New Zealand Early Warning Score Vital Sign Chart User Guide 2017

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1. Introduction

The national vital signs chart and early warning score provide a safety net for adult patients who acutely deteriorate while in hospital. The New Zealand early warning score (NZEWS) is calculated from routine vital sign measurements and increases as vital signs become increasingly abnormal. The EWS triggers an escalating clinical response so that clinicians with the right skills can intervene and manage the patient's deterioration.

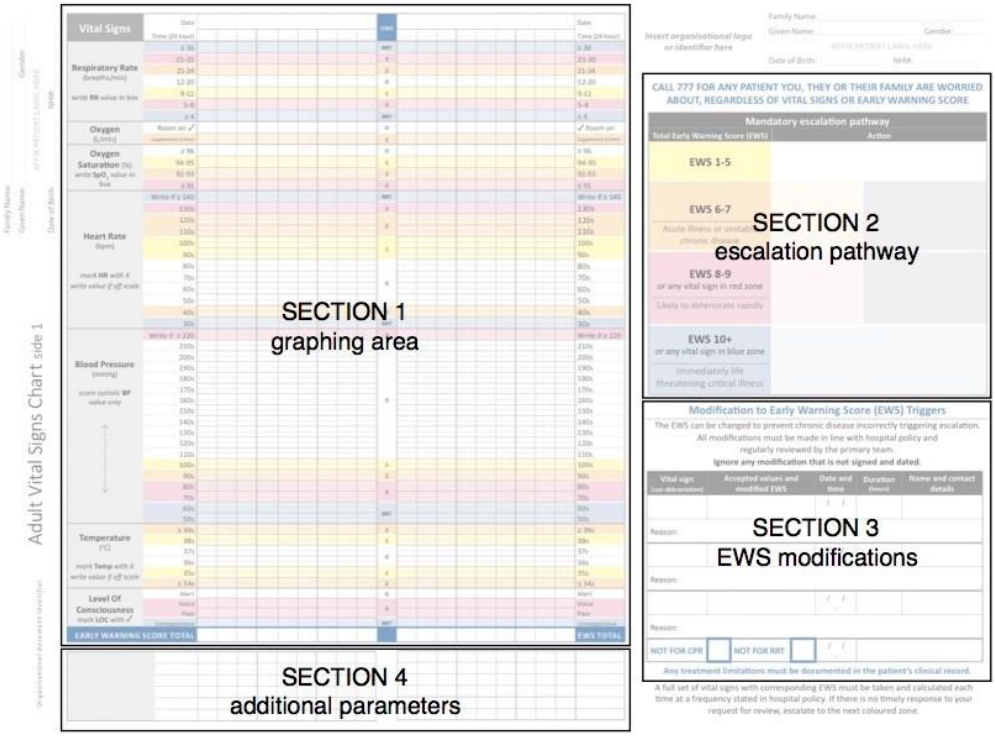
The national vital signs chart and NZEWS were developed based on the best available human factors and clinical evidence and tested for usability in a number of different hospital sites and ward settings. These included acute tertiary medical and surgical wards, inpatient mental health units, a private surgical hospital, and small regional hospitals.

The purpose of this user guide is to provide information about the logistical and clinical considerations for using the national chart. Further detail about the background of the patient deterioration programme can be found on the Health Quality & Safety Commission (the Commission) website.

2. Chart overview

The national vital signs chart and NZEWS are designed for detecting clinical deterioration in a population of acutely hospitalised, non-pregnant, adult patients. Figure 1 illustrates the main areas of the chart that are referred to within this user guide. This section of the user guide provides a brief overview of each section of the chart. Detailed discussion of clinical use follows in the subsequent section.

Figure 1: Overview of the vital sign and NZEWS chart



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2.1. Section 1: graphing area

The purpose of the graphing area is to document vital sign measurements and calculate and document the associated NZEWS. The NZEWS relies on clinicians monitoring and documenting seven core vital sign parameters within the graphing area (section 1) of the chart. These are:

- respiratory rate
- oxygen supplementation
- oxygen saturation
- heart rate
- blood pressure
- temperature
- level of consciousness.

