and access to critical care beds. These combined effects put patients on general hospital wards at risk of experiencing clinically important deterioration.

Studies conducted in the 1990s reported that patients admitted to hospital suffered serious adverse events in approximately 10% of cases. Other studies revealed that such events were preceded by signs of physiological deterioration in up to 80% of cases, often for several hours before the event occurred.

In response, many hospitals worldwide have now implemented Rapid Response Systems (RRSs) to improve the recognition of, and response to clinical deterioration in hospital wards. Key to this approach is the presence of an expert responder team, referred to as a Rapid Response Team (RRT). Three systematic reviews have demonstrated that the introduction of RRSs results in decreases in the frequency of in-hospital cardiac arrests, and one revealed a decrease in all-cause in-hospital mortality.

With RRSs becoming widespread, focus has now shifted toward the epidemiology of the RRT patient. Several studies have revealed that between 10-25% of patients are admitted to the intensive care following RRT review, that one fifth of patients receive more than one RRT call in their hospital admission, that delayed review is associated with increased mortality, and that approximately one-quarter of patients reviewed by the RRT will die during that hospital admission.

Appreciation of the vulnerable nature of the RRT patient has prompted efforts toward understanding of the causes of clinical deterioration needing RRT review, and training the responders to optimise treatment and outcomes of such patients. In contrast to in-hospital cardiac arrests, deterioration that causes a RRT review can be due to multiple aetiologies. Thus, the patient is far less differentiated, and the management of the their review is much more complex and diverse. Accordingly, management does not lend itself as much to the algorithmic approach of basic and advanced cardiac life support. In addition, an individual staff member from the ward may attend RRT calls infrequently. This means that the formation of responding team is ad-hoc and it is highly unlikely that they have trained together in the management of the RRT patient.

In this book, we outline historic studies reporting adverse events in hospitalised patients. In addition, we discuss hospital strategies to improve the recognition of and response to clinical deterioration. Finally, we discuss the principles of team-based assessment of a deteriorating patient, important elements of team leadership, and the specific approach to common causes of RRT activation.

02. WHAT IS KNOWN ABOUT DETERIORATING PATIENTS

Daryl Jones, Chris Subbe

Serious adverse events were previously common in hospitalised patients

Since 1960 there have been multiple studies exploring the nature of clinical deterioration in hospitalised patients. Initially, these studies identified the potential role of medical neglect and iatrogenesis in causing patient harm. These were supported by studies conducted in the 1990s which further explored the resultant serious adverse events.

In Australia Wilson and co-workers reported that 17% off 14,179 patients in 28 hospitals suffered an adverse event which they defined as "*unintended injury or complication that resulted in disability, death, or prolonged hospital stay and was caused by the healthcare management rather than by the underlying disease process*". In New Zealand Davis and co-workers conducted a similar study amongst 6579 patients in 13 hospitals and found a serious adverse incident rate of 12.9%. Using this definition multiple studies worldwide identified that patients experience such events in around 10% of hospital admissions, and in one quarter of cases these were associated with permanent disability or death.

In 2000 the Institute for Medicine's published a landmark report entitled 'To Err is Human' which introduced the

concept of healthcare related harm into the medical mainstream. Subsequent studies explored adverse events in hospitalised patients in the context of specific clinical complications. These were sometimes defined by severe events such as cardiac arrest, unplanned ICU admission, or preventable in-hospital death. Alternatively, the event was defined by clinical complication such as myocardial ischaemia, pulmonary embolism, in hospital sepsis, or acute kidney injury. In some studies the investigators judged whether these events were preventable. However, there was not always strong agreement in such judgement.

Adverse events were preceded by signs of instability

In order to examine for more objective criteria of preventability, some researchers assessed the period leading up to the development of a serious adverse event or complication to ascertain whether there was evidence of prior clinical instability. Several studies revealed that these events what preceded by derangements in commonly measured vital signs, escalation in treatment, or documented staff concern in up to 80% of cases. Importantly, such deterioration had been present for several hours, potentially allowing for intervention prior the occurrence on the event.

The response of ward clinicians was often not commensurate to the deterioration

Retrospective analysis of the assessment and management by ward clinicians in the period leading up to serious adverse events found that the escalation of care and the subsequent treatment was deemed too

frequently be suboptimal. Common care issues prior to cardiac arrests included inadequate clinical assessment, medication errors and sub-optimal response to symptoms. In a study of 100 consecutive emergency ICU admissions suboptimal care was thought to results from lack of organisational skills or knowledge, failure to appreciate the urgency of the situation, and failure to seek advice.

Several clinical conditions are common causes of in-hospital complications

Studies amongst surgical patients suggest that infections, thromboembolism and acute kidney injury are the most common complications. For example, amongst 614,525 patients in 300 US hospitals Hyder and co-workers revealed that wound infection (5.25%), urinary tract infection (1.54%), pneumonia (0.97%), venous thromboembolism (0.73%), acute kidney injury (0.43%) and myocardial infarction (0.3%) were the most common complications.

In a study of 4158 patients aged older than 70 years in 23 Australian and New Zealand hospitals, the most common complications were acute renal impairment (6%), acute pulmonary oedema (3%), acute myocardial infarction (2%) and wound infection (2%).

Amongst general adult patients reviewed by the Rapid Response Team (See chapter 3) in Australia and New Zealand, pulmonary oedema, sepsis, seizures, arrhythmias and acute respiratory failure were the most

frequently reported clinical causes of clinical deterioration.

Both clinical and system factors contribute to clinical deterioration

There are a number of factors contributing to clinical deterioration in hospitalised patients (Table 2.2). In a follow-up study of the 2353 adverse events reported by Wilson and co-workers a detailed qualitative assessment was conducted which found the following factors contributed to the development of adverse events:

- 34.6%: '*a complication of, or the failure in, the technical performance of an indicated procedure or operation*'
- 15.8%: '*the failure to synthesise, decide and/or act on available information*'
- 11.8%: '*the failure to request or arrange an investigation, procedure or consultation*', and
- 10.9%: '*a lack of care and attention or failure to attend the patient*'

In the United States, the term 'failure to rescue' is used to describe an inadequate response by the hospital to clinical deterioration. While initially used in the context of post-operative complications, this terms is now more broadly applied to deterioration without appropriate response to any hospital in-patient. Organisational culture as evidenced by beliefs and behaviours might play an important part. A study by Ghaferi compared high and low performing hospitals. It showed that although complication rates for major surgery were comparable between the hospitals, death after complication was

markedly different. This suggests that outcomes following complications might be determined by a hospitals capacity to recognise and respond to these events in a timely and efficient manner.

How can adverse events be detected and managed?

The following chapters will outline hospital structures and systems aimed at improving the recognition of, and response to clinical deterioration. The principles of team management (chapters 4 and 5), and the phases of team-based management of a deteriorating patient will then be presented (chapters 6-11). Finally, approaches to the management of common scenarios encountered during ward-based clinical deterioration will then be outlined (chapters 12-18).

Table 2.1: Summary of literature on deteriorating in-hospital patients
Serious adverse events occurred in approximately 10% of hospital actions
Serious adverse events were commonly preceded by signs of clinical deterioration
The response of ward clinicians was often not commensurate to the degree of clinical deterioration
The assessment and treatment of clinical deterioration on the ward preceding serious adverse events was often suboptimal
Escalation to senior staff did not always occur

Table 2.2: Clinical and system factors contributing to clinical deterioration
Vital sign measurement on hospital wards is intermittent
Intervals between vital sign measurements maybe as long as eight (or even twelve) hours
Reviews by ward nurses and unit doctors can vary considerably
Many hospitals do not have policies to guide escalation of care when vital signs become abnormal or patients deteriorate
The first clinicians to review deteriorating patients are often junior, lack experience and knowledge, and have multiple competing priorities
In some instances, the usual clinicians may not be available
Staffing levels out of hours are usually markedly lower than those during the day

Further reading:

Jones D. Chapter 1. The role of a medical emergency team in a teaching hospital. Doctorate Thesis 2009

Jones D, Mitchell I, Hillman K, Story D. Defining Clinical Deterioration. Resuscitation. 2013;84:1029-1034

Hyder JA, Wakeam E, Arora V, Hevelone ND, et.al. Investigation of the “Rule of W”, a mnemonic for reaching on postoperative complications. J Surg Educ. 2015;72: 430-437

Story DA, Leslie K, Myles PS, Fink M, et.al. Complications and mortality in older surgical patients in Australia and New Zealand (the REASON study): a multicentre, prospective, observational study. Anaesthesia. 2010;65: 1022-1030

Jones D. The epidemiology of adult Rapid Response Team patients in Australia. Anaesth Intensive Care. 2014;42:213-219

Wilson RM, Harrison BT, Gibberd RW, Hamilton JD. An analysis of the causes of adverse events from the Quality in Australian Health Care Study. Med J Aust. 1999;170:411-415

Kohn LT, Corrigan JM, Molla S. To Err Is Human. Building a Safer Health System. Institute of Medicine (US). 2000

Hogan H, Healey F, Neale G, Thomson R, Vincent C, Black N. Preventable deaths due to problems in care in

English acute hospitals : a retrospective case record review study. BMJ Qual Saf, 2012 Sep;21(9)

Schein RMH, Hazday N, Pena M, Ruben BH, Sprung CL. Clinical antecedents to in-hospital cardiopulmonary arrest. Chest. 1990:1388–92

McQuillan P, Pilkington S, Allan A, Taylor B, Short A, Morgan G, et al. Confidential inquiry into quality of care before admission to intensive care. BMJ. 1998;316:1853–8

Ghaferi AA, Birkmeyer JD, Dimick JB. Complications, Failure to Rescue, and Mortality With Major Inpatient Surgery in Medicare Patients. 2009;250(6):1029–34

03. HOSPITAL STRUCTURES AND GOVERNANCE FOR DETERIORATING PATIENTS

Daryl Jones, Chris Subbe, Tammie McIntyre, Carmel Taylor

Overview

All hospitals must develop and implement strategies to identify patients who are at increased risk of deterioration, identify the deterioration when it occurs, and promptly manage it in order to reduce the risk of subsequent morbidity and mortality.

This chapter outlines hospital structures and governance mechanisms that have been implemented to improve the prevention and identification of clinical deterioration and provide a response to deterioration once it has occurred. Such approaches can be preventive, or reactive (Table 2.1), and some strategies are outlined in more detail below. In Australia, the Australian Commission on Safety and Quality in Healthcare (ACSQHC) has developed and promulgated a National Consensus statement outlining eight essential elements for recognising and responding to clinical deterioration in acute hospitals. In New Zealand, the Health Quality and Safety Commission (HQSC) has a national programme standardising both recognition and responses to adult in-patients who deteriorate.

Vital sign documentation

Studies examining adverse events such as in-hospital cardiac arrest, unplanned ICU admission and unexpected in-hospital deaths have noted that these are often preceded by derangements in commonly measured vital signs. In many cases, these abnormalities remained uncorrected for many hours.

Hospitals should have a policy for the acquisition and documentation of vital signs. Studies in Australia have shown that graphical representation of vital signs using colour coding to indicate normal or acceptable ranges improves clinician recognition of deranged physiology. New Zealand has standardised the vital signs chart that incorporated human factors design testing to optimise recognition of abnormalities and vital sign trends. In selected patients it may be desirable to continuously monitor vital signs, although evidence for the effectiveness of this strategy is not definitive.

Intensive care unit liaison nurses

Intensive care unit liaison nurses (ICULNs) are senior nurses based in the ICU who aim to facilitate the discharge of patients from the ICU to the ward, as well as reviewing and identifying at-risk and deteriorating patients in hospital wards. In some instances, they are also members of the Rapid Response Team (RRT) and can also form part of early escalation systems. They are particularly prevalent in Australia, the United Kingdom and New Zealand typically in larger hospitals with higher ICU admission rates. Internationally they may be known

by a number of different names including outreach or 'patient at risk' (PAR) teams.

Several studies have explored the scope of practice of ICULNs and report that their value is in supporting and educating ward staff, patients and relatives (Table 2.2). Available evidence suggests that the most reviews performed by the ICULN occur during routine follow-up of patients discharged from the ICU. Additional case-load arises from participation in or follow-up of RRT patients, and de novo referrals from ward staff for patient concern.

Hospital wide escalation policy

The ACSQHC consensus statement requires that all acute hospitals have a protocol to outline how the organisation will respond to different levels of clinical deterioration. This is typically a graded response whereby the intensively of the response is commensurate to the level of clinical deterioration. In Australian hospitals there are typically three levels of response

1. A 'Code Blue' or cardiac arrest call. A team is activated and responds immediately when the patient has a cardiac or respiratory arrest, or other immediately life-threatening emergency
2. A Medical Emergency Response or Rapid Response call. The team is typically activated when a patient triggers pre-defined physiological calling criteria. The team is typically composed of senior and expert responders, often from the ICU, and typically arrives within 5 minutes.
3. Ward team based clinical review. This response is activated when the patient displays milder degrees

of physiological derangement. The responders are typically the ward treating doctors under whom the patient was admitted and who may have 20-30 min to attend.

There are several methods by which an RRT can be activated. These include single parameter systems (where a team is called if a single vital sign parameter threshold is breached) and aggregate scoring systems where each vital sign parameter is assigned a score according to the level of derangement. These are then summed to generate an early warning score (EWS) with the response dictated by the value of the aggregate EWS. Other activation systems include patient, family or staff concern (in the absence of physiological derangement).

Hybrid models that combine an aggregate EWS and single parameter calling are also described. One such example is the New Zealand National Early Warning Score implemented by the Health Quality and Safety Commission across every acute public hospital in 2018 (see Figure 3.1). This matches early detection of deterioration with a graded escalation that increases from more frequent vital sign monitoring, through home team junior medical staff, to expert nursing review and finally to rapid response team activation for higher aggregate scores or worsening single parameters.

Automated systems that are able to continuously integrate multiple parameters including vital signs and laboratory data are under development and undergoing clinical testing.

Rapid Response Systems and Rapid Response Teams

One of the most common reactive systems for improving the recognition of and response to clinical deterioration of hospitalised patients is the Rapid Response System (RRS). The RRS describes a hospital wide approach to provide a coherent and integrates system of care with four components.

1. **The afferent limb**. This is the method of identifying deterioration, the calling criteria, and the means of activating the call
2. **The efferent limb**. This is the responding team, generically referred to as the Rapid Response Team (RRT) or Medical Emergency Team (MET)
3. The patient safety and quality improvement limb provides audit and feedback to constantly improve the system
4. The administrative or governance limb coordinates resources and provides oversight for the running of the entire system.

In Australian and New Zealand hospitals with an ICU, the vast majority of RRTs and METs have staff from the ICU as part of the team membership, typically an ICU registrar and/or nurse. Direct consultant involvement in the RRT appears to be relatively uncommon. There is evidence that the number of RRT calls are increasing, and that patients reviewed by the RRT are at increased risk of in-hospital morbidity and mortality. For these reasons, it is important that ICU advanced trainees and nurses are trained in the elements of RRT call management, particularly team leadership skills.

Effectiveness of interventions

Introduction of ICULN services have been associated with reductions in the risk of ICU readmission, following ICU discharge. Other reported benefits include reducing discharge delay as well as patient and family anxiety before ICU discharge.

Introduction of standardised escalation criteria using EWS systems in Hospitals in Wales and Scotland lead to a reduction in mortality from sepsis by 20%. There are now three systematic reviews reporting that the introduction of an RRS is associated with an approximately 30% reduction in the risk of in-hospital cardiac arrests. In addition, one of these reviews reported an association with decreased all-cause in-hospital mortality.

Two studies have suggested improved outcomes of hospitalised patients with the introduction of ACSQHC consensus statement in Australia. Thus, amongst more than 110 ICU-equipped hospitals introduction of the standard was associated with a reduction in the proportion of ward admissions to ICU associated with a cardiac arrest (from 5.6% to 4.1%). In addition, the risk of in-hospital death for cardiac-arrest related ICU admissions from the ward was reduced by approximately 21%.

The second study involved assessment of cardiovascular complications for all hospitals in Victoria, including those without an ICU. This study also revealed a reduction in in-hospital cardiac arrests in association with the national standard. In addition, there were also reductions in the

risk of other hospital acquired cardiovascular complications.

Table 3.1: Overview of hospital-based strategies for deteriorating patients	
Pre-emptive & pro-active strategies	•Measurement and documentation of vital signs •Continuous physiological monitoring in selected patients •Rounding and review by usual clinicians •Nurse consultants •Intensive Care Liaison nurses •Hospitalists and peri-operative physicians •Elective high dependency and intensive care
Reactive solutions	•Hospital wide escalation policy •Review by usual clinicians when early deterioration occurs •'Code Blue' or cardiac arrest teams •Intensive Care Liaison nurses •Rapid Response Teams

Table 3.2: Summary of roles and scope of practice of Intensive Care Liaison Nurses	
Types of patients reviewed	•ICU discharges •During or following RRT review •New referrals from ward staff •Patient and carer escalation
Non-technical skills performed	•Education of ward staff, patients and relatives •Referring patients of concern to other hospital staff •Assessment of patients, review of investigation •Contribution to patient management plan
Technical skills performed	•Management of obstructed airway, assisting with endotracheal intubation •Set-up and modify oxygen delivery systems and/or non-invasive ventilation •Delivery of medication •Trouble shooting or setting up equipment •Insertion of nasogastric tube, venous cannula, or urinary dwelling catheter

Table 3.3: Some examples of RRT activation criteria	
Airway problems	•Obstructed airway •Noisy breathing or stridor •Problem with a tracheostomy tube
Breathing problems	•Any difficulty breathing •Respiratory rate < 8 or > 25 breaths/min •SpO_2 < 90% despite high-flow oxygen
Circulation problems	•Heart rate < 40 or > 120 beats/min •Systolic blood pressure < 90 mmHg •Urine output < 50mL over 4 hr
Conscious state problems	•Sudden change in conscious state •Patient cannot be roused •Prolonged or recurrent seizures
The staff member is worried for any other reason	

SCORE	MET	3	2	1	0	1	2	3	MET
ZONE	BLUE	RED	ORANGE	YELLOW	WHITE	YELLOW	ORANGE	RED	BLUE
Resp Rate	<5	5-8		9-11	12-20		21-24	25-35	>35
SpO_2		≤91	92-93	94-95	≥96				
Supplemental O_2			YES		NO				
Temp			<35.0	35.0-35.9	36.0-37.9	38.0-38.9	≥39.0		
Sys BP	<70	70-89	90-99	100-109	110-219			≥220	
Heart Rate	<40		40-49		50-89	90-110	111-129	130-139	≥140
Level of Consciousness					Alert			Voice or Pain	Unresponsive or fitting

Figure 3.1: Example of a hybrid early warning score - the New Zealand national system

Further reading:

Jones D. Chapter 1. The role of a medical emergency team in a teaching hospital. Doctorate Thesis 2009

Jones DA, DeVita M, Bellomo R. Current Concepts: Rapid-Response Teams. NEJM. 2011;365:139-46

Story DA, Leslie K, Myles PS, Fink M, et.al. Complications and mortality in older surgical patients in Australia and New Zealand (the REASON study): a multicentre, prospective, observational study. Anaesthesia. 2010;65:1022-1030

ACSQHC. National consensus statement: essential elements for recognising & responding to acute physiological deterioration 2nd ed. 2017

Mcintyre T, Taylor C, Reade M, Jones D, Baldwin I. Characteristics and outcomes of patients subject to intensive care nurse consultant review in a teaching hospital. Crit Care Resus. 2013;15:134-140

Eliott 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: 253-262

Martin C, Jones D, Wolfe R. State-wide reduction in in-hospital cardiac complications in association with introduction of a national standard for recognising deteriorating patient. Resuscitation. 2017; 121:172-178

Jones D, Bhasale A, Bailey M, Pilcher D, Anstey MH. Effect of a National Standard for deteriorating patients on Intensive Care admissions due to cardiac arrest in Australia. Crit Care Med. 2018;46:586-593

Health Quality & Safety Commission New Zealand. National deteriorating patient programme. Recognition and response systems. Visited 13th September 2018

Sethi SS, Chalwin R. Governance of rapid response teams in Australia and New Zealand. Anaesth Intensive Care 2018;46:304-12

04. PRINCIPLES OF TEAM MANAGEMENT

Rick Chalwin, Stuart Gillon

Overview

The RRT call is a significant stress burden on the team as well as the patient. As noted by Gillon et al: "the requirement for a MET response has been described as a crisis, as the patient is at risk of imminent harm or death".

