THE DETERIORATING TRAUMA PATIENT

1. Key messages

The Victorian State Trauma System provides support and retrieval services for critically injured patients requiring definitive care, transfer and management. This deteriorating trauma patient guideline provides evidence-based advice on the initial management and transfer of major trauma patients who present to Victorian health services with severe injuries.

This guideline is developed for all clinical staff involved in the care of trauma patients in Victoria. It is intended for use by frontline clinical staff that provide early care for major trauma patients; those working directly at the Major Trauma Service (MTS) as well as those working outside of a MTS.

These guidelines provide the user with accessible resources to effectively and confidently provide ongoing care and monitoring for deterioration in critically injured patients. They provide up-to-date information for frontline healthcare clinicians. The guideline has followed the AGREE II methodology for guideline development and is under the auspice of Victorian State Trauma Committee (VSTC).[1]

Clinical emphasis points

Early identification and management of deterioration in trauma patients follows the same principles as in any clinical setting:

- Early identification of potentially life-threatening problems, particularly those that are readily reversible, may be life-saving.
- Deterioration in a trauma patient is a complex matrix of identified and potentially unrecognised injuries.
- Established and implemented approaches currently in use provide a framework for evaluating and managing deteriorating patients.

- Careful monitoring of trauma patients with close attention to and documentation of vital signs is necessary to identify those at risk.
- A structured approach is required for recognising and managing life threats in trauma patients.
- Calling for help early from Adult Retrieval Victoria (ARV) as well as local resources will help manage a deteriorating trauma patient.

Victorian State Trauma System Guideline

The Deteriorating Trauma Patient

RAUMA VICTORIA

Make early contact with ARV for advice from the major trauma services and to initiate retrieval.

- Always leave a patient with an established care plan and strategy for review.
- Escalate or ask for help if concerned about a patient.

Early Activation

- Initiate in house / local rapid response system
- Consider assistance from Ambulance Victoria

Early Warning Signs

AIRWAY / C-SPINE

- Obstructed Airway
- Stridor / Wheeze
- Swelling of upper airway

BREATHING

- RR < 9 or > 31
- SpO_2 < 95%
- Tracheal Tug
- Any breathing difficulties

CIRCULATION

- HR < 49 or >130/min
- Sys BP < 90 OR >180mmHg
- Peripheral cyanosis

DISABILITY

- Fall in GCS > 2 points
- Seizure
- Alteration in mentation
- New/Uncontrolled pain

If the front line clinician is concerned, initiate response even if the patient appears stable and safe.

Early Intervention

AIRWAY / C SPINE

- Initiate airway manoeuvres (Chin lift / jaw thrust)
- Consider oral airway insertion
- Consider early intubation

BREATHING

- Apply SpO_2 monitoring
- Administer oxygen as necessary to achieve SpO_2 94-98%
- Auscultate and examine chest
- Ventilate as necessary

CIRCULATION

- Establish IV access
- Apply 3 lead ECG monitoring
- Consider fluid administration
- Take 12 lead ECG
- Take bloods for analysis

DISABILITY

- Assess level of consciousness using GCS
- Check pupils
- Check BSL
- Review medication
- Pain Management

In addition: Check patient temperature and ensure normothermic. Treat accordingly if out of range. Consider further imaging if available and time allows.

Need more help or patient not responding to treatment?

ACTIVATE EXTERNAL RESPONSE

ARV escalation - initiate contact with ARV to:

- Communicate your concerns regarding the patients status
- Seek guidance and assistance with interventions / treatment options
- Use tele / videoconference support capacity (where available)
- Prioritise ongoing management of patient and escalate retrieval for definitive care when required

Possible Outcomes

- Local management with support
- Retrieval to a Rural Trauma Service
- Retrieval to a Metropolitan Trauma Service
- Retrieval to a Major Trauma Service

ARV Adult Retrieval Victoria

1300 36 86 61 Statewide 24 hours

28/07/2017 | Version 2.0 | Not applicable to Paediatric patients | Contact us: Trauma.Victoria@ambulance.vic.gov.au

AMBULANCE VICTORIA

3. Introduction

Deteriorating trauma patients

The early recognition and response to clinical deterioration is vital in order to prevent adverse events in the patient care episode including: avoidable morbidity, cardiac arrest, unplanned ICU admission and death. There is clear evidence that changes in physiological vital signs precede these events and research indicates that failure to appropriately recognise and respond to deteriorations or to escalate care in patients who are deteriorating directly leads to adverse outcomes for the patient.

Data from the Victorian government from 2010-2011 show that of the admissions direct to ICU from the ED, 70% were recognized as critically ill or injured on arrival, with 30% assessed as moderate to low acuity who then had an unplanned ICU admission[2].

Early recognition of clinical deterioration is essential for timely escalation of care, clinical response and appropriate management of the patient's condition[3].

Medical Emergency Teams (MET) in hospitals are designed to review patients in the early stages of deterioration in order to attempt to reduce serious adverse events, cardiac arrests and unplanned ICU admissions. That same principle applies to the ED with a similar team based approach to trauma management[4]. *(See below)*

Similarities and differences between MET services and trauma team		
Variable	Trauma team	MET service
Location of patient	Emergency department or trauma centre	Hospital ward
Team leader	Typically emergency department doctor	Typically intensive care unit registrar
Patient profile	Young with few co-morbidities	Elderly with multiple co-morbidities
Presenting problem	Trauma	Hypoxia, hypotension and tachycardia
Need for early intervention	Concept of "golden hour"	Shown for sepsis, myocardial ischaemia, stroke

A fundamental feature of emergency care is managing that risk of clinical deterioration. Trauma patients, however, can be more complex and the sudden deterioration of any particular vital sign may be the result of the complex interaction of several injuries.

Trauma patient management requires careful observation in the period from arrival at the healthcare facility with a focus on two key outcomes of traumatic injury:

- *Primary injury*: the outcomes of the initial mechanical forces that occur from the traumatic event.

- *Secondary injury*: not mechanically caused outcomes of traumatic injuries that may be superimposed on the primary injuries already identified.[5]

Effectively managing a deteriorating trauma patient may require simultaneous resuscitation and assessment. Any deterioration of a trauma patient indicates a need to revisit primary and secondary assessment to guide further intervention.

Key to successfully managing a deteriorating major trauma patient is rapid assessment and intervention with escalation of care to external resources where there are no local resources available, or when patient care is beyond the capacity of the health service[6].

Early communication with ARV clinicians and using tele/videoconference facilities may provide additional support and guidance to clinicians.

Track and Trigger

The Australian Commission on Safety and Quality in Health Care (ACSQHC) recommend that all patients in acute care settings have access to a standardised system of response to guide healthcare providers. Track and Trigger systems actively promote the early recognition of clinical deterioration through regular assessment of vital signs (tracking) and aid in supporting clinical decision making via identification of predetermined physiological criteria (triggers) that indicate when to escalate care. The implementation across all health services of *Recognising and responding to clinical deterioration* (Standard 9) is now fundamental to health service accreditation[7]. This approach uses standardised, colour-coded charts with 'track and trigger' mechanisms to guide escalation of care, reflecting approaches required under the essential elements of the standards. In the 2nd edition currently being introduced across Australia, this standard is now changing to *Recognising and responding to acute deterioration (Standard 8).* The new standard builds on the existing Standard 9 from the first edition. The main changes are that the new standard recognises that deterioration can be physiological, mental or both. Therefore systems need to be in place to recognise and respond to patients' physical and mental deterioration.[8]

See Appendix 1: R2 Observation and Response Chart example.

See Appendix 2: Adult Deterioration Detection System Observation and Response Chart example.

4. Clinical observation of major trauma patients

Major trauma patients may present significant challenges and induce substantial stress on staff, with a loss of situational awareness resulting in key indications for escalation of care being missed. Studies have shown that multi-tasking and task switching can lead to missed indicators of patient deterioration and that clear charting methods, using easily identifiable thresholds for escalation, can reduce adverse events in patient care.

Alongside this, patients in the ED are at increased risk of unrecognised, unreported and/or undertreated clinical deterioration. Many factors come together to increase the likelihood of this such as time pressures, uncontrolled workloads and limited resources. Add to this the relative unknown history of the patient with non-specific complaints that carry a wide range of differential diagnosis.