The skills required for the successful management of an RRT call go beyond the theory and technical abilities of patient management and are imperative.
Various terms describe this skill set such as crisis resource management (CRM) and non-technical skills. All systems share the same principles of establishing team roles and responsibilities, building adaptability and resilience, and achieving appropriate patient disposition. The RRT calls are arguably more dependent upon use of these skills than other clinician-patient encounters. The RRT is typically ad-hoc and multi-disciplinary, assembled at short notice, often at times of clinician fatigue, always at a time of high risk of adverse patient outcomes.
This chapter addresses the aspects of CRM as applied to the RRT

Leadership: Selection

The role of leader during an in-hospital clinical crisis typically falls to the most senior physician in attendance, but this need not be a universally applied rule. It may be

more appropriate that another team member leads, especially if senior medical members are required to undertake complex clinical interventions (such as intubation).

If the leader of the RRT is not predefined by local protocol, it is important that the she or he be identified early in the encounter. The role of leader is potentially fluid, with the leader changing as the technical demands of the situation vary, or as additional personnel arrive.

Leadership: Purpose

Just as a ship needs a captain, every RRT needs a team leader. This role is the most crucial and pivotal to overall team performance. It is easy but fallacious to assume that the team leader exists solely to dictate or direct. Instead, the team leader should see themselves as the linchpin that co-ordinate the team's efforts.
As mentioned above, RRTs are typically staffed ad-hoc and from different departments. So, a key function of the team leader is to break the ice. If time allows, a quick round of introductions on arrival is invaluable. While sounding trite, this is an effective way to establish the sense of a team with shared purpose rather than independent clinicians coincidentally attending the same patient.

There is always great temptation for team leaders to take on clinical tasks - it is instinctual to want to touch the patient. But the team leader is most effective when remaining 'hands off'. Just as a ship’s captain has the helmsman at the wheel and the orchestra’s conductor leaves the playing of instruments to the musicians, the

team leader similarly should oversee the RRT call. Their ideal position is at the foot of the bed so full visibility can be maintained of team members and the patient.
Another role for the team leader is to be the team's external interface. This may be with parent clinical teams or hospital logistic staff. Although this imposes an additional cognitive burden on the leader, it is important to insulate team members from distractions that may hamper their performance of urgent tasks.

Leadership: Style

There is no ideal leadership style. Possibilities range from democratic and affiliative through to authoritative and coercive. A useful rule of thumb is to be adaptive and opportunistic based on the demands of the situation. Calls for non-urgent issues or end-of-life care clearly need a gentle, collaborative approach. Conversely, at calls for peri-arrest management some niceties can be suspended as a decisive, concise style is more appropriate.

Leadership: Communication

The most important aspect of the team leader's hub role is optimising communication. In stressful situations, both the quantity and volume of speech tends to increase. RRT calls risk becoming noisy and chaotic when this isn't controlled. The net result is a loss of team effectiveness and performance.
To overcome this, ideally the majority of communication should be centrally routed via the team leader. Doing so ensures an efficient bidirectional flow of information. Team members pass up important findings and concerns, team leaders pass down requests and guidance. This naturally

evolves into a loop whereby the team leaders transduce information received into progressing the clinical plan, and vice versa by team members. This is shown in Figure 4.1.

Followers: Role

Other members of the RRT are, by definition followers. This is not, as the name may imply, a passive role. Active engagement in the process is key to successful team working. Nor is it a fixed role: the follower may need to be prepared to take over the leadership role depending on the situation.

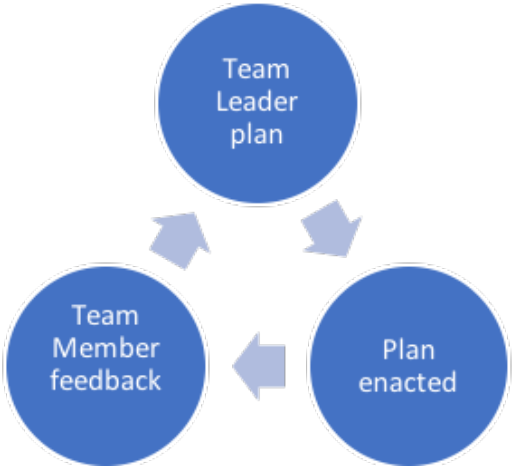


Figure 4.1: Optimal Team Communication Loop

Followers: Purpose

A team's strength lies in its members. They can contribute usefully by reinforcing the team leader's role, respecting each other, speaking up with pertinent information, performing specific tasks and requesting task allocation when idle.

Followers: Style

Their role is complex and nuanced. On one hand, it is desirable for them to exhibit the initiative and experience of highly performing clinicians. On the other, they need to remain a coordinated group under the direction of the team leader so that a common team goal can be achieved. This is, as detailed above, difficult to perfect in an ad-hoc team.

Followers: Communication

The United States Air Force have a slang saying, "Hooah", phonetic for HUA (heard, understood, acknowledged). This exemplifies the principle of closed-loop communication. In essence, it is a mechanism to achieve error checking and confirmation that tasks have been executed.

RRTs are often staffed by shift workers. Sleep deprivation combined with a complex clinical situation can readily lend to errors in decision-making. Add in a noisy, stressful environment and instructions may not be heard correctly. In combination, these may lead to mistakes in task performance.

A potential solution is routine use of closed-loop communication. Team leader instructions are repeated, queried if concerning, and only actioned when confirmed as correct. Performance of the task is further relayed back to the team leader when complete. An example of this is shown in Figure 4.2.

Situational Awareness

Safety for the team and patient are paramount. This is especially challenging to achieve at RRT calls. Typically, the location may be resource or space constrained and the clinical scenario undifferentiated and evolving. In this scenario, constant monitoring and adaption is essential.

As observed above, oversight of the call is one of the key roles for the team leader. This is multi-faceted, covering team actions and the patient response to treatment. Team members should be monitored to ensure they are actively participating in clinical management and undertaking requested tasks. But the team leader's responsibility is also to maintain a safe working environment for those staff. This means either alerting them to imminent risks (e.g. needlestick injury) or preventing that exposure in the first place.

The patient's clinical course may change, perhaps unpredictably. A highly performing team remains vigilant and adapts to that change. This confers resilience; that is the ability to retain control of the clinical situation even in the face of considerable and rapid variability.

To achieve this, team members play an important role too. Theirs is to alert the team leader of observations or

concerns. One aspect of this has already been covered above in closed loop communication. It is not uncommon for only one member of the team to have noticed an issue. If they say nothing, avoidable error may follow.

Further to this, not all error checking need occur via the team leader. Expediency may necessitate a direct member-to-member alert if an immediate risk presents itself to a fellow team member.

Confirmation and reinforcement of situational awareness may be enhanced by verbalisation of perceived understanding of the current situation (particularly by the team leader). Furthermore, frequent “time-outs” explicitly refocus members back from their immediate tasks to share knowledge and perception of the clinical situation as it evolves.

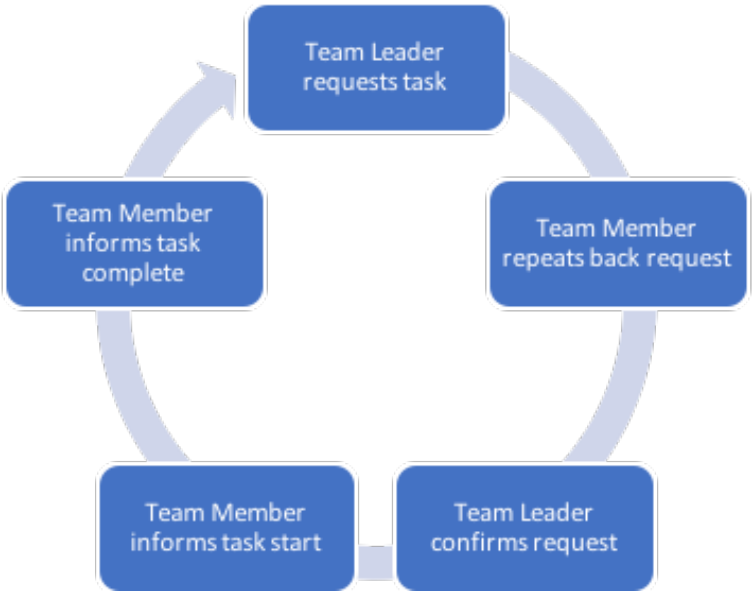


Figure 4.2: Example of Closed Loop Communication

Decision-making and Planning

Patient management and call disposition may be thought of as clinical tasks. However, there is an important aspect relevant to this chapter – that of decisiveness. The natural psychological responses to crisis are either panic or paralysis. Neither is helpful even though understandable. There are strategies to overcome this. Training, especially in simulated emergencies is invaluable. It permits graded exposure to clinical pressures in a low-stakes environment and confers 'stress inoculation'.
Verbalisation of psychological discomfort at calls may assist too. It is highly probable that a team leader's stress is shared by other members. Reinforcement of roles, responsibilities and a common goal may at least partly decompress this and prevent the team from becoming overwhelmed.
Teams should always remember that it is not an admission of failure to request additional assistance. Rather, it is a sign of maturity to recognise when the situation demands more clinical skills or knowledge than the currently present team possesses. From a governance perspective too, senior involvement can always be justified.

Summary

The RRT is a complex entity working in difficult circumstances. In this setting, efficient team work is important to manage a 'crisis'. This can be achieved by clear leadership, a supportive team culture and quality communication.

Further reading:

Gillon S, Radford S, Chalwin R, Devita M, Endacott R, Jones D. Crisis resource management, simulation training and the medical emergency team. Crit Care Resusc. 2012 Sep;14(3):227-35

Chalwin R, Flabouris A. Utility and assessment of non-technical skills for rapid response systems and medical emergency teams. Intern Med J. 2013 Sep;43(9)962-9

Flin R, Maran N. Identifying and training non-technical skills for teams in acute medicine. Qual Saf Health Care 2004;13 Suppl 1:i80-4

05. THE ROLES AND GOALS APPROACH TO RAPID RESPONSE TEAM MANAGEMENT

Daryl Jones, Stuart Gillon, Jayne Ramsdale

Overview

Rapid response team (RRT) calls differ from other types of medical emergencies in a number of ways. Firstly, as noted in previous chapters, the RRTs are typically ad hoc, and it is likely that members have not worked together before. Secondly, team members may differ in their seniority, skill set and level of experience from call to call. Finally, clinical deteriorations that prompt RRT reviews deterioration occur due to multiple different causes.

Combined, these factors mean that it is difficult to train a RRT using an algorithmic approach similar to that used for management of cardiac arrests. In this chapter we define the concept of a 'roles and goals' approach. This offers a framework for RRTs, regardless of composition or clinical scenario, to structure their review.

Important concepts of RRT calls

An RRT call may be initiated when the requirements of a patient exceed the capability of the staff currently caring for them. Thus, a RRT call can be made when ward staff are unable to summon senior assistance, feel out of the depth, or are concerned about the clinical status of a

patient. Accordingly, an RRT call often represents a crisis for the ward staff.

Concurrently, the RRT members are likely to be unfamiliar with the patient's clinical situation, the ward staff who activated the call, or indeed other RRT members. The assembly of the RRT is often ad hoc with variability in the composition, seniority, skill mix, and familiarity of the assembling staff. This is further exacerbated since RRT composition is typically from different departments, with members not arriving at calls simultaneously.

The complexity of RRT calls is further increased by the diverse nature of conditions that precipitate the clinical deterioration. This has led to the concept of 'RRT syndromes', defined by the trigger (e.g. tachycardia, hypotension, altered level of consciousness), but each syndrome being caused the consequence of a range of possible aetiologies (See Chapters 6 -12). Classifying potential RRT activations into syndromes may offer the opportunity to structure team response into a variety of syndrome specific 'standard operating procedures'.

How cardiac arrests differ from RRT calls

As outlined above, RRT calls may be due to a variety of clinical conditions. In contrast, cardiac arrests have fewer precipitants and can be easily classified by whether the initial rhythm is shockable or non-shockable. The management of cardiac arrests is therefore far more amenable to algorithmic management, as specified in national Resuscitation Council guidelines. Thus, team responses may therefore be more rigid, which in turn lends itself to standardised training. Furthermore, there

are a more limited number of individual roles, and the team goals are clear.

Team goals during a RRT call

Although RRT calls maybe due to a diverse range of conditions, it is possible to establish a relatively generic set of goals that should be applicable for all RRT calls (Table 5.1). This might otherwise be considered as the minimum to be achieved during the management of a RRT call. Such team goals may vary between institutions depending on case mix, hospital activity and local systems.

However, the goals of team management need to be ubiquitous and apply to all RRT calls regardless of their aetiology, elements of treatment, and skill mix of the responding team.

RRT member roles during a call

The individual roles of the assembled team are likely to vary according to the skill mix, seniority, experience, and number of staff who assemble. It is possible that the team may not have all of the skills required to manage the call. In such instances there will be a need to escalate to seniors or other specialties to obtain staff with appropriate knowledge, skills or experience.

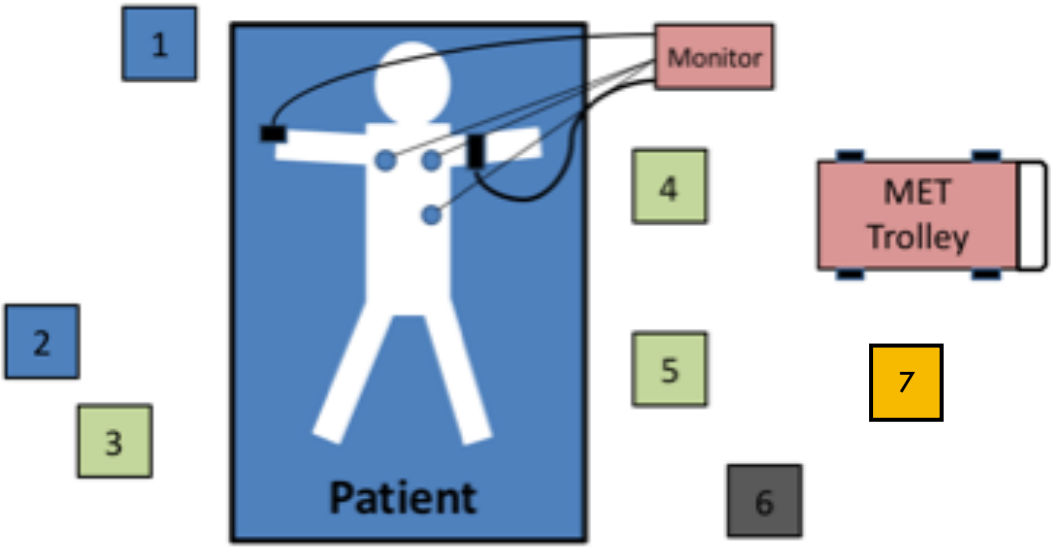
RRTs may have many different compositions. Typically, a doctor will be team leader (often from ICU). Other members may include a ward nurse, ICU or acute care nurse, intern, physician trainee, data scribe, nurse in charge, and ward assistant (Figure 5.1). Each member will have a relatively limited number of defined roles (Table 5.2).

There are published details for the training of a RRT nurse. The RRT doctor should have a comprehensive knowledge of the causes of clinical deterioration and the appropriate management of such conditions. In addition, they should possess team leadership skills including prioritisation and planning of tasks, coordination, supporting and communication with team members, gathering information, and ability to make balanced decisions. The team leader should remain calm, provide clear instructions, make the best use of existing resources, and communicate clear priorities with the assembled team.