Recognising and responding to clinical deterioration

The initial clinical management of a major trauma presentation needs to rely on both the collection of concise data and on astute observations gained from clinical examination of the patient to relay to consulting team members.

Clinical criteria for escalation of care provides decision support for clinical staff to ensure there are clear guidelines on when to intensify and increase frequency of communication and observation. Respiratory rate changes, specifically tachypnoea is the most sensitive and specific indicator of clinical deterioration so should be measured frequently and accurately.

Staff should also be aware of acute changes in the patient over time such as fluctuations in pupillary response, confusion, agitation or delirium or an acutely cold, clammy, cyanotic or pulseless extremity.

Additionally, clinicians need to be aware of changes in frequent observations that are documented routinely during the patient's initial assessment and early management.

The following tables indicate key criteria requiring further assistance with patient assessment and management.

Early warning signs of patient deterioration[9]

Partial airway obstruction (excluding snoring)
Oxygen saturation 90–95%
Respiratory rate 5–9 bpm or 30–40 bpm
Pulse rate 40–50 or 120–140
Systolic BP 80–100 mmHg or 180–240 mmHg
Poor peripheral circulation
Urine output < 200 mL over eight hours
Greater than expected drainage fluid loss
A drop in GCS of 2 points or GCS < 12 or any seizure
New or uncontrolled pain (including chest pain)
ABGs $Pa0_2$ 50–60, PCO_2 50–60, pH 7.2–7.3, BE –5 to –8 mmol/L
BSL 1–3 mmol/L

Late warning signs of patient deterioration[9]

Airway obstruction or stridor
$Sp0_2$ < 90%
Respiratory rate < 5 bpm or > 40 bpm
Pulse rate < 40 or > 140
Systolic BP < 80 or > 240 mmHg

Excess blood loss not controlled by ward staff
Unresponsive to verbal command or GCS < 8
Urine output < 200 mL in 24 hours or anuria
ABGs $Pa0_2$ < 50, PCO_2 > 60, pH < 7.2, BE < –7
BSL < 1 mmol/L

Used with permission from:
http://www.cec.health.nsw.gov.au/programs/between-the-flags

The ACQSHC *National Consensus Statement: Essential elements for recognising and responding to clinical deterioration* require eight important clinical processes to be in place at all healthcare services:

1) Measurement and documentation of observations: establishing the need for the assessment of measureable physiological abnormalities that occur prior to adverse events.
2) Escalation of care: where an escalation protocol sets out the organisational response to dealing with different levels of physiological abnormality, including modifications to nursing care, increased monitoring, review by attending staff, review by senior medical and nursing staff, or calling for emergency assistance from intensive care or specialist teams.
3) Rapid response systems: where severe deterioration occurs, it is important that the capacity exists to obtain appropriate emergency assistance or advice prior to the occurrence of an adverse event. In some facilities this may be a combination of on-site and external clinicians or resources.
4) Clinical communication: effective communication and teamwork among clinicians is an essential element for recognising and responding to clinical deterioration. Poor communication has been identified as a contributing factor to incidents where clinical deterioration is not identified or properly managed.
5) Organisational support: without strong organisational support for implementation, the system will fail. There needs to be acceptance from senior management to help drive the health care facility to ensure that their systems for recognising and responding to clinical deterioration are operational and effective.
6) Education: It is essential to provide education to the clinical and nonclinical workforce in support of this standard in order to ensure familiarisation and usage in practice.
7) Evaluation: of new systems is important in order to establish their efficacy and determine if any changes are required to optimise performance
8) Technological systems and solutions: it is important to consider the use of technological systems and solutions which may aid in the delivery and accessibility of implementing new systems.

In managing a deteriorating patient in all health services, the Consensus Statement provides clear guidelines on the development and governance of rapid response systems.

5. The role of the team in recognition of deterioration

The acronym DETECT can be used to assist in identifying and managing deteriorating patients and to guide staff as to when to escalate assessment and intervention or activate a rapid response team if available at the health service[10].