Table 5.1: Examples of team goals during RRT calls
Team assemble and obtain handover from ward staff
Attend to immediately life-threatening emergencies
Develop provisional diagnoses
Commence initial therapy to restore deranged physiology
Agree a management plan and communicate with ward staff
Escalate to more senior staff in alignment with hospital policy
Transfer patients not responding, or whose care needs exceed the ward environment to a higher level of care
Notify the RRT response to usual treating team and the patient's relative or next of kin
Document events in the patient's medical record

Table 5.2: Some examples of potential individual roles during RRT calls	
TEAM MEMBER	**ROLES**
Ward Nurse	Hands over Assesses vital signs Conveys trigger(s) for call Communicates ongoing assessment to team
Scout	Sources medication & equipment Checks with RRT nurse
Scribe	Records vital signs Records interventions
Parent unit doctor	Provides clinical information Notification of parent unit
Ward support staff	Fetch oxygen cylinder Take urgent blood tests to laboratory Assist with patient transport
RRT nurse	Application of monitoring Assist with assessment Delivery of critical care medications
RRT doctor	Clinical decision making Team leadership Advanced technical skills (e.g.intubation) Liaison with ICU/HDU if admission required

Figure 5.1: Summary of Individual Team Members Assembled During RRT Call



1. RRT team leader
2. Ward doctor
3. Ward nurse
4. RRT nurse
5. Data scribe
6. Ward assistant/scout
7. Nurse in charge

Further reading:

Gillon S, Radford S, Chalwin R, DeVita M, Endacott R and Jones D. Crisis resource management, simulation training and the medical emergency team. Crit Care Resus. 2012; 14:227-235

Siems A, Cartron A, Watson A, McCarter R Jr, Levin A. Improving pediatric Rapid Response Team performance through crew resource management training of team leaders. Hosp Pediatr. 2017 Feb;7(2):88-95

Chalwin R, Radford S, Psirides A, Laver R, Bierer P, Rai S, Knott C, Dyett J, Jones D. Participant perceptions of a rapid response team training course. Crit Care Resusc. 2016;18:283-288

Cooper S, Cant R, Connell C, Sims L, Porter JE, Symmons M, Nestel D, Liaw SY. Measuring teamwork performance: Validity testing of the Team Emergency Assessment Measure (TEAM) with clinical resuscitation teams. Resuscitation. 2016 Apr;101:97-101

Topple M, Ryan B, Baldwin I, McKay R, Blythe D, Rogan J, Radford S, Jones D; Austin Health MET nurse investigators. Tasks completed by nursing members of a teaching hospital Medical Emergency Team. Intensive Crit Care Nurs. 2016;32:12-9

06. KEY PHASES OF A RAPID RESPONSE TEAM CALL

Sam Radford

Overview

Rapid response calls are part of a broader hospital system designed to recognise and respond to clinical deterioration and enhance patient safety. Ideally these calls are conducted in a logical progression and can be envisioned as separate but overlapping phases.

Understanding the phases of an ideal rapid response call can help clinicians understand the differing tasks and focus that they and each of their team members may encounter. Of course, real world events often open up diversions. But a well-informed rapid response team can ensure they come back on track and complete all tasks within a phase before moving on to the next phase.

The phases of a RRT call

Figure 6.1 outlines the key phases that occur in an ideal rapid response call. Each of these phases will be further expanded upon in subsequent chapters. The initiation and resolution of each phase will be influenced by the knowledge and confidence of participants. Education and skills training can be directed to improve performance.

After a call **activation** by ward staff, the RRT will arrive and **assemble**. There will be communication and handover from the ward staff to the responding RRT.

After a period of assessment and initial management by the RRT staff, a provisional diagnosis will be made, and a management plan will be developed and **actioned** in conjunction with the usual treating team. Finally, there will be **disassembly** of the RRT call, which should be an active process. This involves clear communication between the team members and the ward staff about the ongoing plan of management , and who will be responsible for subsequent patient **follow-up**.

Summary

Understanding the key phases of an ideal RRT Call helps to break a complex multi-professional team event down into 'bite size' steps. These phases can be considered individually to best understand the individual and team skills required.

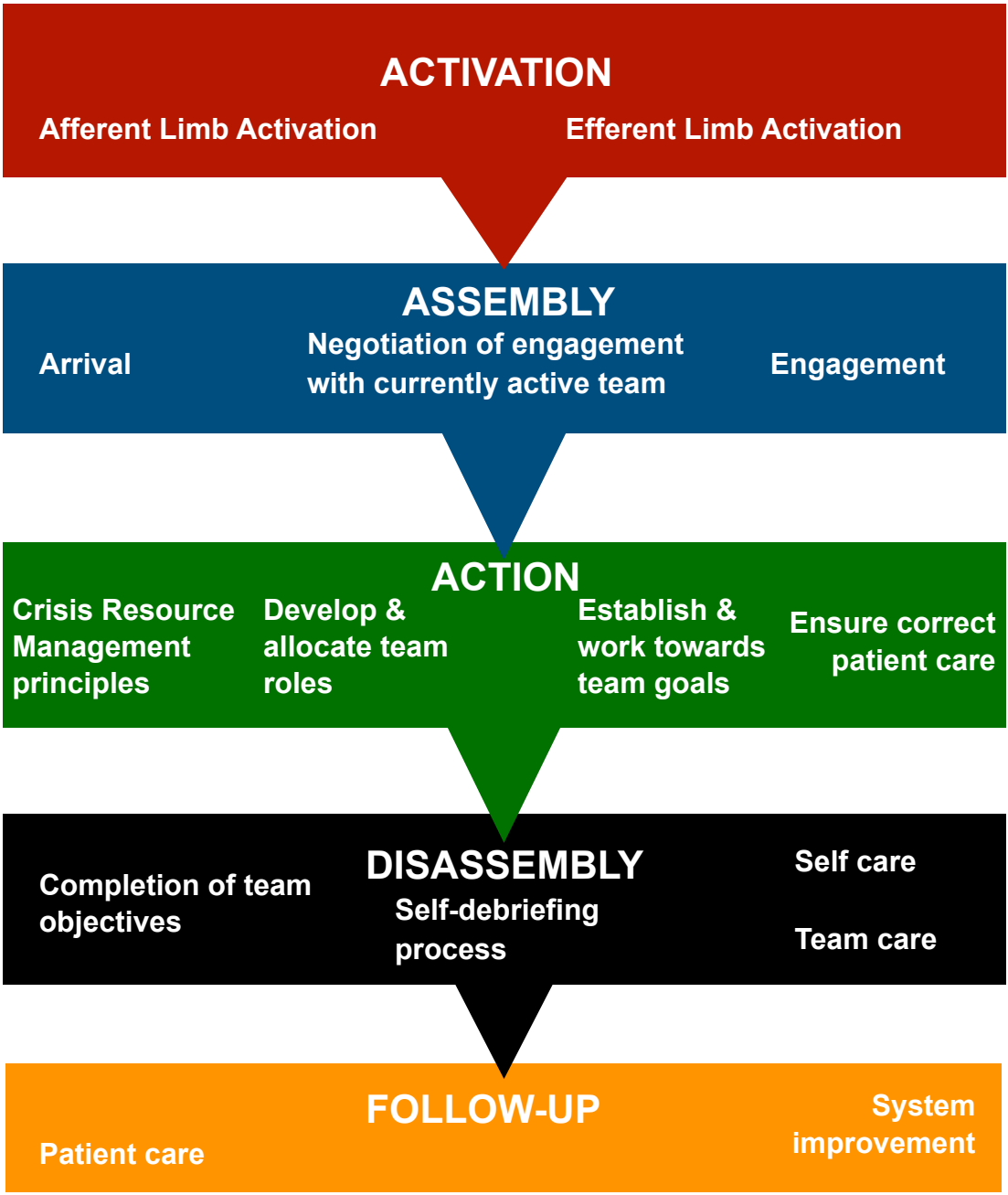


Figure 6.1: Phases of Rapid Response Team processes
(from C.Knott, used with permission)

07. RAPID RESPONSE TEAM ACTIVATION

Sam Radford

“At a cardiac arrest, the first procedure is to take your own pulse.” Law 3, The House of God by Samuel Shem (1978)

Overview

Activation of the rapid response team relies upon clinicians recognising an abnormal physical sign **and** the crucial step of escalating that concern to achieve an appropriate response. This is referred to in the literature, often confusingly, as the 'afferent limb' of the rapid response system. The sickest patients will trigger involvement of the rapid response team (RRT).

Ward staff in the activation phase

Clinical staff on wards experience the 'afferent limb' activation phase very differently to the colleagues that are soon to join them. This may represent a time of significant uncertainty with patient and family unrest. It is a natural response as they are caring for a deteriorating patient whose care needs are likely to exceed their knowledge and skills. Conversely, some deteriorations may be recognised as a predictable event.

The RRT in the activation phase

Activation of the RRT relies upon an efficient, functioning communication system to alert members of the activation.

The ideal communication structures are carefully standardised to reduce undesirable variability. This allows for the best combination of speed and accuracy. An optimal communication process includes:

- a single emergency phone number (standardised across the whole organisation)
- trained call takers with a standardised emergency script
- standardised output from a phone call (often an automated cascade of computer generated pager, text messages or smartphone activations)
- distinctive emergency tones via overhead speakers with a standardised script to communicate the
    - type of emergency response
    - patient location
    - admitting medical team

RRT members are unlikely to be unoccupied, waiting for a RRT call nearby. Instead they are likely to be engaged meaningfully in other clinical or non-clinical activities elsewhere in the hospital campus. In small (often rural) hospitals, some RRT members may not be on campus but summoned from home.

Each RRT member, upon being notified of the call needs to divest themselves from their current activity. Possible exceptions may include being mid-way through a sterile procedure such as a central venous line insertion. Ideally such an eventuality would be recognised in advance and the responsibility transferred to a suitable colleague.

A key part of the activation phase of an RRT call is for team members to know where they are going and how to get there in the most efficient manner possible. Staff

orientation to frequent call locations as well as the far flung and obscure parts of the hospital is crucial for safe and confident RRT performance.

Hospitals built vertically as a tower rely on elevators to move people and equipment between floors. These are a precious resource and are invariably full, on another floor, or out of service when RRT activation occurs. Ideally elevators in hospital should have an override function, either via key or swipe card, that allows clinicians to commandeer the nearest available. Communicating politely with existing passengers regarding the urgency of the situation and reason for diverting the elevator is, of course, a requirement.

Transit time to the RRT call may present some relatively uninterrupted time in which team members may choose to gather their thoughts. Some clinicians choose to review cognitive aides and acronyms such as 'ABCDE' or '4Hs and 4Ts'. Lanyard cards, small handbooks (such as this one) or smart phone apps can prove very handy in these circumstances. Attempts to predict the nature of the RRT call on the basis of its location may be neither accurate or helpful. The sentiments of both 'common things occur commonly', and 'expect the unexpected' may prove to be very apt on occasion.

Summary

Commencing a RRT call requires carefully designed smoothly functioning processes at the bedside as well as the hospital switchboard. Efferent staff should know their way around the hospital, including legitimate short cuts such as elevator overrides. Transit time can be helpful

'thinking time', use it productively. Staff nominated to cover RRT calls must take responsibility for their own availability. Temporarily passing the baton to a colleague is an acceptable way to ensure that staff and patient safety isn’t compromised.

08. TEAM ASSEMBLY

Rick Chalwin, Victoria Eaton

Overview

Rapid response team (RRT) calls are, by their nature, undifferentiated emergencies on previously unmet patients. For emergency physicians, this is their standard working fare. However, RRTs are typically staffed by clinicians from other areas who are accustomed to a controlled environment with a known patient cohort. So, it is natural for RRT members to experience some apprehension and uncertainty at calls until experienced. Even then, RRT calls can be sufficiently challenging that even seasoned team members may still become overwhelmed. Chapter 5 describes some principles of team management that may help overcome this and maintain control, which should be read before the following.

Team Member Arrival

RRT staff typically do not work together outside calls and are usually from several different departments. Therefore, it is almost certain that team members will not all arrive at the call subject simultaneously. This poses the quandary of not delaying assessment and treatment versus the efficiency of handover to, and call commencement by, a complete team. In general, the deteriorating patient needs expedited management, so a safe default is to proceed and dovetail in team building when able.

Triage

An initial screening assessment of the patient should occur as early as possible. One simple but effective model that may be useful is to adopt the first responder's disaster tool. In this, patients are allocated one of five codes:

- **RED:** potential survivor, will die without immediate treatment (e.g. impending airway obstruction)
- **YELLOW:** potential survivor, not immediately life-threatening but will not improve or deteriorate further without treatment soon
- **GREEN:** probable survivor, minor or trivial problems only, treatment is non-urgent
- **BLUE:** moribund and not expected to survive or benefit from active treatment (e.g.: terminal malignancy, in severe respiratory distress)
- **BLACK:** already deceased (e.g. no signs of life, not-for-CPR order in effect)

Classification may be possible simply from an initial report by locally present staff. More usually, it will require assessment by the first team member(s) present. Crucially this does not have to be the team-leader. Although since it is vitally important to triage correctly, this should be performed by an experienced team member. The pathway of care can be forked at this point into patients identified as **RED** and all others.

A primary survey, similar to that employed in trauma settings, is the quickest way of determining this. Its purpose being "the simultaneous assessment for, and

management of, life-threatening reversible [clinical problems]".
If any are found, i.e. a **RED** triage, care is prioritised to urgently stabilising the patient. Other aspects of team-bonding, information gathering and task allocation will need to occur contemporaneously alongside management. Even at this very early stage, disposition of the patient should be considered as managing critically unwell patients in non-acute areas is difficult. The risks of moving an unstable patient versus continuing to work in a resource-limited environment must be weighed up carefully. Early senior assistance or advice will be invaluable.

For all other triage categories, there should be time to assemble the team, obtain handover and allocate role and responsibilities before commencing further comprehensive assessment and treatment. These are detailed as follows:

Ice-Breaking

Due to the ad-hoc nature of the RRT, and especially in large hospitals, it is entirely possible that team members and those calling them will not know each other. Taking a moment for introductions is invaluable to develop rapport. A suggested structure is for the team leader to ask each person present to state their name, designation and whether representing the RRT, ward staff or parent team. Such a request can be repeated for newly arriving staff members to ensure that all present know each other and team expectations can be met.

Receiving Handover

This is one of the most important, yet overlooked, components of any call. To repeat themes from earlier sections, the RRT will not normally know the patient and their journey through the hospital to that point. So effective handover from the current care team will significantly improve team efficiency and help expedite call disposition. The goal should be to negate the need for subsequent, laborious information gathering during the call. There are a number of recognised formats or structures for handover, one of which, ISBAR, is presented here:

I: the ***identity*** of the patient (and person delivering the handover if not already introduced)
S: the current ***situation***, i.e. the trigger or reason for the call, and why the patient is in hospital
B: salient ***background*** co-morbidities, and any treatment limitation orders or end-of-life care plans
A: findings of a recent ***assessment***, especially physiological observations or clinical concerns that triggered the call
R: ***recommendations***, as a voicing of specific concerns that the team should address

The aim should be to deliver this information succinctly and ideally should take no more than one minute. A good guide is to consider what information is absolutely essential and would significantly alter management or call disposition. For example, minutiae about the patient's course in hospital can be summarised into one or two sentences, or omitted completely unless relevant to the call trigger.

The most important piece of information to establish early is the existence and content of any treatment limitation order. This is especially so if the patient is in cardiac arrest on team arrival. If the patient or their proxy has declined cardiopulmonary resuscitation, this must be respected as soon as discovered. Similarly, medical orders precluding certain invasive measures should also be ascertained as soon as possible, and followed unless very clear grounds for revocation exist. Such preferences are often recorded on 'goals of care' or 'treatment escalation plans', the formal documentation of which may vary from hospital to hospital (see chapter 9). If doubt or equipoise exists, senior advice should be sought.

Priority should be given to determining these limitations of treatment but, importantly, should not delay resuscitation efforts.

Getting the ball rolling

At this point it may be useful for the team-leader to concisely summarise the handover and initial objectives for the call. Although the latter may change, it is important to establish a common purpose that the team can work towards. This requires allocation of initial roles and responsibilities. Some systems may have these pre-assigned. Doing so removes this step and team members can immediately commence their initial function after handover. However, in systems where this isn’t in place, the team-leader will need to allocate these. While incurring a small time penalty, this does permit flexibility as the team can be adapted so suit the needs of any call.

Allocation of Roles and Responsibilities

The value of team introductions will become apparent now, as the right task can be allocated to the most appropriate team member. Some key initial goals that are common to most calls include:

1. Obtaining a current set of observations
2. Examination of the patient
3. Obtaining intravenous access or ensuring that existing lines are patent
4. Instituting management to address physiological abnormalities
5. Reviewing the case record and recent investigation results
6. Involving parent or cover clinic medical staff (if not already present)

It is important, though, that the team leader does not allocate themselves specific clinical tasks unless team size or skillset mandate this. This permits maintenance of situational awareness. Thereafter, further assessment and management will depend on the needs of each call. Further material on the handling of certain RRT call 'syndromes' are provided in chapters 13-18.

Summary

Approaching the uncertainty of a RRT call can be daunting. However, a strategised approach should assist with the initial approach to and workup of any patient. Key in this is early triage and expeditious management of life-threatening, reversible emergencies.

Further Reading:

Nocera A, Garner A. Australian disaster triage: a colour maze in the Tower of Babel. Aust N Z J Surg. 1999;69:598-602

Australian College of Emergency Medicine. Australasian College for Emergency Medicine (ACEM) Literature Review on the Australasian Triage Scale (ATS). Accessed September 2018

Chalwin R, Flabouris A. Utility and assessment of nontechnical skills for rapid response systems and medical emergency teams. Intern Med J. 2013 Sep;43: (9)962-9

Gillon S, Radford S, Chalwin R, DeVita M, Endacott R and Jones D. Crisis resource management, simulation training and the medical emergency team. Crit Care Resus. 2012; 14:227-235

Australian Commission on Safety and Quality in Health Care. Safety and Quality Improvement Guide Standard 6: Clinical Handover (October 2012). Accessed September 2018

Jones DA, Bellomo R. Chapter 18, MET: Physician-Led RRTs in: DeVita MA, Hillman K, Bellomo R (eds). Textbook of Rapid Response Systems 2nd edition. Springer. 2017 p.193

09. TEAM ACTION PHASE

Rick Chalwin, Tim Beckingham

Overview

The scope of this chapter is to provide a generic framework of important steps that are common to most RRT calls. It should be read in conjunction with the clinical chapters on MET syndromes (chapters 13-18).

Goals of Care

Early on during a call, and especially in arrest or peri-arrest patients, it is important to establish if any treatment limitation orders are in effect. 'Good faith' protects clinicians who provide treatments contrary to patient wishes while ignorant to those wishes. However, it is hard to defend this when the opportunity to discover these was available but not taken. Similarly, countermanding clinician-initiated treatment limitation orders undermines clinical consensus and risks rapport with consumers.

The RRT may have a role in end-of-life care, especially in sudden patient distress or pain. Such events constitute patient deterioration, even though the goal of care may be palliative. Similarly, the RRT may be activated to a patient without treatment limitation orders, for whom conservative management or palliation is indicated. In such cases, the utility of the RRT attendance is the input of experienced, skilled clinicians with the confidence to make such judgements. The parent team should be closely involved in decision-making, although may need

guidance from the RRT on determining reasonable and achievable goals of care

Disposition

The RRT is a scarce, precious resource. While attending calls, that team is unavailable to other deteriorating patients. So, a key aim should be to disposition the call as soon as practical. This does not imply that short-cuts should be taken or patients abandoned, but calls should not drag on unnecessarily nor the RRT “take over” care of patients from parent teams. To achieve this, a recurring theme during calls should be regular re-triage and assessment of response to treatment. Patients will reasonably fall into one of a few categories. Each naturally tends towards an appropriate choice between:

- '*Stay and play*': RRT continues care in-situ
- '*Swoop and* ': RRT transfers patient to a higher acuity area, or for investigation or a procedure.