There are a range of parameters that should be taken into consideration when deciding if escalation of care is required.

- Many institutions now advocate for escalation and clinical review even if the only criteria met is that staff are concerned about the patient.

This may be without markedly abnormal observations and no added differential diagnosis. Further communication may assist in identifying acute changes in the patient's condition.

The activation of local resources may include contributions from pre-hospital team members such as emergency response personnel, secondment of in-house staff to assist or the recall of off-duty staff. The potentially challenging circumstances of managing a deteriorating patient require leadership and early planning. It should also include nominating a skilled staff member to supervise and guide assessment and intervention.

Importantly, the lead of the response team should remain, where possible, dedicated to this single role, and not become involved in direct intervention. This may be limited by the need to assist in managing the patient as advanced skills of the leader may be required; however, they should return to the supervisory role as soon as possible to manage overarching supervision, continuously scoping for changes in the patient's condition and indications for further intervention.

For health services with limited capacity, communication with ARV contributes to the team assessment and management of a deteriorating trauma patient.

This additional communication with experienced staff may provide the required clinical support to improve patient care and offer staff assurance that the patient is being appropriately managed under difficult circumstances.

The DETECT algorithm (see table below), promotes the use of a systematised process to detect Deterioration, Evaluate, Treat, Escalate and Communicate with your Team. This system promotes a 'concern, communicate and care for' approach for these patients to ensure they receive simple, early intervention to reverse deterioration.

The DETECT algorithm, 'detect deterioration' uses the ABCDEFG[11] format (see Appendix 3) to ensure effective assessment of the patient is undertaken including collecting important information that may indicate the patient is heading down the 'slippery slope' and for effectively communicating the patient's status.

DETECT algorithm

D	**Detect deterioration** •Recognise that you have a problem by gathering information relating to your patient. •Use the ABCDEFG algorithm (look, listen, feel). •Identify early and late warning signs.	**Trauma examples** Increasing respiratory rate, increasing heart rate, falling blood pressure, ongoing revealed blood loss, pallor, altered conscious state, decreased urine output.
E	**Evaluate** •Likely causes of deterioration. •Whether your skills and the skills of those around you will meet the patient's needs. •If and when to call for help. •The urgency of the response. •Continue to constantly re-evaluate.	Evolving head injury and changing conscious state where the cause appears obvious but need to exclude concealed haemorrhage and complications of chest trauma compromising ventilation. Consider early communication of any problems identified.
T	**Treatment** •Prioritise interventions using the ABCDEFG algorithm to guide your decision making. •Commence simple treatments such as oxygen, positioning your patient and establishing IV access. •Call for help if you can't manage.	Begin basic life support if required, check oxygen administration, ensure large-bore IV access and administer resuscitation fluids, position patient as needed (for example, left lateral/sit up) check point of care/formal blood tests, prepare equipment for interventions such as intubation.
E	**Escalate** •Be aware of signs of further deterioration, or failure to reverse deterioration. •Know how and who to call for more assistance. •Know when the patient's clinical management requires advanced skills.	Notify the senior doctor/nurse in charge, activate local protocols, re-contact ARV, use internal and/or external resources where capacity exists.
C	**Communicating** in **Teams** •Provide leadership where appropriate. •Coordinate activities within the team. •Use the ISBAR algorithm to communicate clearly.	Revise, prepare and communicate the patient's care plan, assess outcomes of intervention, designate a team leader and other roles to the response team members, consider tele/video conferenced support from ARV.

	•Document clearly the patient's outcome in the healthcare record.	
T		

Used with permission from:

http://www.cec.health.nsw.gov.au/programs/between-the-flags

6. Early activation or consultation

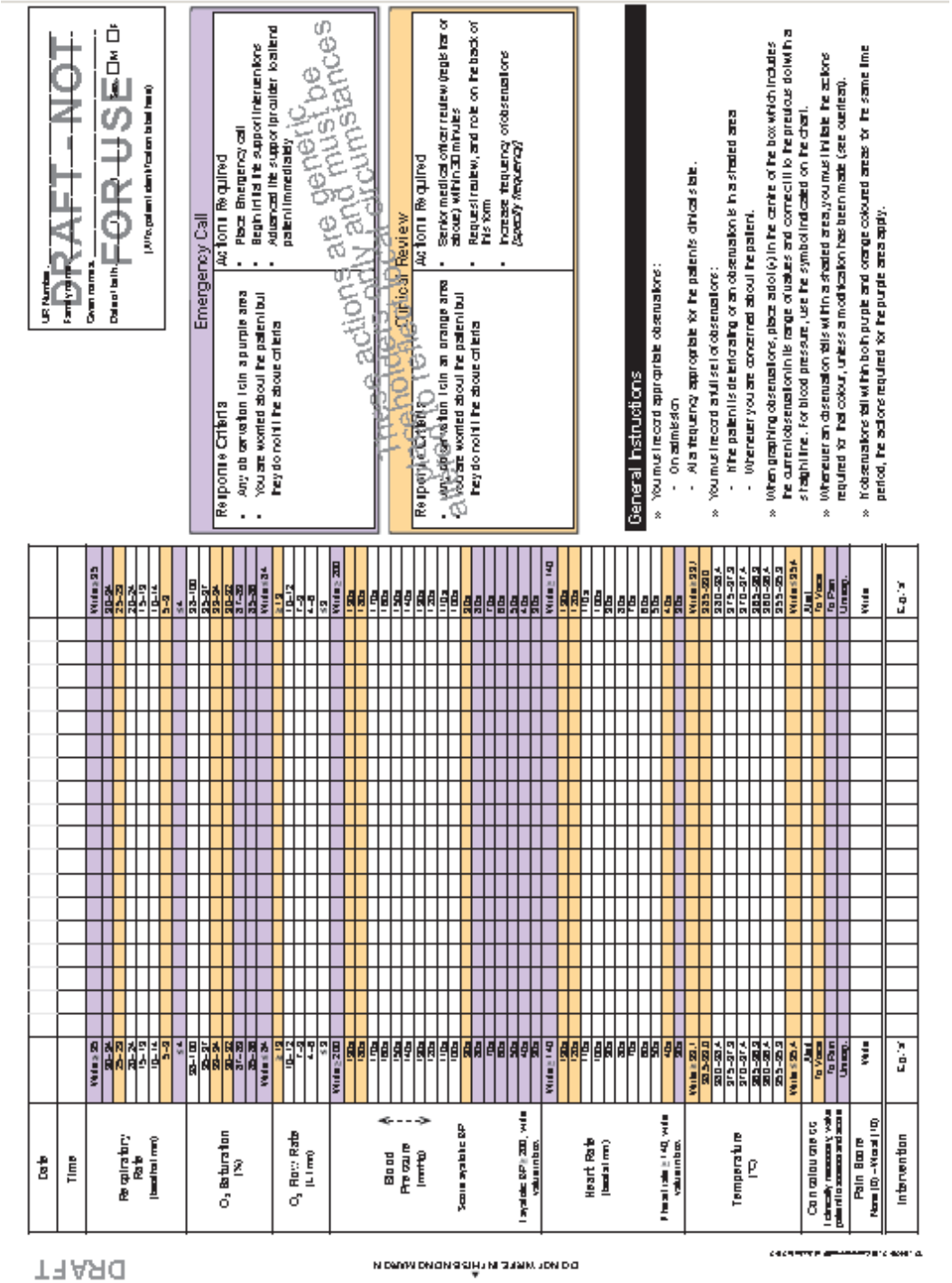
If critical care clinical advice is required or it is anticipated that transfer to an MTS will be needed, early retrieval consultation and activation is essential (phone ARV on 1300 368 661).
Early retrieval activation ensures access to critical care advice and a more effective retrieval response.
Early activation and timely critical care transfer improves clinical outcomes for the patient.
If you are undecided, call the ARV coordinator, who can provide expert guidance and advice over the phone or via tele/videoconference, and link to an MTS as required.