The objective is to conduct care in the most appropriate location by the most appropriate team. This may be obvious early on, or some care may be required to determine responsiveness to treatment. Certainly, there is no gain in moving patients if their care needs can be met on the ward. Conversely, it is counterproductive to deliver critical care in resource-poor areas. For example, unless the patient is at imminent risk of death without an invasive procedure, it is safer to urgently move the patient to a higher acuity area and perform it in that well-equipped setting surrounded by experienced, familiar colleagues. Table 9.1 lists disposition by triage category.

Table 9.1: Disposition by patient triage category

PATIENT STATE	DISPOSITION
RED •Not expected to respond with RRT treatment alone, or •Expected to need ongoing critical care, or •Significant deterioration despite treatment	Expedite transfer to appropriate care area or for further investigation or procedure (unless treatment limitation precludes this)
YELLOW •Expected to respond to RRT treatment alone, or •Responding to RRT treatment, or •Not requiring ongoing critical care	Continue treatment in current area Regularly re-triage aiming to transition to **RED** or **GREEN** status as soon as possible
GREEN •Responded to RRT treatment, or •Not requiring RRT ongoing treatment •Care needs can be met by ward team	Stand-down RRT Handover to parent team
BLUE or **BLACK** •Moribund, peri-arrest or arrested in setting of treatment limitation order	Assist with palliation if necessary Stand-down RRT Handover to parent team

Time-Keeping

There are no hard and fast rules for ideal RRT call duration. As per discussion of goals of care and disposition, the team should regularly evaluate their presence and whether it is necessary to remain with the patient or in that location.

In general terms, within 15 minutes a second or third triage assessment should provide enough information to disposition many calls. At the 30 minute mark, most calls should be resolved. If this doesn't seem possible, escalation to seniors will facilitate decision-making and disposition.

Escalation and Referral

There is a tendency for the RRT to be viewed as an independent service, rather than a continuum of hospital care teams. The presence of parent team or ward staff at calls is essential. They know the patient and their involvement provides continuity of care, especially if the patient is to remain on the ward at completion of the call. Therefore, a representative from the parent or cover team should routinely attend all calls on their patients. If this does not occur, it seems reasonable for the RRT leader to urgently request their input or attendance.

The RRT typically comprises high performing clinicians with multiple competencies and capabilities. However, the team should remain mindful that they are not an island. Instead, an open culture of seeking advice and external input is encouraged. Senior or second opinions are valuable to guide decision-making; specialist opinions

can provide useful insights to guide clinical management and disposition.

It should be seen as a sign of clinical maturity to seek help when necessary. Calling for help is never inappropriate.

Logistics

Clinicians tend to focus on patient care. This is reasonable, but the RRT needs to consider logistics too. Mostly this will apply during patient transfers, but it also becomes important at calls in very resource limited or non-clinical locations.

Seek assistance from hospital coordinators and orderlies. They will have a good understanding of resources and can obtain necessary equipment or supplies. When transferring patients, they will have the competencies to safely physically handle patients and will know the quickest routes through the hospital.

Bringing such non-clinicians into the team management is vital. The RRT does not need to specify how to achieve required tasks, but more state the objective and then rely on their expertise.

Team-working

This is, of course, one of the most crucial and applicable aspects of the RRT patient attendance. Developing and using non-technical skills will optimise team performance. Chapter 5 (Principles of Team Management) provides comprehensive guidance on this.

Table 9.2: Suggested generic call checklist	
Goals of Care	What care would be appropriate for the patient? Is there a treatment limitation order?
Disposition	Is the patient expected to respond to treatment? Is this the best location to manage the call or should they be transferred? Is the patient responding as expected to the treatment?
Time keeping	**15 min check:** if the call cannot be stood down, why not? **30 min check:** if the call cannot be stood down, seek senior or second opinion
Escalation & Referral	Is a representative from the parent team and/or ward present? Would a senior or second opinion be helpful? Would another specialist opinion be helpful?
Logistics	Is an orderly required? Is an orderly present? Are additional supplies or equipment required? Can the patient be safely transferred if this becomes necessary? How will the patient get to their required destination?

Further reading:

Gillon S, Radford S, Chalwin R, DeVita M, Endacott R and Jones D. Crisis resource management, simulation training and the medical emergency team. Crit Care Resus. 2012; 14:227-235

Jones DA, Bellomo R. Chapter 18, MET: Physician-Led RRTs in: DeVita MA, Hillman K, Bellomo R (eds). Textbook of Rapid Response Systems 2nd edition. Springer. 2017 p.193

Tan LH, Delaney A. Medical emergency teams and end-of-life care: a systematic review. Crit Care Resus. 2014;16:62-8

Jones D, Duke G, Green J et al. Medical Emergency Team syndromes and an approach to their management. Crit Care. 2006 Feb;10(1):R30

Bergmeir C, Bilgrami I, Bain C et al. Designing a more efficient, effective and safe Medical Emergency Team (MET) service using data analysis. PLoS One. 2017;12(12):e0188688

10. TEAM DISASSEMBLY

Rick Chalwin, Victoria Eaton

Overview

Rapid response teams (RRTs) are a precious resource. Most hospitals only roster one available team, and typically staff are not supernumerary. This means that when the RRT is attending a call, there is diminished capacity to attend other calls or other clinical duties. Therefore, one priority for the team is to achieve successful resolution of the call as soon as reasonably possible.

This does imply that shortcuts should be taken or standards compromised. However, the RRT should avoid being drawn into aspects of care delivery or management beyond the remit of the Rapid Response System or taking over care that is the responsibility of the ward or parent clinical team. Therefore, a careful “stand down” of the deteriorating patient response is essential.

Disposition

Comprehensive discussion on this can be found in the previous chapter. It becomes increasingly important to address towards the Disassembly phase of calls. Certainly, the RRT should not simply disband without a clear plan for ensuring patient management continues in an appropriate location.

In general terms, the patient disposition from most RRT calls will be one of:

1. Upgrading to higher acuity care
2. Remaining in the current care location or level
3. Transfer to another department or hospital for a procedure or intervention

It is important to determine this as soon as practically possible. At some calls this may be patently obvious very early on (e.g. acute airway obstruction requiring immediate intubation). At others, some period of observation may be required to ascertain the patient response to treatment prior to determining the appropriate call outcome.

Decision-making

As with most clinical scenarios, involvement of seniors including those from the parent team to facilitate decision-making is invaluable. Questions to ask oneself include "do I think this patient will trigger another call today?" and “will the parent team be able to look after this patient if we leave?"

There are many competing priorities around deciding which patients should have their level of care upgraded. Clinical needs must be balanced against hospital operational efficiency. If doubt exists, it is always safer to upgrade care for deteriorating patients. A reasonable mentality is to default towards taking any RRT call inpatient to a higher acuity area unless clinical sense dictates it is safe to leave them on their base ward. A converse attitude risks repeat calls to the same patient and unmet care needs in between.

Upgrading care to higher acuity

This is indicated if the patient's current or expected clinical needs cannot be met in their base ward, and in the absence of a precluding treatment limitation order. Higher acuity destinations include the intensive care unit, high dependency unit, coronary care unit or other designated acute area. The clinical diagnosis, level of support treatments and physiological state will dictate which is appropriate.

'Stay and play' vs 'scoop and run'

This is a concept familiar to retrieval medicine. It may be tempting to aim to completely stabilise a critically unwell patient prior to moving them. This may even seem logical, as however limited resources and patient access may be on the ward, it will be lower when travelling down corridors.

Experience and evidence from the pre-hospital arena shows the opposite. Any risks, and they are very real, from transporting a fragile patient are mitigated by the high level of care available at the destination. And some patients simply cannot be stabilised in the ward setting.

There may also be times when invasive procedures can't wait. But this must be weighed up in the knowledge that performance may suffer in an unfamiliar area with limited equipment and staff. Some examples include hand-bagging the patient to intubate in ICU or performing CPR en route to initiate emergency ECMO.

Overall, an ethos that the patient is too sick to ***not*** transport is worth considering.

Remain in current ward

Leaving the patient in their current care area requires careful planning and handover to prevent further deteriorations and repeat calls.
It would be unusual for a RRT subject to require no ongoing care beyond the call. Rather the patient is likely to need further medications, fluid therapy and investigations. To achieve this, a clear 'baton pass' to the ward team must occur. Ideally this would be multi-disciplinary and at a reasonably senior level. The goal should be to ensure continuity of care after standing down of the RRT response.

Handover

Similar to its use in the assembly phase, a suggested format for the handover can be:

I: the ***identity*** of the patient (and both those releasing and accepting care of the patient)
S: the current ***situation***, i.e. the trigger or reason for the call, and why the patient is in hospital
B: salient ***background*** co-morbidities, and any treatment limitation orders or end-of-life care plans
A: findings of the RRT ***assessment***, especially the causative factor(s) for the call and treatment delivered
R: recommendations, as the ongoing plan to be followed after RRT stand down

Clearly the latter is the most important at this stage. As covered above, continuity of care is crucial. It may well be that the receiving team who will be taking over care were not present during the call. Handover should emphasise and prioritise key ongoing clinical issues that must be addressed.

Read back

A comprehensive handover is wasted if the receiving team has not correctly received and interpreted that information. A form of closed loop communication – read back – is useful here. This requires the receiving clinicians to relay back their understanding of the recommendations provided by the RRT. If any inconsistencies or inaccuracies are encountered, this allows for correction and reinforcement.

The goal is task minimisation for the RRT. As deficits in handover may result in repeat calls or, worse, omission of essential care delivery by the receiving team. Therefore, responsibility for post-call care rests with the RRT as much as those accepting care of the patient.

Documentation

Medico-legally, anything not recorded is presumed to have not happened. A full written account of any RRT is essential. This can be by any member of the team and doesn't necessarily have to be by the team leader. However, it is the responsibility of the team leader to ensure that the notes accurately reflect the assessment and management of the RRT.

Good documentation also assists to reinforce the recommendations handed over to the receiving team. This should emphasise in unequivocal terms the plan for the patient along with an explanation of clinical concerns. This will allow any clinician subsequently following up the RRT call to ascertain what is necessary for that patient.

Some useful information to record includes:

- Care delivered and completed during the call
- Care or investigations initiated during the call and awaiting completion or follow-up by the receiving team
- Suggested care that could not be initiated by the RRT due to time or resource constraints
- Contingencies in the event of further deterioration (especially where the patient will remain on their current ward)
- Contact details for senior clinicians overseeing the receiving care team.

Debrief

RRT calls can be highly stressful for attending clinicians. This is especially so in paediatric and obstetric cases or when the patient dies at the calls despite best efforts by the team. In this setting, a debrief may prove useful in assisting mental health for the team and assuaging doubts.

There is often a pressing need for team members to return to rostered duties or transport the patient. This typically results in an unordered disbanding of the team and no formal recognition of the quality care delivered.

If time permits, debrief should be done at completion of calls. Where this isn't possible, the team can arrange to reform at a mutually convenient time. The crux is to ensure the psychological wellbeing of the team and avoid the post-traumatic stress disorder that can ruin careers.

Summary

The close of any RRT call is a time of potential vulnerability for the patient. Thorough handover and a formalised passing of care responsibility will ensure continuity of high quality care and prevention of further deterioration.

Further Reading:

Gillon S, Radford S, Chalwin R, Devita M, Endacott R, Jones D. Crisis resource management, simulation training and the medical emergency team. Crit Care Resusc. 2012 Sep;14(3):227-35

Calder L, Forster A, Steill I et al. Mapping out the emergency department disposition decision for high-acuity patients. Ann Emerg Med 2012;60:567-76

Standard 6: Clinical Handover. Safety and Quality Improvement Guide. Australian Commission for Quality and Safety in Health Care, October 2012

Jones DA, Bellomo R. Chapter 18, MET: Physician-Led RRTs in: DeVita MA, Hillman K, Bellomo R (eds). Textbook of Rapid Response Systems 2nd edition. Springer. 2017 p.193

11. FOLLOW UP AFTER THE RAPID RESPONSE TEAM CALL

Sam Radford

Overview

After the immediate care of the rapid response team (RRT) call is completed there may be reasons for some team members to return and review progress. Such follow-up visits have the potential to positively influence patient care, staff education and well-being as well as contributing to hospital systems improvement.

Care of the Patient

The vast majority of RRT patients remain in their existing location of care. The on-going care of these patients remaining in the ward is the primary responsibility of the admitting team. There may however be a role for repeated review (in a non-urgent context) by members of the RRT or other ICU outreach and liaison services if time and resources allow.

RRT events can generate new diagnostic hypotheses as well as new treatment interventions. Like many medical hypotheses these may well be inaccurate. Instead diagnoses (and by extension prognoses) become better defined with longitudinal review of the patient and their salient investigation results.

If at all possible building in a system of review of patients that have had an RRT event can have benefits for the patient and their family, the local team delivering care and RRT responders. Table 11.1 lists some questions that might be suitable to follow up with patients and staff as well as possible benefits.

Table 11.1: Potential benefits of RRT follow-up

Whom to follow up with	Potential questions	Potential benefits
Patient & Family	Have symptoms resolved? Do they have any questions or concerns regarding their RRT call?	- Confirmed physiological stability or improvement - Check on psychological impact of emergency intervention - May help initiate a broader discussion about goals of care.

Ward Nursing Staff	Do they feel that patient & family are comfortable? Have vital signs improved? Have the RRT triggers been adjusted? By what amount, for what duration, is this safe? Have goals of care been clarified between home team, patient & family?	- Physiological stability - Early recognition of potentially unsafe adaptations to RRT triggers - Early recognition of differing expectations about goals of care - Potential for moral and educational support of ward colleagues
Admitting Medical Team	How do they feel the patient is doing? Is there more diagnostic certainty now (changing signs, relevant test results)? Is there agreement between treating team(s) & patient around goals of care? Is there a role for further RRT calls or similar escalation?	- Clarification of diagnosis - Clarification of expected clinical trajectory - Ensure proper documentation of goals of care - Potential to model excellent team care focussed on patient wishes - Potentially reduce the number of repeated RRT calls if unlikely to be beneficial to patient

Follow-up can be considered a form of secondary prevention (like taking aspirin after a myocardial infarction) for further deterioration. This is a valuable activity that has the potential to improve patient and family experience, as well as staff experience and unplanned emergency workload.

Investing time and resources in such follow-up can be highly variable. Table 11.2 lists some possible staffing models by which this could be achieved.

Table 11.2: Possible follow-up staffing models

Possible follow-up strategies	Benefits	Drawbacks
No routine follow-up	No immediate cost to efferent team	Ongoing reliance on busy ward teams as sole detector of potential and actual deterioration
Ad hoc follow-up	Potential to direct follow-up efforts to patients that RRT staff identify as needing follow-up	Variability in clinical service. May vary between different staff and days of the week. Relies on RRT expertise to identify patients that may benefit from follow-up
Targeted follow-up (objective scoring system)	Direct follow-up to all RRT patients that meet relevant criteria	Requires dedicated staff to apply scoring system as well as deliver follow-up
Routine Follow-up	All RRT patients are followed up routinely after events, such as by ICU Liaison Nurse the following day	Requires dedicated staff to see all patients including those with limited benefit from such an intervention.

Care for the Team

Following up with fellow team members may provide an opportunity to help with staff education and general well-being. Many RRT interactions can leave staff with substantial concerns regarding their own knowledge and performance. Additionally, when invasive and uncomfortable therapies are delivered for very little patient benefit there is a real risk of staff feeling a degree of 'moral injury'. Senior follow-up by nurses or doctors with relevant expertise and clinical credibility may identify and close any gaps in understanding and performance that were troubling staff.

Identifying and Improving Systems Issues

RRTs are designed to provide a safety net for patients with failing physiology. In many cases the failed physiology is the end result of hospital systems that limit the capacity to appreciate or predict the potential for deterioration. In some RRTs it may be apparent to senior staff that certain practices or processes have made patient deterioration more likely. If such a 'system issue' is diagnosed, there is a responsibility for the RRT staff to help initiate a quality improvement process. This may be as simple as discussing concerns and possible solutions with a senior team member such as the local Nurse Unit Manager. Alternatively, it may require more formal notification of actual or potential risk via dedicated reporting systems

Summary

Providing follow up visits to RRT patients and locations has the potential to deliver substantial positives to patients, their family, the staff providing care as well as general hospital systems improvement.

Further Reading:

National consensus statement: essential elements for recognising and responding to acute physiological deterioration, Second Edition. Australian Commission for Quality and Safety in Health Care, January 2017

12. HOW TO APPROACH CLINICAL DETERIORATION

Alex Psirides, Jennifer Hill, Laurence Walker

Responding to acutely deteriorating patients often involves working with uncertainty. This commonly occurs in an environment where familiar resources or expertise may not be immediately available. A structured approach to such potentially serious events will enable rapid assessment, diagnosis and treatment. Unlike an undifferentiated patient who may present to the Emergency Department, most patients who deteriorate in a ward environment have been admitted for more than 24 hours. As such, they have often deteriorated *despite* being treated for their admitting condition.

Therefore it is worth considering whether one of the following issues is responsible for the rapid response team (RRT) being activated:

- *the patient has deteriorated despite the correct treatment*
- *the treatment or admitting diagnosis is wrong*
- *the patient had deteriorated as a consequence of a treatment or procedure*
- *the patient has developed a new problem*

Patients with multiple co-morbidities and/or treatments are more at risk for adverse events or interactions of medication.

Deterioration that is significant enough to require RRT review is, not surprisingly, predictive of adverse outcomes. These include subsequent ICU admission, cardiac arrest or death. Mortality is significantly increased both in hospital and for up to 30 days after review with rates reported of between 20-30%. Teams should therefore consider if the patient is dying, and whether it is possible or prudent to try to stop them. A suggested basic approach is outlined in Figure 12.1.