7. Further information

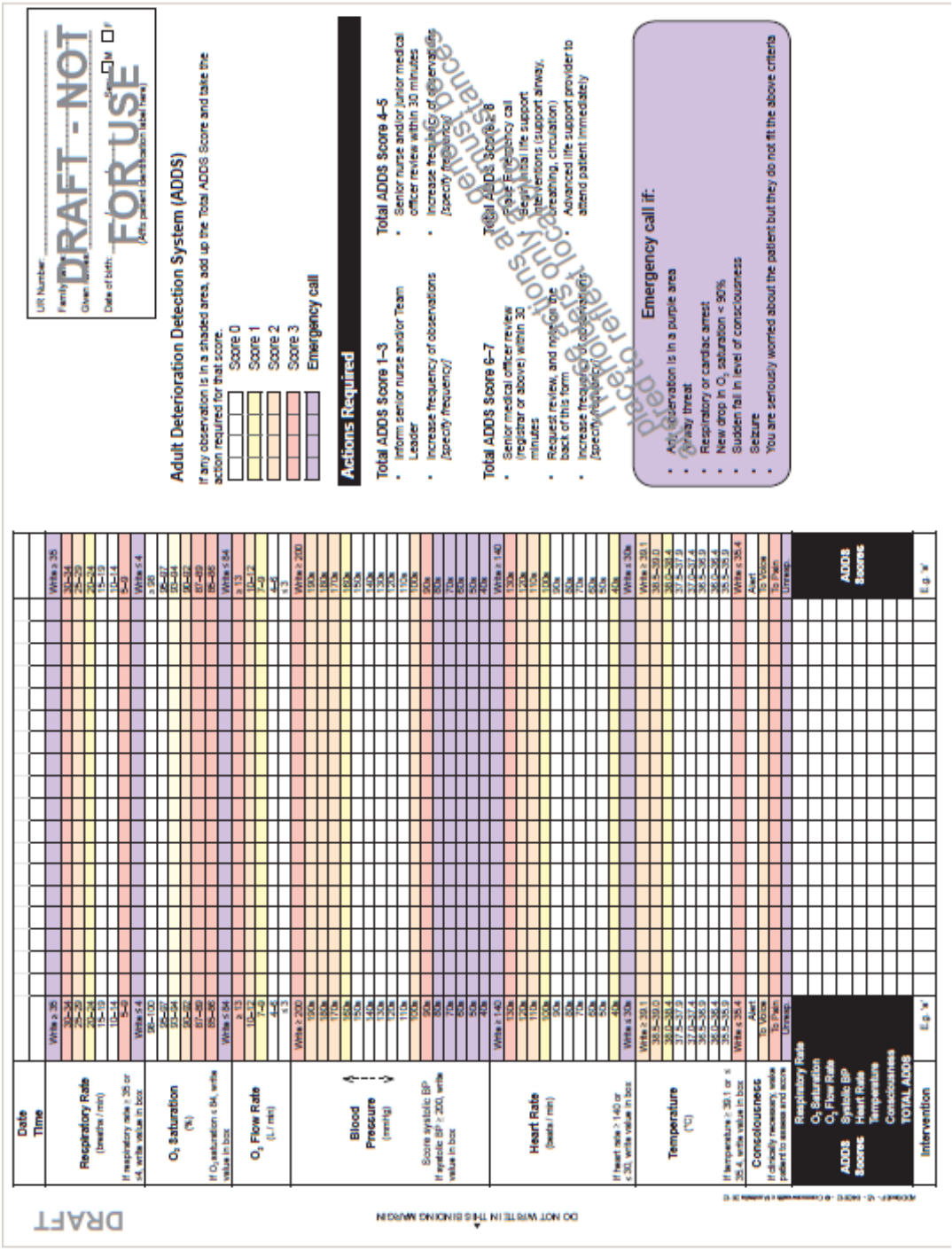
- FINAL DRAFT: National Safety and Quality Health Service Standards (second edition)
- https://www.safetyandquality.gov.au/wp-content/uploads/2017/09/National-Safety-and-Quality-Health-Service-Standards-second-edition.pdf

- 8: Recognising and Responding to Acute deterioration: overview.
- https://www.safetyandquality.gov.au/wp-content/uploads/2017/09/8-Recognising-and-Responding-to-Acute-Deterioration.pdf

8. Appendix 1: R2 Observation and response charts example



9. Appendix 2: ADDS Observation and response chart



10. Appendix 3: ABCDEFG for deteriorating patients

A	**Airway**	**Look** • For any signs of airway obstruction. • For evidence of mouth/neck/swelling/haematoma. • For security of artificial airway.	**Listen** • For noisy breathing e.g. gurgling, snoring or stridor.	**Feel** • For the presence of air movement. • For security of artificial airway.
B	**Breathing**	**Look** • At the chest wall movement, to see if it is normal and symmetrical. • To see if the patient is using their neck and shoulder muscles to breathe (accessory muscles). • At the patient to measure their respiratory rate.	**Listen** • To the patient talking to see if they can complete full sentences. • For noisy breathing e.g. stridor, wheezing.	**Feel** • For the position of the trachea to see if it is central. • For the surgical emphysema or crepitus. • If the patient is diaphoretic (sweaty).
C	**Circulation**	**Look** • At the skin colour for pallor and peripheral cyanosis. • At the capillary refill time. • At the patient's central venous pressure and jugular venous pressure.	**Listen** • To the patient for complaints of dizziness and headaches. • For patient's blood pressure and heart sounds.	**Feel** • Your patient's hands and feet to see if they are warm or cold. • Your patient's peripheral pulses for presence, rate, quality, regularity and equality.
D	**Disability**	**Look** • At the level of consciousness. • For facial symmetry, abnormal movements, seizure activity or absent limb movements. • At pupil size, equality and reaction to light.	**Listen** • To patients response to external stimuli and pain. • For slurred speech. • For patient's orientation to person, place and time.	**Feel** • For patient's response to external stimuli. • For muscle power and strength.
E	**Exposure**	**Look** • For any bleeding e.g. investigate wounds and drains that may be hidden by bed clothes.	**Listen** • For air leaks in drains. • For bowel sounds.	**Feel** • The patient's abdomen.
F	**Fluids**	**Look** • At the observation and fluid charts, noting the fluid input and output. • At losses from all drains and tubes. • At the amount and colour of the patient's urine and urinalysis results.	**Listen** • For patient's complaints of thirst.	**Feel** • The skin turgor.
G	**Glucose**	**Look** • At blood glucose levels. • For signs of low glucose, including confusion and decreased conscious state. • At medication chart for insulin and oral hypoglycaemics.	**Listen** • For patient's complaints of thirst. • For patient's orientation to person, time and place.	**Feel** • If the patient is diaphoretic (sweaty, cold or clammy).
Give oxygen	• Based on your assessment (above) decide on an appropriate oxygen flow rate or percentage. If in doubt commence on 4L/min on a Hudson mask and increase as indicated by oxygen saturation or patient condition			
Position your patient	• Position your patient to optimise their breathing – usually this is as upright position as possible and as tolerated by the patient. • Place the patient in the left lateral position if they are unconscious but have adequate breathing and circulation and where there is no evidence of spinal injury.			
Call for help if you can't manage	Establish IV if not present, +/- fluids.			
Never leave a deteriorating patient without a priority management and review plan	Document and communicate clearly: • All treatments provided. • Outcomes of treatment implemented. • What care is still required. The plan should include expected outcomes and when the patient will be reviewed again			

11. Appendix 4: AGREEII Score Sheet – The deteriorating trauma patient guideline

AGREE II Score Sheet: The deteriorating trauma patient guideline

Domain		Item	AGREE II Rating						
			1 *Strongly Disagree*	2	3	4	5	6	7 *Strongly Agree*
Scope and purpose	1.	The overall objective(s) of the guideline is (are) specifically described.							X
	2.	The health question(s) covered by the guideline is (are) specifically described.							X
	3.	The population (patients, public, etc.) to whom the guideline is meant to apply is specifically described.							X
Stakeholder involvement	4.	The guideline development group includes individuals from all the relevant professional groups.						X	
	5.	The views and preferences of the target population (patients, public, etc.) have been sought.							X
	6.	The target users of the guideline are clearly defined.							X
Rigor of development	7.	Systematic methods were used to search for evidence.					X		
	8.	The criteria for selecting the evidence are clearly described.						X	
	9.	The strengths and limitations of the body of evidence are clearly described.						X	
	10.	The methods for formulating the recommendations are clearly described.						X	
	11.	The health benefits, side effects and risks have been considered in formulating the recommendations.						X	
	12.	There is an explicit link between the recommendations and the supporting evidence.							X
	13.	The guideline has been externally reviewed by experts prior to its publication.							X
	14.	A procedure for updating the guideline is provided.							X
Clarity of presentation	15.	The recommendations are specific and unambiguous.						X	
	16.	The different options for management of the condition or health issue are clearly presented.							X
	17.	Key recommendations are easily identifiable.							X