An analysis of the epidemiology of RRT patients shows recurrent themes relating to both triggers for team activation and the underlying clinical cause of deterioration. Outcomes can be similarly classified. The recognition of recurrent triggers allows RRT reviews to be classified into specific 'syndromes'. Awareness of these facilitates pattern recognition, allowing rapid focussed diagnostics with simultaneous treatment. Several studies have described five reasons for RRT calls that cover almost all episodes of acute clinical deterioration. In order of decreasing frequency (most common first), these are:

- Hypoxia
- Hypotension
- Altered conscious state
- Tachycardia
- Tachypnoea

Sepsis, cardiogenic shock, pulmonary oedema and arrhythmias are the most commonly seen underlying clinical causes. Approaches to specific RRT syndromes are covered in chapters 13-18.

As with the 'ABCDE' approach to resuscitation (Airway, Breathing, Circulation, Disability, Exposure), an alphabetical '**A to F**' framework for guiding the management of an RRT call is recommended:

- **Ask** ward staff the reason for the call. **Assess** the patient for **aetiology** and reversibility of deterioration. **Ascertain** the existence of an **advance** care plan or goals of care documentation
- **Begin basic** resuscitation including supporting airway, breathing and circulation if required. Perform a more thorough assessment after any immediate life-threatening problems have been addressed. This includes a review of the vital signs chart, patient notes and relevant investigations conducted so far
- **Call** for help early if required (such as specialist skills not immediately available, senior support with decision making - particularly around end-of-life recognition and management). **Communicate** with the patient, their family and carers, and ward staff as you investigate and treat the underlying cause
- **Discuss** the patient with the relevant medical staff (including the primary or on-call team if not present). **Document** the reasoning and actions of the RRT including ongoing issues that the primary team should address. This includes clear notification of any treatment limitation that may have been initiated by the RRT. **Decide** the

disposition of the patient at the end of RRT review. If they are to remain on the ward, ongoing management should be handed over to the relevant nursing and medical teams; if they require more intensive care, consider transfer to an area where this can be provided (such as a High Dependency or Intensive Care Unit). **Disposition** may include interhospital transfer if such facilities are not readily available on-site

- **Explain** the reason for the call and subsequent management plan to the patient and their family or next of kin
- Arrange **follow-up** of the patient if appropriate, either by the primary team or with an ICU Liaison Nurse, Outreach or Patient At Risk service if available.

All of the above should be conducted in a polite, supportive and professional manner. It has been demonstrated that rudeness during clinical emergencies has an adverse effect upon staff performance. Any behaviour by RRT members that may discourage ward nurses or other clinicians from calling for help in the future is a patient safety risk and may need to be addressed through the relevant RRT governance process.

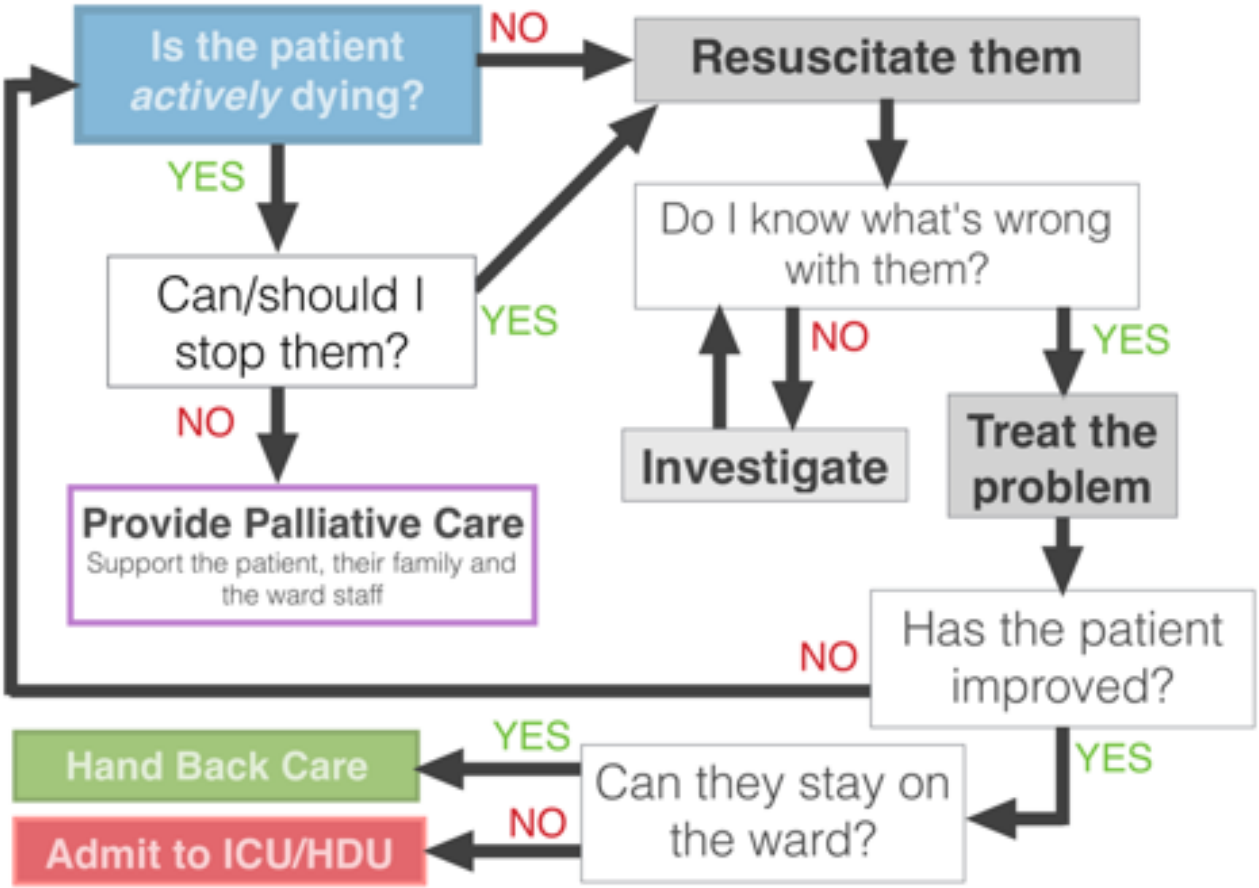


Figure 12.1: A recommended approach to the RRT call (begin at blue box)

Further Reading:

R. J. Smith, J. D. Santamaria, E. E. Faraone, J. A. Holmes, D. A. Reid, A. E. Tobin. The duration of hospitalization before review by the rapid response team: A retrospective cohort study. Journ Crit Care. 2015 Aug; 30(4):692-697

D. Jones, I. Mitchell, K. Hillman, D. Story. Defining clinical deterioration. Resuscitation. 2013 Aug;84(8): 1029-1034

A. Psirides, J. Hill, D. Jones. Rapid Response Team activation in New Zealand hospitals - a multicentre prospective observational study. Anaesthesia and Intensive Care Medicine. 2016 May;44(3):391-397

D. Jones. The epidemiology of adult Rapid Response Team patients in Australia. Anaesthesia and Intensive Care Medicine. 2014 Mar;42(2):213-219

D. Jones, G. Duke, J. Green, J. Briedis, R. Bellomo, A. Casamento, A. Kattula, M. Way. Medical emergency team syndromes and an approach to their management. Crit Care. 2006 Feb;10(1)

C. F. Mullins, A. Psirides. Activities of a Medical Emergency Team: a prospective observational study of 795 calls. Anaesthesia and Intensive Care Medicine. 2016 Jan;44(1):34-43

A. Riskin, A. Erez, T. A. Foulk, A. Kugelman, A. Gover, I. Shoris, K. S. Riskin, P. A. Bamberger. The impact of

rudeness on medical team performance: a randomized trial. Pediatrics. 2015 Sep;136(3):487-495

13. MANAGEMENT OF THE PATIENT WITH RESPIRATORY DISTRESS

Sam Radford

Overview

Tachypnoea and respiratory distress are common triggers for RRT calls. Applying a structured approach to the simultaneous assessment and management of these clinical encounters is strongly recommended. In this chapter a 'top to toe' framework is outlined for assessing the many possible aetiologies.

The treatment options for dyspnoea are largely focussed on relieving distressing symptoms (with oxygen therapy, ventilatory support or low dose parenteral opiates) whilst treating an underlying cause if possible. A technical knowledge of oxygen and ventilatory supports and how to assess their limits and efficacy is an important skill for rapid response team (RRT) leaders to develop.

Immediate assessment and management

Any RRT member walking into a dyspnoeic patient's room is usually confronted with a wealth of powerful information. The room itself can have numerous clues (audible O2 therapy, patient seated or reclined, sputum cups or suctioned secretions). Immediate inspection of the patient should assess the level of objective patient comfort or distress, as well as for relevant clinical signs (such as respiratory rate). As with all RRT reviews the

routine early establishment of ECG and SpO_2 monitoring in addition to repeated observations is recommended. All dyspnoeic or tachypnoeic patients should have oxygen therapy commenced as early as possible. Only in patients with proven CO_2 retention is it reasonable to pursue lower oxygenation goals (such as targetting SpO_2 88-92%). If in doubt, start O_2 therapy and titrate once arterial or venous blood gas results are known.

Knowledge

Tachypnoea is an objectively measured respiratory rate (RR) above normal. The use of a relatively sensitive RR trigger for RRT activation (i.e. 25 breaths per minute for adults) or an appropriately weighted early warning score (EWS) that also includes a hypoxaemia score is strongly recommended. Many EWS systems (including the New Zealand Early Warning Score) also score supplemental oxygen administration so any patient who is both hypoxaemic **despite** oxygen is escalated more quickly; additionally so if also tachypnoeic.

In contrast dyspnoea is a subjective and distressing phenomenon experienced by a conscious patient who feels either 'air hunger' or that their breathing is 'laboured'.

While tachypnoea and dyspnoea usually overlap in many clinical syndromes it is entirely possible that one can be observed or experienced without the other.

Tachypnoea (with or without the sensation of dyspnoea) is a response that our bodies make to a range of changes or

insults. The main drivers for an elevated RR are hypoxia, low pH (either by metabolic or respiratory pathways) or by cerebral inputs (anxiety or conscious control).

We recommend using a simple 'top to toe' anatomical approach (shown in Table 13.1) to considering contributory causes when assessing patients at an RRT with an elevated RR. When considering each possible aetiology, it is helpful for the team leader, the team and of course the patient to think out loud. This clear demonstration of a systematic approach can have the benefit of building confidence and sharing expertise. It can also allow for efficient delegation of examination tasks with clear, closed-loop communication bringing the findings back to the team generally and the leader specifically.

Table 13.1: Anatomical model for evaluating possible causes of tachypnoea at RRT call

Site	Possible Cause	Supportive Findings
Cerebral cortex	Injury (stroke, trauma)	History Localising neurology Scars
Cerebral cortex	Pain or anxiety ***(apply this label cautiously, and only after ruling out other causes)***	History Agitation Tachypnoea, Somatic pain

Brainstem	Injury (stroke, trauma)	History Coma Neurologic findings
Upper airway	Anatomical obstruction (mass, foreign body)	Very anxious Patient positioning (propped up) Audible stridor (listen) Targeted evaluation of oropharnyx (look +/- feel)
Upper airway	Physiologic obstruction (loss of control, stroke, obstructive sleep apnoea)	Noisy breathing Decreased GCS Less likely to demonstrate anxiety Lateralising neurological findings (facial droop, hemiplegia)
Lower airways	Fixed or dynamic obstruction (broncho-constriction, compression)	History Wheeze Metered-dose inhalers
Lung parenchyma (loss of gas exchange)	Infection (pneumonia)	Fevers Sweats Sputum changes Dull percussion note Consolidation on CXR

Lung parenchyma (loss of gas exchange)	Pulmonary oedema	Features of CCF (especially LV dysfunction) Features of acute myocardial ischaemia Murmurs (especially pansystolic murmur of mitral regurgitation) Fluid balance chart (look for increased intake +/- oliguria)
Lung parenchyma (loss of gas exchange)	Pulmonary haemorrhage	Haemoptysis History of related cause (lung cancer, bronchiectasis, viral pneumonia, pulmonary embolus)
Loss of lung perfusion (VQ mismatch)	Pulmonary embolus	History of DVT/PE Risk factors for DVT/PE Syncopal episode (massive PE)
Pleural spaces (loss of ventilation)	Pleural effusion Pneumothorax Haemothorax	History Auscultation (absent breath sounds) Percussion note changes

Chest wall	Rib fractures (+/- flail chest)	History of trauma (including coughing in frail patients) Paradoxical chest wall movement (segment 'sucking in') Tenderness on palpation
Chest wall	Neuromuscular	History (spinal injury, motor neurone disease) Abnormal respiratory movements ('abdominal rocking')
Below the diaphragm (metabolic acidosis)	Metabolic acidosis (non-anion gap)	SpO_2 may be normal Excess chloride from 0.9% NaCl administration Check ABG

Below the diaphragm (metabolic acidosis)	Metabolic acidosis (elevated anion gap)	SpO_2 may be normal Check ABG & consider **LTKR** **L**actate: any shock state. Specific vascular bed insufficiencies (hepatic or intestinal ischaemia) **T**oxins: history of overdose, check medications **K**etones: first presentation type 1 diabetes (sweet breath, high BSL, polyuria, polydipsia, weight loss, usually young), known type 1 diabetes **R**enal: Marked renal failure (chronic or acute)

Technical Skills and familiarity

Knowing how well a patient is coping and how much reserve they have left for further compensation requires an understanding of the level of support they are receiving.

Supported ventilation (the act of moving air in and out to get rid of CO_2) is best performed by trained critical care staff with specific expertise. Supported ventilation in the context of an RRT might include bag-valve mask ventilation or the use of a mechanical ventilator (usually via a nasal or face mask (but occasionally via a tracheostomy). The main variables for assessment are level of pressure, volumes achieved, patient tolerance of ventilatory support and measures of success or failure such as a decreasing CO_2 or respiratory rate.

Supported oxygenation is much more frequently seen in RRT events (regardless of whether the patient is also receiving a degree of ventilatory support). Having a quick pragmatic understanding of just how much additional oxygen support is provided by different oxygen therapies is essential for staff leading RRTs to master. Table 13.2 provides a very approximate guide to common oxygen delivery modalities. Oxygen delivery strategies are essentially a combination of both device factors (flow rate and seal) and patient factors (minute volume generated by patient, percentage of atmospheric air diluting the delivered oxygenation).

In situations with little to no seal (such as the Hudson mask) and minute volumes that greatly exceed the O_2 flow being delivered (e.g. O_2 at 6L/min and a minute

volume of 20L/min) then the overall oxygen fraction of gas breathed in will not be greatly elevated above 21%.

Such a pragmatic understanding can help teams realise the limits of patient reserve that the current treatment modality may be doing a good job of masking.

Table 13.2: Oxygen delivery devices & nominal fraction of inspired oxygenation

Mode of delivery	Range of FiO_2 delivered
Nasal prongs	25-40%
Hudson mask	35-50%
Enhanced Hudson mask (higher O_2 flow rate or increased reservoir via non-rebreather bag). Also potentially via high-flow nasal prong devices	40-60%
Non-invasive ventilation (including bag-valve mask)	Up to 100% (with a good seal) Markedly reduced if any mask movement
Endotracheal tube	100% (with a good seal)

Quick and comfortable arterial blood gas sampling is an essential skill for RRT members to develop. Likewise experience with setting up both the fit of a non-invasive ventilation mask and the initial ventilator settings is a crucial team skill along with an understanding of both continuous positive airway pressure and bilevel positive airway pressure modes. This expertise is most commonly found in experienced critical care nurses or physiotherapists.

Additional skills for pneumothorax management, ranging from emergency needle decompression (for tension) to chest drain placement should also be available to the team.

Non-technical and team skills

Providing meaningful reassurance and symptom relief to patients in respiratory distress is a crucial skill as most will have a strong element of anxiety or panic. Successfully managing this aspect of an RRT can help settle patients, their family and all team members. Careful, calm, but confident interactions may prevent additional anxiety from further exacerbating an already unstable clinical situation.

A dyspnoeic RRT call is a particular clinical situation where the specific expertise of respiratory physiotherapists can be very useful. Recognising the limits of the RRT team is crucial for the small number of dyspnoeic RRTs that end up with endotracheal intubation. Senior critical care input is recommended if the possibility of intubation is being considered. Many circumstances will favour bringing the expertise to the patient's location.

Other situations will be best managed by relocating the patient and many of the RRT members to a specific critical care environment to best optimise the chances of safe intubation.

Further Reading:

Cretikos MA, Bellomo R, Hillman K, Chen J, Finfer S and Flabouris A. Respiratory rate: the neglected vital sign. Med J Aust. 2008;188 (11):657-659.

14. MANAGEMENT OF THE PATIENT WITH ALTERED CONSCIOUSNESS AND NEUROLOGICAL DETERIORATION

Sam Radford, Michelle Topple

'*Cogito ergo sum*'
(I think; therefore I am)
René Descartes, Discours de la méthode,1637

Clear and consistent communication

Thinking and awareness of one's own existence, sensations and surroundings is the essence of consciousness. Few have expressed it as clearly as 17th century French philosopher René Descartes. Communicating the many gradations of consciousness remains a constant challenge for clinicians.

There is a multitude of possible synonyms to explain decreased conscious state including: stupor, obtunded, drowsy, unrousable, sluggish, slumber, blackout, syncope and faint. These all have a range of possible interpretations making them highly unsuitable for clinical communication.

To ensure this important clinical presentation is not underestimated we recommend the use of a single

phrase, 'coma' (from the Greek κῶμα, meaning 'deep sleep') to describe a decreased conscious state. This phrase captures the required severity and reduces ambiguity.

The next challenge is the choice of a structured assessment tool to assess grades of change. Such a tool needs to be understandable, reproducible and validated in the patient population to which is is applied.

The Glasgow Coma Scale (GCS) has the advantage of being widely taught and understood by the majority of clinicians. With practice it can be used consistently. It is not however, a validated tool for all types of coma assessment. Rather it was developed in 1974 for the assessment of head trauma and has not been modified since. Despite this limitation it represents a practical and effective tool for RRT clinicians to master for assessing patients with a wide array of neurologic insults. We strongly recommend that RRT members, and indeed ward-based staff practice assessing and communicating the GCS to aid in clear communication of a patient's current state and progress.

Using the GCS is much more than just communicating a single number out of fifteen. Rather, the communication of the three constituent parts (eyes, speech and motor) provides a far more valuable and clearer picture of a range of presentations.

An alternative system in common use in Australasian hospital wards is the AVPU score. This divides patients by their level of response to stimuli including **A**wake and alert, responding to **V**oice, responding to **P**ain, and **U**nresponsive. AVPU is also the preferred neurological scoring system in many early warning score systems that may lead to RRT activation. While such a system may be appropriate for quick communication of the severity of neurological deterioration, we recommend the more granular GCS score be used in the RRT situation.

Team assembly

Upon arrival at any RRT understanding the reason for the call trigger is important. Obtaining this information from the patient, family and local clinical team in a constructive supportive manner is the first task upon arrival. Some decreases in conscious state are both marked and sustained. These circumstances will present the arriving team with an obviously comatose patient. This may well mean that even the initial discussion of why the RRT was called is deferred or handled simultaneously to the immediate priority of ensuring a safe airway and breathing. Such a situation should be recognised as especially risky and should be escalated if necessary to ensure appropriate airway trained staff are available. An approach to assessment and management is outlined in Table 14.1

Decreased consciousness may also be transient and have resolved substantially before the RRT members assemble. Such a presentation allows for a little more time in communicating the clinical course and concerns before launching into hands-on management.

Goals of care

Decreased conscious state RRTs may well need to escalate to invasive critical care therapies such as intubation for airway protection and ongoing mechanical ventilation. Given this possibility, these RRT calls require the early delegation of a team member to identify the up to date agreed goals of care for this particular patient early in the RRT response.

Even in patients with a focus on comfort care (and not invasive life supporting therapies), some simple manoeuvres to protect the airway such as patient positioning and clearing obvious obstructions (secretions, food, dentures) may be entirely appropriate.

Table 14.1: Simultaneous assessment & management for RRT patients with decreased conscious state	
A: Airway (with attention to cervical spine protection)	•Positioning •Head tilt •Jaw thrust •Clear the oropharynx •Consider in-line immobilisation •Escalate and call for help early if intubation being considered
B: Breathing	•Oxygen •SpO_2 monitoring •Look for pattern of breathing – is there evidence of airway obstruction or apnoea?
C: Circulation	•Feel the pulse •Examine ECG •Obtain blood pressure and compare to baseline
DEFG: Deficits; **D**on't **E**ver **F**orget **G**lucose	•Assess limbs, trunk and face •Assess sensation, motor and reflex •Finger-prick testing •ABG/VBG as back-up opportunity
E: Exposure	•Assess pupils early •Top to toe •Front to back •May need log roll

Attention to the A-E approach

For patients with a sustained decrease in conscious level then careful assessment as to the adequacy of the **ABC**s (**a**irway, **b**reathing and **c**irculation) should be part of the initial assessment and management. The **ABC**s should be frequently reviewed throughout the call.

Complex airway and breathing management techniques are beyond the scope of this handbook, but attention to the basic supports will help all RRT members. Basic life support manoeuvres such as jaw thrust, head tilt (balanced against any risk to cervical spinal cord) and clearing the oropharynx manually or with a Yankauer sucker are all skills that a broad array of clinicians can institute.

All patients with decreased conscious state need a quick assessment of their oxygenation, heart rhythm and ECG and blood pressure. Timely application of monitoring helps get this information to the RRT as soon as possible. At the same time provision of oxygen therapy (via face mask, or in a more assisted manner with bag-valve mask is also imperative).

When assessing the circulation RRT members should be especially vigilant for significant alterations from the patient's baseline. For instance, the new finding of an irregularly irregular heart rate may indicate atrial fibrillation (AF) as a possible contributor to a stroke, or a relative

decrease in systolic pressure i.e. from a baseline of 180mmHg to a new 'low' of 120mmHg may both be very relevant.

Once the ABCs have been attended to the team has time to complete the especially important **D** tasks. The first is the crucial: **D**on't **E**ver **F**orget **G**lucose. Finger-prick glucose testing should be carried out early in all RRT calls. It is perhaps most relevant to patients with a decreased GCS given the importance of glucose as a metabolic fuel for the brain. Timely recognition and correction of hypoglycaemia may greatly improve a patient's morbidity and mortality risks. If finger-prick testing is forgotten or delayed, then the sampling of an arterial or venous blood gas represents a second opportunity for glucose levels to be checked.

Careful assessment of **D**isability for neurologic deficits (sensory, motor, reflexes) in the limbs, trunk and face may help localise within the nervous system any aetiologies.

Timely assessment of pupillary size and reactivity is imperative. The finding of one or more pupils being fixed and dilated should alert the clinician to the possibility of raised intracranial pressure and a high likelihood of further rapid deterioration.

Exposure of the patient to ensure examination of the entire body surface is important to ensure that important clinical signs are not missed. Physically touching and examining patients provides the clinician with important information as well as

demonstrating to patient and family the clinician's professionalism and care.

Examination can exclude evidence of long-standing neurological deficit (scars, contractures) or new trauma (bruising, abrasions). In any patient in whom new trauma is suspected as a contributor to their decreased GCS then extreme care should be taken with the cervical spine.

Any traumatic mechanism of injury sufficient to impair conscious state may be sufficient to cause C-spine bony injury. In such scenarios, use of the Canadian C-Spine or Nexus screening tools will identify patients who need C-spine immobilisation and imaging.

Transiently decreased GCS

For transient episodes of decreased GCS, RRT members need to consider what processes might briefly interrupt consciousness. We recommend consideration of some of the potential causes listed in Table 14.2. Caution is advised when attributing causality solely to delirium. The manifestations of delirium can mask the clinical features of other conditions that contribute to a low GCS.

Table 14.2 Approach to considering causes for transient decrease in conscious state

Cause	Considerations
Circulation	•Rate and rhythm: vasovagal event? •LV function (shock) •RV function (acute dysfunction & syncope = massive PE until proven otherwise)
Seizures	•Convulsive vs non-convulsive •Ongoing vs terminated •Known seizure disorder vs new seizures
Trauma	•Fall from bed? •Head strike? •C-spine protection •Any increased bleeding risk (anticoagulation): early CT brain to rule out evolving haemorrhage
Hypoactive delirium *(may be in addition to other causes)*	•Environment •Capacity to communicate clearly (may be unable to vocalise) •Medications (contributing, relieving) •Family members: possible help to reorient and reassure •Metabolic derangement •Length of stay •Sleep derangement •Pain •Metabolic derangement

Causes of sustained decrease in GCS

An ongoing depressed conscious state represents a potentially risky situation for the patient and caregivers. We recommend the use of a structured approach to assessing and managing possible causes.

One such approach is based upon the neuroanatomical determinants of consciousness (see Table 14.3). Consciousness is a complex neurologic process that relies on an intact Reticular Activating System (RAS). The RAS commences in the brainstem, progresses up through the thalamus before spreading to both cerebral cortices. Single disruptions at the level of the brainstem and thalamus can produce coma. However, after the thalamus, processes contributing to coma must impact on both hemispheres of the cerebral cortex.

Table 14.3: Anatomical model for considering possible aetiologies of a sustained decreased conscious state

Anatomical Location	Possible Aetiologies
Brainstem & thalamus	•Stroke – especially posterior circulation (common) •Contusions or bleeds in trauma

Unilateral cerebral process (with secondary spread to other hemisphere)	•Stroke (ischaemic or haemorrhagic) with secondary oedema •Haematoma (usually due to trauma) with secondary oedema
Diffuse bilateral cortical injury	•Blunt force trauma (diffuse axonal injury) •Hypoglycaemia •Hepatic encephalopathy •Uraemic encephalopathy •Hypercapnea •Systemic infection (sepsis) •Cerebral infection (meningitis, encephalitis) •Poisoning (intentional vs iatrogenic) •Seizures (Status epilepticus) •Gross hypoxic injury - hanging •Hydrocephalus •Subarachnoid haemorrhage

Location of care

After the immediate assessment and management tasks the RRT members need to determine the ongoing care needs of the patient.

The nursing needs of a patient with an ongoing or fluctuating level of coma are very significant. If active, life prolonging therapies are appropriate the best location of care is an environment with enhanced experience and support. In large Australasian hospitals this is often a dedicated neurologic high dependency unit (neuro HDU) or within an intensive care unit.

Sometimes the goals of care are contingent upon finding out the results of a CT brain to determine the reversibility or otherwise of any particular insult. The movement of such a patient about the hospital is a high-risk undertaking. We recommend that any patient who needs an urgent CT brain to complete the investigation of their cause of coma be accompanied by appropriately trained clinical staff. This usually means a doctor and a nurse with advanced airway skills. Such staff may be present (and available) in the RRT membership or may need to be specifically requested.

Summary

This chapter has outlined the importance of clear, consistent language regarding coma. Immediate role and task allocation plus timely assessment of goals of care are vital in these RRTs. A structured

approach is crucial, especially when considering the aetiologies of both transient and sustained coma. Lastly RRT members needs to carefully consider the matching of patient needs and staff skill sets for safe ongoing care.

Further Reading:

Teasdale G, Jennett B. Assessment of coma and impaired consciousness: a practical scale. *Lancet*. 1974;2(7872):81-84.

McNarry AF, Goldhill DR. Simple beside assessment of consciousness: comparisons of two simple assessment scales with the Glasgow Coma scale. *Anaesthesia*. 2004 Jan;59(1):34-7

15. MANAGEMENT OF THE PATIENT WITH HYPOTENSION AND ALTERED HEART RATE

Alex Psirides, Jennifer Hill, Laurence Walker

Hypotension and dysrhythmias are common triggers for activating Rapid Response Teams (RRTs), with some studies showing they are responsible for a fifth of all calls. Observational data show mortality risk increases with progressive hypotension and further still with recurrent episodes. Patients presenting with tachycardia have a higher mortality than those with bradycardia.

Patients presenting with both abnormal blood pressure and heart rate may have a common underlying cause (e.g. obstructive shock in massive pulmonary embolus) or one abnormality may be caused by the other (e.g. hypotension due to uncontrolled rapid atrial fibrillation from an underlying electrolyte abnormality). When considering contributory factors, the effects of common medications should be borne in mind (e.g. beta blockade preventing compensatory tachycardia in a hypotensive bleeding patient).

Causes of hypotension, as a manifestation of shock are often divided into four categories. These are:

- **Hypovolaemic** (dehydration, haemorrhage)
- **Distributive** (sepsis, anaphylaxis, neurogenic)
- **Cardiogenic** (ischaemic heart disease, arrhythmia, left ventricular failure, valvular disease)
- **Obstructive** (pulmonary embolus, tamponade), pneumothorax.

Although these are often described as discrete conditions, patients reviewed by RRTs may have multiple contributory factors (for example, a dehydrated post-operative patient who is bleeding).

As with other emergency scenarios, management involves simultaneous resuscitation to stabilise the patient, a brief history and targeted examination, and appropriate investigations to determine the underlying cause. A chart review should be carried out by a team member including a review of vital signs trends and recent medication administration.

If the patient is unresponsive, has no signs of life and/or no central pulse is palpable, CPR must be commenced immediately following the appropriate national Resuscitation Council algorithm.

If the patient requires transport (e.g. to radiology for investigation of shock), monitoring equipment and escort by an appropriately skilled clinician is required.

In assessing and managing a patient with hypotension and altered heart rate, the following factors and pathologies should be considered (shown as a simplified graphic in figure 15.1):

1) Measurement error:

If the patient is alert, peripherally warm and appears well, consider measurement error.

- Repeat the blood pressure measurement and palpate a peripheral or central pulse to assess for rate and character. If the pulse is suggestive of poorly controlled

atrial fibrillation (rapid and irregular), an automated (oscillometric) blood pressure device is likely to produce considerable error. Blood pressure should be checked with a manual cuff and the radial or brachial artery palpated to assess the systolic

- Check the cuff size is appropriate for the patient. An inappropriately large cuff will underestimate and an inappropriately small cuff will overestimate the true blood pressure
- Check the blood pressure in another limb if possible
- If the patient has invasive (arterial) monitoring, check the transducer height and the 'zero' setting are correct. Flush the line using the pressure bag valve to see if the line is over or underdamped

2) Medication error or effect:

- Ask the patient/nurse if they have recently received/ administered any medication
- Check any intravenous or epidural infusions that may be running to ensure both the rate and concentration of drug are correct
- Check the medication chart for prescribed drugs with vasoactive potential. Some thoughts to consider are:
  - Are the doses correct?
  - Was the correct dose administered?
  - Was the drug administered to the correct patient?
  - Was a new antihypertensive recently commenced or re-commenced after a delay?
  - Were multiple antihypertensive agents given together?
  - Have there been any dose changes?
- Check the patient's allergies and sensitivities.

    - Could this be anaphylaxis to a non-prescribed drug administered in error or a drug administered despite a known sensitivity?
- If the patient has an epidural in-situ, ask about recent bolus or increase in infusion rate. Assess level of sensory block using ice and check for motor block. If the block is too high, decrease rate or cease infusion, pending review by an anaesthetist or pain management service

3) Pathophysiological causes:

a) Primary arrhythmia:

- Ask about symptoms of palpitations or light-headedness and previous history of same. Check if any rate-controlling medication has been ceased or omitted, deliberately or by mistake. If known implanted pacemaker, ask about indication for insertion, its function (does it cardiovert or defibrillate) and when last checked
- Check peripheral and central pulse character and volume. Assess peripheral perfusion as a guide to adequacy of cardiac output (warmth, capillary refill). Listen to lung fields for crepitations (is the rate contributing to left ventricular failure) and listen to the heart for a flow murmur. Assess peripheral perfusion as guide to adequacy of cardiac output
- Obtain an ECG as soon as possible or place real-time single-lead cardiac monitoring (such as from a defibrillator) if the patient is unstable to allow rhythm assessment and intervention if cardioversion or defibrillation is indicated

- If external pacing device present (temporary wires after cardiac surgery or transvenous wire), check it is switched on, connected to patient (check leads at both box and patient). Check it is not oversensing or failing to capture (contributing to bradycardia) or causing a pacemaker-mediated tachycardia
- Examine laboratory results for contributory electrolyte abnormality (hypokalaemia +/- hypomagnesaemia in atrial fibrillation, hyperkalaemia in bradycardia) or acidaemia, new renal or hepatic impairment
- Examine medication chart for omission of regular rate-control agent(s) or recent commencement of new agents. Consider drug error involving repeat dosing or incorrect doses of regular medication. Check remaining volume of any currently running infusion – has a pump or syringe error occurred? Also check recent diuretic therapy (electrolyte sparing or not) and whether electrolyte supplements given
- Management is dependent on the arrhythmia. Both bradycardias and tachycardias should be classified into narrow (regular or irregular) and wide complex (regular or irregular) and management urgency guided by the presence or absence of hypotension +/- altered conscious level.
- Bradycardia management is focused on treating the underlying cause whilst the rate is increased using either conservative (stop causative agent and wait), pharmacological (e.g. atropine, adrenaline) or electrical treatment (pacing +/- CPR) depending on urgency.
- Tachycardia management is similar with the choice of pharmacological agent dependent on blood pressure, urgency and co-morbidities (e.g. avoid beta-blockade in hypotensive sensitive asthmatics). Suitable acute agents may include amiodarone (if hypotensive), beta

blockade (if normo- or hypertensive) or digoxin (if either of the other agents are contraindicated)
- Once rate control or stability is achieved, consideration should be given to likely recurrence of arrhythmias and appropriate plans made (e.g. replacement of electrolytes, long term medications, cardiology referral). The need for ongoing cardiac monitoring should also be considered which may require transfer to a higher acuity area

b) Hypovolaemia:
- Ask about thirst and oral intake, vomiting, high nasogastric aspirates, wound losses, diarrhoea, polyuria, recent abdominal surgery, prolonged nil by mouth periods
- Check for low JVP, fast weak pulse, dry mouth, cold peripheries with slow capillary return. Consider third spacing of fluids (especially in pancreatitis, recent severe burns or liver failure). Look for obvious sources of fluid loss
- Examine charts for negative fluid balance, recent vs admission weight, reduced input and high output, trends in urine output if catheterised. Recent temperature or administration of high flow non-humidified oxygen may contribute to losses
- Investigate with bedside tests such as passive leg raise or an assessment of fluid responsiveness with bolus administration. Laboratory tests include renal function tests (including urea:creatinine ratio) and full blood count (haemoglobin and white cell count). If both equipment and skill-set available, consider point-of-care ultrasound to assess volume state (echo, inferior vena cava size and variation with inspiration)

- Management includes administration of appropriate fluids titrated to a response with regular ongoing review. If symptomatic, lie the patient flat if possible and raise their legs. Obtain urgent intravenous access if not already present. In cases where this is likely to be difficult, or 2 attempts have been unsuccessful, obtain intraosseus access. Commence a crystalloid bolus of an appropriate volume (e.g. 10ml/kg). If excessive losses are contributory and ongoing, consider appropriate therapy to reduce these if possible

c) Haemorrhage:

- Ask about thirst, dark stool, bleeding, surgical drain losses, haematuria, recent surgery, recent radiological procedures or thrombolysis (systemic or regional)
- Check relevant sites for obvious source of loss (surgical and puncture sites). Consider retroperitoneal bleeding in patients with recent femoral cannulation or abdominal trauma. Check limb compartments around known fracture sites. Check bed sheets for un-noticed exsanguination from disconnected drains, lines (especially femoral), wounds or stoma/PR bleeding
- Check for cold peripheries, poor capillary return, fast weak pulse, pale conjunctiva or mucous membranes
- Examine charts for fluid balance including drain output volume and nature. Check medication chart for recent or ongoing anticoagulation; check that doses and frequency are appropriate (reduced if abnormal renal function) and check recent anticoagulation monitoring (aPTT for heparin and dabigatran, INR for warfarin). Check haemoglobin trend and transfusion history since admission
- Investigate with urgent full blood count, renal function tests and coagulation panel. Obtain haemoglobin via

venous/arterial blood gas while waiting. Send crossmatch if none current. Consider reversal of anticoagulation if recent or ongoing use of relevant agents. High urea:creatinine ratio suggestive of GI bleed. Obtain imaging relevant to suspected bleeding site (CXR, CTA if stable etc.) and refer to relevant specialty (surgery, gastroenterology, interventional radiology etc.). If both a portable ultrasound equipment is available and a clinician with the relevant skills, consider performing a FAST or RUSH scan during the RRT call

- Management includes supportive therapy (fluid or blood product administration, oxygen if hypoxaemic) whilst the source of bleeding is identified. Local massive transfusion protocols should be considered if available. Permissive hypotension may be considered in active bleeding (targeting a systolic pressure ~ 80-90 mmHg or mean arterial pressure of 50-65 mmHg) to avoid over-resuscitation, potentially contributing to worsening bleeding

d) Pulmonary embolus:

- Ask about duration of immobilisation (recent surgery or long distance travel) prior to hospitalisation, history of cancer, trauma, previous deep vein thrombosis or pulmonary embolus, prothrombotic syndromes (antiphospholipid syndrome, factor V Leiden mutation etc.). History of prothrombotic use (oral contraceptive pill, hormone replacement therapy, smoking). Preceding palpitations or calf pain, current pain and onset/ radiation, shortness of breath, haemoptysis.
- Check for cold shut-down peripheries, weak pulses, raised JVP, right parasternal heave and abnormal heart sounds (loud P2)

- Examine charts for use of appropriate pharmacological or mechanical DVT prophylaxis
- Obtain ECG to look for tachycardia, new right bundle branch block or right axis deviation. CXR may show focal oligaemia or wedge infarction (if older). Check ABG for A-a gradient, respiratory alkalosis, metabolic acidosis. Other bloods including D-Dimer, troponin and BNP may be useful if low or negative. Obtain an urgent echo, looking for a dilated or impaired right ventricle, or visible thrombus in the pulmonary artery (transoesophageal echo provides better views). CTPA if stable
- Management includes supportive therapy (oxygen if hypoxaemic, cardiovascular support if hypotensive), anticoagulation and consideration of urgent thrombolysis. Occasionally a radiological intervention is indicated (if available) or extra-corporeal membrane oxygenation (ECMO)

e) Cardiogenic:

- Obtain history and nature of pain (including chest/jaw/arm), palpitations, nausea or vomiting, shortness of breath. Ask about history of ischaemic heart disease or congestive heart failure. Previous surgical or angiographic interventions (coronary artery bypass grafting, coronary stent placement)
- Check for cold shut-down peripheries, weak pulses, raised JVP, new murmur if valvular lesion, pericardial rub, auscultate lung bases for crepitations and palpate peripheries for oedema.
- Examine charts for cessation or withholding of usual anti-platelet/anticoagulation agents (particularly in surgical patients) or diuretics, review previous and

current ECGs looking for new changes, examine fluid balance since admission.