Domain	Item	AGREE II Rating						
		1 *Strongly Disagree*	**2**	**3**	**4**	**5**	**6**	**7** *Strongly Agree*
Applicability	18. The guideline describes facilitators and barriers to its application.							X
	19. The guideline provides advice and/or tools on how the recommendations can be put into practice.							X
	20. The potential resource implications of applying the recommendations have been considered.							X
	21. The guideline presents monitoring and/ or auditing criteria.							X
Editorial independence	22. The views of the funding body have not influenced the content of the guideline.							X
	23. Competing interests of guideline development group members have been recorded and addressed.							X
Overall Guideline Assessment	1. Rate the overall quality of this guideline.	**1** *Lowest possible quality*	**2**	**3**	**4**	**5**	**6**	**7** *Highest possible quality*
Overall Guideline Assessment	2. I would recommend this guideline for use.	*Yes*	*Yes, with modifications*		*No*			
		X						

12. References

[1] Brouwers M, Kho ME, Browman GP, Burgers JS, Cluzeau F, Feder G, Fervers B, Graham ID, Grimshaw J, Hanna S, Littlejohns P, Makarski J, Zitzelsberger L for the AGREE Next Steps Consortium. AGREE II: Advancing guideline development, reporting and evaluation in healthcare. Can Med Assoc J. 2010. Available online July 5, 2010. doi:10.1503/cmaj.090449

[2] Considine J, Jones D, Bellomo, R. Emergency department rapid response systems: the case for a standardized approach to deteriorating patients. European Journal of Emergency Medicine 20:375-381. 2013.

[3] Hosking J, Considine J, Sands N. Recognising clinical deterioration in emergency department patients. Australasian Emergency Nursing Journal (2014) 17, 59-67

[4] Considine, J. & Jones, D. (2015). Rapid response systems and the emergency department. In Cameron, P, Jelinek, J, Kelly, AM, Brown, A & Little, M. Textbook of Adult Emergency Medicine. Fourth Edition. (pp. 875-880). Elselvier: Sydney

[5] Boyle M, Smith E, Archer F. A review of patients who suddenly deteriorate in the presence of paramedics. BMC Emergency Medicine. 2008. 8:9. doi:10.1186/1471-227X-8-9

[6] Shere-Wolfe R, Galvagno S, Grissom T. 2012. Critical care considerations in the management of the trauma patient following initial resuscitation. Scand J Trauma Resusc Emerg Med. 20(1)68. Available at: http://www.sjtrem.com/content/20/1/68 (Accessed April 4 2014).

[7] Australia. National consensus statement; essential elements for recognising and responding to clinical deterioration. Australian Commission on Safety and Quality in Health Care. 2010. Sydney

[8] ACSQHC. (2017, September 4). *NSQHS Standards (second edition)*. Retrieved from Australian Commission on Safety and Quality in Health Care: https://www.safetyandquality.gov.au/our-work/assessment-to-the-nsqhs-standards/nsqhs-standards-second-edition/

[9] Clinical Excellence Commission: Programs Between the Flags – keeping patients safe [cited 2014 June 17]
Available from: < http://www.cec.health.nsw.gov.au/programs/between-the-flags>.

[10] American College of Surgeons. Advanced Trauma Life Support. 9th Edition. American college of Surgeons committee on Trauma. 2012, Chicago.

[11] Grol R, Grimshaw J. 2003. From best evidence to best practice: effective implementation of change in patients care. The Lancet. vol. 362, no. 9391, p. 1225–1230