- Obtain serial ECGs, cardiac enzymes and obtain a CXR and echo. Consider graft or stent occlusion if hypotensive after recent coronary artery surgery or intervention. Examine ECG, looking for new changes or changes associated with grafted/stented vessels. Also consider aortic dissection if recent aortic instrumentation (intra-aortic balloon pump, on-pump cardiac surgery, interventional radiology, thoracic endovascular aortic repair etc.). Check blood pressure in both arms if dissection suspected.
- Management includes consideration of an antiplatelet agent +/- anticoagulation in acute coronary syndrome and referral to appropriate service (cardiology or cardiothoracic surgery).
- Supportive measures include oxygen (if hypoxaemic), diuretic (if pulmonary oedema suspected), blood pressure support or afterload reduction, consideration of intra-aortic balloon pump (or other cardiac support device if available) and consideration of transfer to a higher level of care

f) Tamponade:

- Ask about recent trauma, cardiac surgery, vascular instrumentation including coronary or aortic stent placement, symptoms suggestive of malignancy, recent respiratory infection, recent anticoagulation therapy
- Check for cold peripheries with poor capillary return, weak fast pulse, raised JVP (particularly paradoxical rise with inspiration) and quiet heart sounds. If pericardial drain in-situ, check for kink, occlusion or tap switched off to patient

- Check charts for recent drain removal (pericardial or chest) and anticoagulation status
- Obtain ECG (small complexes or electrical alternans), CXR (cardiac contour size and shape) and urgent echo (transthoracic initially but may require transoesophageal if tamponade suspected despite negative transthoracic imaging)
- If tamponade is confirmed, refer to appropriate service (cardiology or cardiothoracic surgery if available). Consider emergency pericardiocentesis if patient continues to deteriorate. Reversal of any anticoagulants should be considered if bleeding is suspected as cause. Occasionally, a sternotomy is required if pericardiocentesis is unsuccessful

g) Sepsis: See chapter 17 'Management of the patient with possible sepsis'

h) Regional anaesthesia (epidural or spinal/ subarachnoid blockade)

- Check if epidural catheter in-situ. If recently returned from theatre, ask about the type of anaesthesia and whether regional anaesthesia was administered. If so, when, which agent, and at what dose. Check peri-operative trends in blood pressures from anaesthetic record and post-anaesthesia care unit/recovery. Check if a vasoactive agent was administered either as bolus or by infusion. If so, when was it stopped? Ask about headache, back pain, breathing difficulty, new weakness or abnormal vision. If no epidural catheter is present and anaesthetic history is unclear, check posterior lumbar and thoracic spine for puncture marks or dressings

- Check for warm, vasodilated peripheries. Check for presence of motor block (brief peripheral neurological exam) and sensory block (pain or loss of cold sensation to ice). Assess dermatome level and symmetry. Excessive ('high') epidural blockade affecting T3 dermatome or above can cause respiratory distress (intercostal muscle involvement), arm weakness, profound hypotension and bradycardia. If there is any suspicion of a high block, the epidural infusion must be stopped and anaesthesia or pain services contacted immediately
- Check rate of infusion or frequency and dose of top-ups. Does what is prescribed match what is being given? Check error history of pump (if available) or total doses administered and lock-out time if there is a patient controlled epidural infusion
- Give fluid if systolic blood pressure <90 mmHg. Sitting the patient up may reduce the block height but also worsen hypotension. Discuss epidural rate titration with anaesthesia or pain services. If a peripheral vasoconstrictor is required, the patient may need to be transferred to a higher level of care
- Spinal shock from trauma or cord infarct may present in a similar way to neuraxial blockade. It should be considered in the list of differential diagnoses if the history is suggestive, in the absence of regional anaesthesia

i) Anaphylaxis:

- Ask about any allergies or family history of anaphylaxis, recent medication administration including blood products. Ask about associated symptoms- rash, stridor, wheeze, flushing, swelling, difficulty breathing, swallowing or talking, and rate of onset

- Check for warm vasodilated peripheries and rapid pulse. Listen for wheeze (inspiratory or expiratory) and examine anterior chest and abdomen for urticarial rash
- Check charts for known or suspected allergies, recent administration of medications. If recent return from surgery, check anaesthetic record for medications administered
- Stop any infusion currently being administered, including blood products, if suspected to be the trigger
- Investigations include serum tryptase (typically taken at 1, 6 and 24 hours)
- f airway compromise is suspected or progressing, urgently escalate to a senior doctor with the appropriate expertise. Administer adrenaline via nebuliser whilst waiting
- Give high flow oxygen, place patient supine, and urgently administer adrenaline 0.5 mg intramuscularly, obtain intravenous access, give fluid if systolic blood pressure <90 mmHg. If bronchospasm is present or hypotension persists, consider repeating intramuscular adrenaline bolus every 5 minutes. Ongoing symptoms require adrenaline infusion and escalation to a higher level of care

j) Tension pneumothorax:

- If there is time, ask about recent trauma, central venous line insertion attempts (jugular or subclavian), chest drain removal, previous pneumothorax, family or personal history of spontaneous pneumothorax (particularly if tall and thin)
- Check for cool, shut down peripheries and respiratory distress. Look for tracheal shift and unilateral chest wall expansion. Percuss for increased resonance and listen for reduced air entry. Check neck or clavicles for needle

puncture sites or dressings. If chest drain has recently been removed, check dressing is occlusive
- Obtain pulse oximetry and urgent chest X-ray if stable and time permits. Check previous chest films if available
- Give high flow oxygen if hypoxic, occlude chest drain site with saline-soaked clean gauze if sucking wound visible or audible
- If the patient has worsening shock, perform urgent needle thoracostomy using 14 or 16 gauge intravenous cannula inserted into the second intercostal space in the mid-clavicular line, or perform a finger thoracostomy in the fifth intercostal space at the anterior axillary line on the side of the suspected tension; a formal chest drain will need to be inserted subsequently

Any patient requiring a rapid response team review for hypotension +/- altered heart rate should have a plan put in place that includes ongoing monitoring frequency and guidance for re-escalation. Depending on the underlying cause (resuscitation fluid will redistribute, anaphylaxis may be biphasic) the initial management may be only transiently successful with potential for recurrence once the team have departed. Recurrent requests for review of the same patient should prompt reconsideration of the underlying cause and why treatment has been unsuccessful. It should also prompt consideration of transfer to a higher acuity area for closer monitoring or administration of a vasoactive infusion.

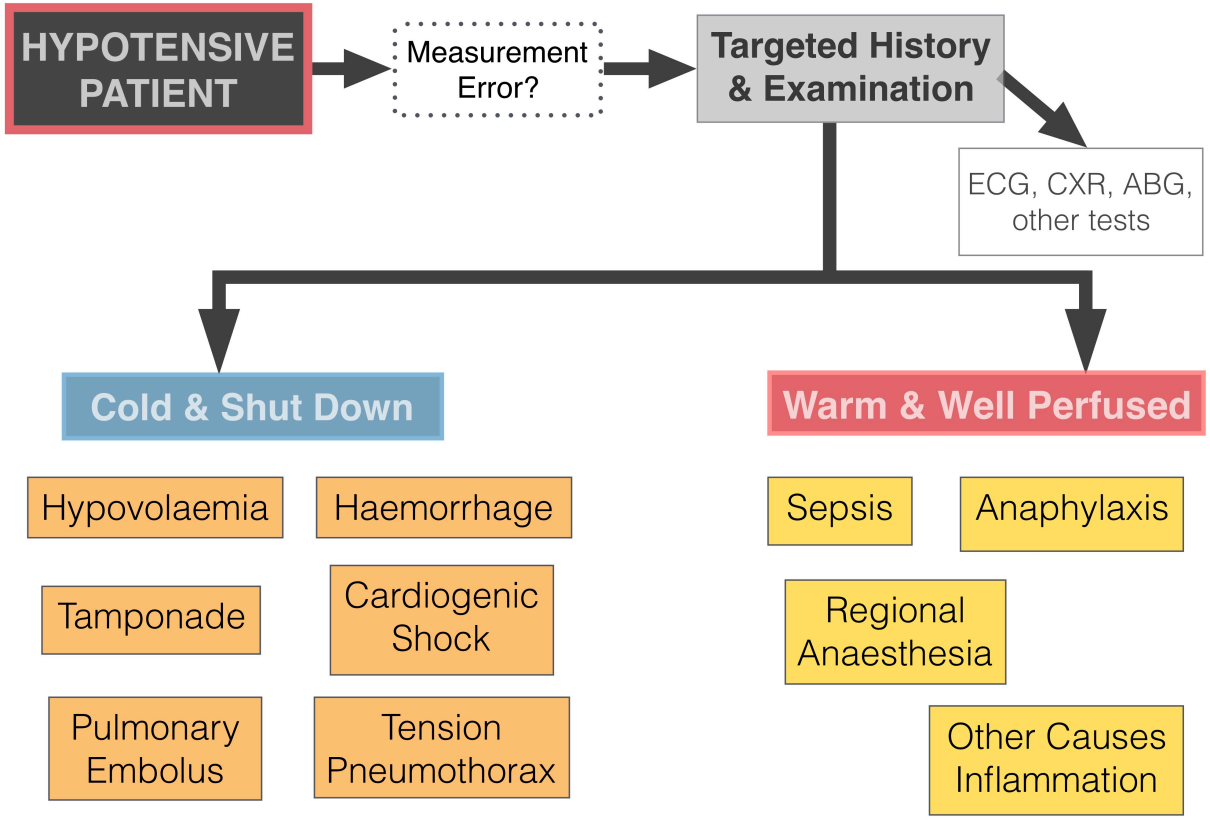


Figure 15.1: a simplified approach to the hypotensive patient

Further Reading:

Bleyer A, Vidya S, Russell G, et al. Longitudinal analysis of one million vital signs in patients in an academic medical center. Resuscitation. 2011;82(11):1387-1392

Smith R, Santamaria J, Faraone E, et al. Rapid response team diagnoses: frequencies and related hospital mortality. Criti Care and Resuscitation. 2017;19(1):71-80

Khalid I, Qabajah M, Jamad W, et al. Outcome of hypotensive ward patients who re-deteriorate after initial stabilization by the Medical Emergency Team. Journal Crit Care. 2014;29(1):54-59

Whiteman A. Epidurals and their care on a surgical ward. British Journal Hospital Medicine. 2010;71(3)

16. MANAGEMENT OF THE PATIENT WITH LOW URINE OUTPUT

Alex Psirides, Jennifer Hill, Laurence Walker

Overview

The accepted definition of oliguria is a urine output less than 0.5 ml/kg/hr. In the absence of continuous urine output measurement from an indwelling catheter, this may be difficult to calculate. Patients deemed at high risk of kidney injury should either have a urinary catheter inserted or accurate measurement of intermittent urine output obtained to allow for assessment of oliguria. As it may be a late sign of deterioration (after protracted hypotension for example), it should be assessed in the context of other vital signs. Oliguria may be a marker of a systemic disease process.

The mechanisms causing reduced urine output have been categorised anatomically with relation to the kidney into pre-renal, renal and post-renal.

Causes to consider include:

Pre-renal: hypovolaemia, bleeding, hypoperfusion from sepsis, abdominal compartment syndrome, obstructive or cardiogenic shock, renovascular diseases
Renal: sepsis, nephrotoxins, rhabdomyolysis, renal diseases (haemolytic-uraemic syndrome, glomerular disease etc.)

Post-renal: obstructing stone, clot or tumour, blocked urinary catheter, abdominal compartment syndrome, post-surgical ureteric injury

Assessment

A thorough chart and laboratory result review should be conducted. Particular attention should be paid to:

- The reason for the current admission to hospital, working diagnoses and a review of the relevant medical background. Particular attention given to any history of kidney problems
- Review medication chart for diuretics or nephrotoxins. Check if a regular diuretic has not been prescribed or the dose reduced. Common nephrotoxins include aminoglycoside and beta-lactam antibiotics, non-steroidal anti-inflammatory drugs, cyclosporin, amphotericin B, frusemide, allopurinol and ACE inhibitors. Check for recent administration of radiological contrast agents. Ask the patient if they take any herbal medicines or alternative therapies
- Assessment of vital signs chart for relevant trends in heart rate, blood pressure and temperature. Tachypnoea will increase insensible fluid losses. Check if recorded blood pressure is consistent with that previously measured; what is the normal for this patient?
- Assessment of fluid balance. This could either be by documented daily input vs output or admission weight vs current weight. Excessive losses (particularly from bowel output or surgical drains) may not have been adequately measured or replaced. Check fluid balance charts for correct addition of values and that the totals have been accurately carried over from day to day.

Consider underestimation of insensible (unmeasured) losses in febrile patients or those receiving higher flow non-humidified oxygen. Unless the patient has a stoma, bowel losses are difficult to measure and often underestimated. Check type, volume and rate of fluid maintenance or replacement administration. If the patient has burns, check the calculation of fluid loss against burnt surface area

- Laboratory results of both current and previous admissions should be reviewed if available. How do the most recent electrolytes, urea and creatinine relate to admission or previous blood tests? What is the trend in these values over time? The results of any previous urinalysis or kidney imaging should also be reviewed. White cell count and haemoglobin trends may suggest sepsis or bleeding as contributory factors

History

- Ask about recent surgery (reason for and site of operation, elective vs emergency, complications) or trauma to the abdomen or limbs. Any previous involvement with renal medicine or urology including kidney transplant, urological surgery including nephrectomy, previous need for dialysis etc. How often does the patient pass urine and in what quantities? Ask about thirst, light-headedness, abdominal, limb or back pain, haematuria, dysuria, urinary frequency, rigors.

Examination

- Examine hands and feet for evidence of perfusion (cool/warm and capillary return), assess jugular venous

pressure and listen to lung fields for evidence of fluid overload. Examine abdomen, looking for scars, abdominal distension or renal angle tenderness, listen for bowel sounds. Palpate suprapubic area for tenderness or bladder distension. Check back for scars not previously disclosed. Check muscle compartments in limbs
- If present, check urinary catheter for clots, obstruction or kinks. If present, check any nephrostomy drain for same. Examine urine for blood, clots or colour change suggestive of rhabdomyolysis.

Investigations

Investigations should include blood tests (full blood count, liver function tests (including albumin), urea, creatinine and electrolytes, venous blood gas, creatine kinase, levels of relevant nephrotoxic drugs) and relevant imaging (ultrasound to assess bladder volume, renal arteries and ureteric obstruction; CT may be required but may have limited utility if contrast cannot be used).

Management

Management should focus on treating the presumed underlying cause/disease process (bleeding, sepsis etc.) and achieving normovolaemia. If an underlying cause is not immediately apparent, other interventions may be trialed. These might include:
- Aspirating or flushing the urinary catheter to assess for obstruction; if an obstruction cannot be resolved, the catheter should be removed or changed
- A fluid bolus to assess if the oliguria is fluid responsive
- Diuretics if fluid overload is suspected

- Cessation of any nephrotoxic agents

If a mechanical obstruction, abdominal or limb compartment syndrome, or rapidly deteriorating renal function is found then the patient should be referred to the relevant specialty (urology, interventional radiology, surgery, renal medicine, intensive care etc.)

Further Reading:

Calzavacca P, Licari E, Tee A, Egi M, Haase M, Haase-Fielitz A, Bellomo R. A prospective study of factors influencing the outcome of patients after a Medical Emergency Team review. Intensive Care Med. 2008 Nov. 34(11):2112-6

Perner A, Prowle J, Joannidis M, Young P, Hjortrup PB, Pettila V. Fluid management in acute kidney injury. Intensive Care Med. 2017 Jun.43(6):807-815

17. MANAGEMENT OF THE PATIENT WITH POSSIBLE SEPSIS

Alex Psirides, Jennifer Hill, Laurence Walker

Sepsis remains a potentially reversible cause of injury and death in hospitalised patients. Current definitions (from 'Sepsis-3') are:

- Sepsis: a life-threatening organ dysfunction caused by an abnormal host response to infection
- Septic shock: sepsis **and** persistent hypotension despite adequate volume resuscitation

As definitions of sepsis have evolved, various scoring systems to improve the early recognition of sepsis have been described. These include SIRS (Systemic Inflammatory Response Syndrome), SOFA (Sequential Organ Failure Assessment) and qSOFA (quick SOFA). However there is some evidence that a commonly used early warning score (EWS) that aggregates seven separate vital signs is both more sensitive and specific than other scoring systems in predicting death or ICU admission from sepsis. EWS systems are used in many hospitals to escalate care to rapid response teams (RRTs). As such, RRTs will commonly encounter patients in whom the diagnosis of sepsis must be considered; sepsis has been reported as contributing to 20-40% of RRT reviews in different studies.

Both sepsis and septic shock are medical emergencies. Delay in either the recognition or subsequent treatment

places a patient at increased risk of injury or death. The decompensation of septic patients to a shocked state increases their risk of death two to threefold.

The management of patients with sepsis can be divided into three separate phases:

1) Recognition that sepsis is present (considering the diagnosis and then investigating appropriately)
2) Resuscitation (if shock is present)
3**) Infection management** (antibiotic therapy and source control)

The RRT should consider the following in more detail:

1) Recognition of sepsis:

qSOFA can be used by the RRT to rapidly assess patients at the bedside using the following 3 criteria:

- Altered mentation (new onset GCS ≤14)
- Tachypnoea (respiratory rate ≥22 breaths per min)
- Hypotension (systolic blood pressure ≤100 mmHg)

The presence of two or more of these (in the absence of an alternative explanation) should prompt consideration of sepsis as a cause of deterioration.

Other criteria to consider include:
- Presence of hyper or hypothermia (the latter is associated with increased adverse outcomes)
- Elevated or decreased white cell count
- Suspected or proven infective focus

- Clinical source: chest, abdomen, skin/soft tissue/joint, wound, central nervous system, intravenous or arterial line, implanted device (heart valve, pacemaker, shunt, joint replacement etc.)
- Micro-organisms within sterile site (body cavity, blood, CSF)
- Evidence of end-organ hypoperfusion (e.g. elevated lactate) or dysfunction (e.g. acute kidney injury)

Appropriate specimens for culture should be obtained as indicated by suspected source. These may include blood, urine, sputum, wound/fluid discharge, wound swab, CSF, or joint aspirate.

2) Managing resuscitation:

If required, the patient should be resuscitated simultaneously with phases 1 (recognition) and 2 (managing infection) above. Resuscitation involves providing:

- Intravenous fluid administration. The amount and type depend on clinical setting, volume status of patient, history of cardiac or renal disease, presence of myocardial depression. An initial crystalloid bolus (0.9% saline, Hartmann's or Plasmalyte) of 10-20 ml/kg is appropriate. Fluid resuscitation targeted to central venous oxygen saturation has not been shown to be beneficial
- Supplemental oxygen if hypoxaemia is present (SpO_2 ≤92%)
- Vasopressor infusion (e.g. metaraminol, phenylephrine or noradrenaline) if shock remains refractory to fluid administration

If there are signs of organ dysfunction, the patient should be discussed with a senior clinician. In addition to the three qSOFA scoring criteria above, concerning signs include:

- Raised lactate (> 3.0 mmol/L)
- Oliguria (< 0.5 mL/kg/hr) or new rise in creatinine
- New coagulopathy (INR > 1.5 or PTT > 60 seconds in the absence of other causes)
- Thrombocytopenia (platelets <100 x 10^9 /L)
- Patient not improving despite resuscitation
- More than 2 lites of intravenous fluids have been given to achieve an acceptable blood pressure

Physiological goals should be documented with the expected ongoing frequency of vital sign assessment and when to call for help. The patient should be regularly reviewed. Once microbiological results are available, antibiotic therapy should be adjusted accordingly.

Patient who fail to respond to initial resuscitation or subsequently deteriorate again should be considered for transfer to a high dependency or critical care environment.

3) Managing infection:

Antibiotics should be commenced as soon as possible, and never later than one hour after the diagnosis of sepsis. Antibiotic choice must be appropriate for the suspected source and micro-organism and given intravenously if possible. If the source is unclear, initiation

of broad-spectrum antibiotics is indicated until microbiology results become available.

Considerations for choice of agent/s include:
- Community vs hospital acquired (the latter should be considered in patients admitted for ≥48 hours. Causative organisms may have different antibiotic sensitivities to those found in the community)
- Review of recent microbiology (previous antibiotic use, cultures taken prior to or since admission)
- Any known drug allergies or sensitivities
- Special conditions (immunosuppression by therapy or disease, febrile neutropenia, bone marrow or solid organ transplant)
- Local antibiotic guidelines

Source control should be expedited if the source of infection is known or suspected. This could include:
- Removal of any suspected intravenous line (central or peripheral), device or prosthesis if possible
- Radiologically guided percutaneous drainage of any known abscess or suspected fluid collection
- Surgical review for excision of infected tissue and/or drainage of obstructed systems

In patients with persistent shock, the following should be reconsidered:
- Choice of antibiotics
- Adequacy of source control
- Myocardial depression in sepsis (echo to assess)
- Incorrect diagnosis of sepsis or concomitant disease process (e.g. myocardial ischaemia)

Further Reading:

Jones D. Improving in-hospital sepsis outcomes. Journal Crit Care. 2017;40:294-295

Guirgis F, Jones L, Esma R, et al. Managing sepsis: Electronic recognition, rapid response teams, and standardized care saves lives. Journal Crit Care. 2017;40:296-302

Rhodes A, Evans L, Alhazzani W, et al. Surviving sepsis campaign: international guidelines for management of sepsis and septic shock 2016. Intensive Care Med. 2017;43(3):304-377

Churpek MM, Snyder A, Han X, et al. Quick sepsis-related organ failure assessment, systemic inflammatory response syndrome, and early warning scores for detecting clinical deterioration in infected patients outside the intensive care unit. Am J Respir Crit Care Med. 2017;195(7):906-911

Cross G, Bilgrami I, Eastwood G, et al. The epidemiology of sepsis during rapid response team reviews in a teaching hospital. Anaesth Intensive Care. 2015;43:193-8

Singer M, Deutschman C, Seymour C, et al. The third international consensus definitions for sepsis and septic shock (Sepsis-3). JAMA. 2016;315(8):801-810

18. MANAGEMENT OF THE DYING PATIENT

Daryl Jones, Imogen Mitchell

Overview

As outlined in previous chapters, patients admitted to acute hospitals experience clinical deterioration in approximately 10% of admissions. The purpose of Rapid Response Systems (RRSs) and Rapid Response Teams (RRTs) is to aid in the recognition of, and response to such deterioration. However, it is increasing apparent that in some cases, clinical deterioration is not a reversible process, but instead, is part of the dying process.

Commonly used calling criteria are based on worsening of vital signs and conscious state. It is not surprising then, that patients who are in the process of dying will breach such RRT calling criteria. Patients who are the subject of RRT calls have issues around end of life care (EOLC) in approximately one-third of cases. In some instances this will be relatively obvious, but in others there will be some uncertainty, particularly out of hours.

This chapter outlines issues around EOLC RRT calls and identifying those patients who are at risk of a poor prognosis. An approach to the assessment and management of RRT calls where EOLC issues are obvious and uncertain are outlined.

What is an EOLC RRT call?

Examples of EOLC RRT calls include:
- a patient with pre-existing limitations of medical treatment (LOMT)
- irreversible physiological deterioration occurring in the context of pre-existing advanced or multiple co-morbidities.

Literature suggests that EOLC issues occur in approximately one-third of RRT calls. In many cases, the patient will have a pre-existing LOMT, which will clarify whether the patient is for cardio-pulmonary resuscitation (CPR) and other critical care supports such as intubation. However, in many cases documentation may be confusing, such as stating that the patient is not to receive critical care supports but should have interventions by a RRT whose staff are often sourced from a critical care area.

In some instances, the patient may not have a documented LOMT in spite of the patient having limited functional or physiological reserve or an incurable condition. In such cases the RRT may need to implement a new LOMT in conjunction with the usual treating doctors, the patient, and/or their surrogate decision maker.

Identifying patients with a poor prognosis

Several factors are known to be associated with an increased risk of death during an acute hospital admission (Table 18.1). Conceptually, these can be classified into pre-existing patient factors, factors that are

present at the time of presentation to hospital, and factors occurring following hospital admission.

It is critical to determine these risk factors during a RRT call to provide as clear an understanding of a patient's prognosis for that hospital admission and beyond.

An initial approach to an EOLC RRT call

When the RRT arrives to review the deteriorating patient, it is likely that they will not be familiar with the patient and their clinical condition. Accordingly, on assembly it is important to acquire targeted information to begin to triage the patient, and to ascertain information needed to formulate a provisional diagnosis, and initial management plan.

As part of the early assessment, it is important to establish which of the following three categories the call falls into:

- Clearly **not** about EOLC
- Clearly about EOLC
- Unclear if about EOLC

Importantly, it is essential to determine whether the patient has previously expressed or documented a perspective on their goals of care. Specifically, what type of treatment they would want in the event of significant clinical deterioration. In addition, it may be possible to establish the patient's values, what is important to them and what would be the minimum level of acceptable disability.

These preferences may be documented in an advance care plan or advance care directive. Such information is important in bringing clarity to the goals of care, and whether LOMTs should be implemented. The variables outlined in Tables 18.1 and 18.2 can help determine whether a critical care intervention will be of help to the patient and guide goals of care decisions.

Managing a RRT call with clear EOLC issues

A RRT call with clear EOLC issues occurs when the patient has an advance care plan stating their wishes and/or there is an existing documented LOMT in place. In such instances, the patient will receive treatment up to and including the specified treatment limits with the intent of restoring function and reversing the current clinical condition.

In situations where the patient has experienced substantial deterioration, and/or a decline in functional status, or the condition is deemed to be incurable, it may be appropriate to move the focus of care to relieving symptoms, which may involve specialist palliative care (Figure 18.1). It is crucial that the patient, their family/carer and the treating consultant are involved in this decision and accepting of the plan to transition care goals to prioritise symptom relief rather than extending lifespan.

How to approach a MET call where EOLC issues are unclear

This is the most challenging of the three listed categories of RRT call. Such calls may be more likely to occur out of hours, where the usual treating doctors are not present in the hospital, and the covering (on-call) doctor may not be familiar with the patient. In 'unclear EOLC' RRT calls there is typically no documented LOMT and the goals of care may not have been ascertained.

Uncertainty may arise when there are pre-existing co-morbidities and/or functional decline, but not sufficient to make the patient dependent on personal care. In addition, this may occur if a definitive diagnosis has not been made, the prognosis of the primary condition is unclear, there has been insufficient time to treatment to work, or the patient is only slowly responding to treatment.

Uncertainty may also occur when there is a lack of agreement between the RRT staff, the treating team, the out of hours treating team or the patient/family/carer concerning the patient's prognosis and the likely benefit of critical care intervention. If there is any ambiguity about the patient's goals of care during a RRT call, it is important to institute emergency treatment in the first instance. During this time, it is important to gain further information about the patient's prior expressed preferences and self-perceived quality of life, as well as information needed to aid prognostication for the risk of in-hospital death (Table 18.1), which can be sought from the treating consultant and the family or carer.

during the RRT call, it is important for the RRT and usual doctors to escalate concerns to both the treating and ICU senior medical staff. If, despite these efforts, doubt still exists, then it is reasonable to admit the patient to the ICU for a trial of care, observe response and re-evaluate decisions as appropriate.

Table 18.1: Factors known to be associated with increased risk of in-hospital death	
Pre-existing patient factors	•Patient frailty e.g. clinical frailty scale •Multiple co-morbidities •Advanced co-morbidity •Incurable metastatic cancer •Poor functional state e.g. dependence in daily activities of living •Poor nutritional state •Increasing age
Factors at time of hospital admission	•Emergency (non-planned) admission •Requirement for inter-hospital transfer •Delayed presentation especially with sepsis, myocardial infarction, stroke •Disease with poor prognosis e.g. intracranial haemorrhage •Severe level of disease •Evidence of shock or other organ dysfunction
Factors after hospital admission	•Acquiring problems or complications e.g. delirium, pressure area, nosocomial infection •Receives multiple RRT calls •Unplanned admission to the ICU •Deterioration despite adequate duration of optimal ward-based treatment

Table 18.2: Summary of features and interventions for different categories of RRT call based on the presence of EOLC issues

Metric	Clearly EOLC RRT call	Clearly not EOLC RRT call	Unclear if EOLC
Patient features	LOMT already present. Frail, elderly, multiple and advanced co-morbidity. Assisted accommodation, poor functional state, poor self-perceived QOL.	Patient for full care. Younger, few co-morbidities, independent living, good functional status and QOL	LOMT may not be documented. Some co-morbidity and assistance with daily living needed, but acceptable self-perceived QOL.
Reversibility of clinical deterioration	Presenting condition and/or cause of deterioration unlikely to respond to attempts at curative care.	Highly reversible	Prognostic uncertainty either in relation to diagnosis, stage of illness or likelihood of response to treatment
Aim of assessment	Ensure therapy is being administered to level of documented limits Ensure comfort care documented and consider palliative care referral.	Identify the cause/s of deterioration.	Improve the accuracy of prognostication.. Explore perspectives of patient, NOK, and treating team Establish prior functional state and patient preferences for treatment.

Focus of intervention	Continue trial of ward based treatment if appropriate Ensure that clear goals of care and comfort measures are documented Consider palliative care referral	Provide evidence based care to avoid preventable morbidity and mortality. Decide whether the patient is best managed in the ward or ICU	Establish agreement on: • clear goals of treatment and how to measure these • the limits and intensity of treatment to be provided Provide evidence based care to avoid preventable morbidity and mortality. Decide whether the patient is best managed in the ward or ICU

Key: *RRT = rapid response team, EOLC = end of life care, LOMT = limitation of medical treatment, NOK = next of kin, QOL = quality of life*

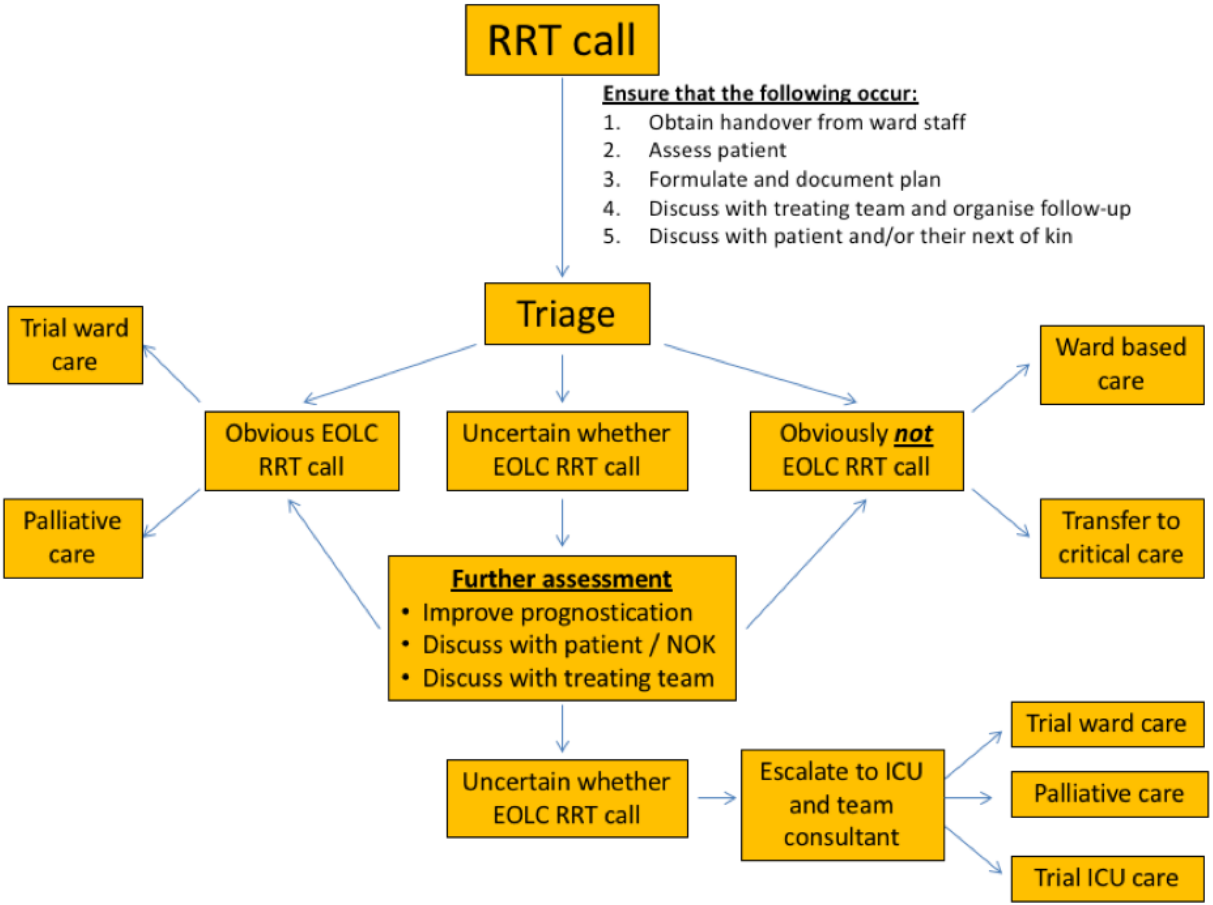


Figure 18.1: Suggested triage of potentially dying patients during RRT calls

Further Reading:

Jones DA, Bagshaw SM, Barrett J, Bellomo R, Bhatia G, Bucknall TK, Casamento AJ, Duke GJ, Gibney N, Hart GK, Hillman KM, Jaderling G, Parmar A, Parr MJ. The Role of the Medical Emergency Team in End of Life Care: A multicenter, prospective, observational study. Crit Care Med. 2012;40:98-103

Jones D, Moran J, Winters B, Welch J. The rapid response system and end-of-life care. Current opinion in critical care. 2013;19:616-623

Farley KJ, Mitchell I, Jones D. A practical approach to end-of-life rapid response team calls. Crit Care Resusc. 2015;17:208-210

Acknowledgments:
The editors would like to thank the following co-authors and reviewers for contributing their time and expertise to this handbook:

Dr. Tim Beckingham, ICU, Lyell McEwin Hospital, Adelaide, Australia
Ms. Victoria Eaton, Rapid Response System, Lyell McEwin Hospital, Adelaide, Australia
Dr. Stuart Gillon, Queen Elizabeth University Hospital, Glasgow, Scotland
Jennifer Hill, ICU, Tupua Tamasese Meaole Hospital, Apia, Western Samoa
Dr. Cameron Knott, ICU, Bendigo Hospital, Australia
Tammie McIntyre, ICU, Austin Health, Melbourne, Australia
Prof. Imogen Mitchell, ICU, Canberra Hospital, Canberra, Australia
Jayne Ramsdale, ICU, Austin Health, Melbourne, Australia
Dr. Chris Subbe, ICU, Ysbyty Gwynedd, Bangor, Wales
Carmel Taylor, ICU, Austin Health, Melbourne, Australia
Michelle Topple, ICU, Austin Health, Melbourne, Australia
Dr. Laurence Walker, ICU, Wellington Regional Hospital, Wellington, New Zealand

Graphic design, typesetting, digital post-production & website: Alex Psirides

9 780473 453756