Documentation in the graphing area must be consistent to enable trends indicating deterioration or improvement in a patient's condition to be easily detected.

If any of these seven parameters deviates from the norm a score (0-3) is assigned. The score assigned increases as vital signs deviate further from the normal zone. The score for each individual parameter is added together to calculate the aggregate NZEWS and the total score is documented in the bottom row of the graphing area.

Abnormal vital signs associated with a given score are also identified by the differently coloured zones on the chart. Individual vital sign parameters in the red or blue zones trigger escalation actions specified on the escalation pathway (section 2 of the chart) regardless of total NZEWS.

2.2. Section 2: escalation pathway

The escalation pathway specifies the actions to be taken in response to the detection of vital sign parameter abnormalities. The NZEWS or individual parameter triggers associated with the yellow, orange, red and blue zones of the escalation pathway indicate progressively increased levels of clinical risk. The response to each level of clinical risk articulated in the escalation pathway must be determined locally in order to reflect available resources and processes of care.

2.3 Section 3: NZEWS modifications

The purpose of the modifications section is to allow NZEWS triggers to be individualised for patients with chronic disease or known vital sign abnormalities that are not representative of clinical deterioration. Modifications may be made to single or multiple vital sign parameters.

For example, a patient on a beta blocker with a known slow heart rate may inappropriately trigger escalation of care unless a single parameter modification for heart rate is made. Patients with chronic obstructive pulmonary disease on home oxygen may need modifications made to multiple parameters including respiratory rate, oxygen supplementation, and oxygen saturation.

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2.4. Section 4: additional parameters

Up to two additional parameters can be monitored using the chart. These can be selected by each organisation to reflect local practice needs. It is recommended that any additional parameters are selected based on the need for monitoring at a frequency similar to that for the core vital signs so that trends over time can easily be identified. This may mean selecting different parameters for charts used in different clinical areas. For example:

- an acute surgical hospital where vital signs are measured multiple times a day might select pain scores on rest and movement and neurovascular observations as additional parameters
- an acute mental health unit where vital signs are measured daily might find it more relevant to select bowel function and blood sugar level as additional parameters.

3. Clinical use

This section discusses clinical use of the vital signs chart. This includes:

- vital sign documentation
- making modifications to calling criteria
- calculating early warning scores
- escalation of care.

An online learning module is available and provides opportunities for clinicians to access this information and test their knowledge. Fact sheets about related topics such as supplementary oxygen, sepsis and capabilities for responders are also available on the Commission website.

3.1. Documenting vital signs

Vital signs must be documented consistently so that trends over time can be recognised and assessed accurately. Inconsistent documentation can contribute to errors and potential delays in recognising physiological deterioration. Instructions for documenting each vital sign parameter, the accepted abbreviation, and the unit of measurement are printed in the grey column to the left of the graphing section of the vital sign chart.

3.1.1 Respiratory rate

Respiratory rate is frequently one of the first vital signs to become abnormal in the early stages of physical deterioration. Each row of the graphing area for respiratory rate represents a range associated with severity of abnormality rather than a consistent numeric range. Document the actual numeric value on the chart so that trends can be detected.

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Respiratory Rate (breaths/min) *write* **RR** *value in box*	≥ 36			
	25-35			
	21-24			
	12-20			
	9-11			
	5-8			
	≤ 4			

3.1.2. Supplementary oxygen

Patients who require supplemental oxygen to maintain their oxygen levels are at increased risk of deterioration. Document the use of supplemental oxygen on the chart using a tick in the relevant box of the graphing area.

Oxygen is a drug with specific indications and contraindications. As such it must be prescribed on the national medication chart and administered using appropriate equipment for the prescribed flow rate to achieve a targeted oxygen saturation range.

Oxygen (L/min)	Room air ✓			
	Supplement (L/min)			

3.1.3. Oxygen saturation

Document the numerical value for oxygen saturation in the relevant box of the graphing area.

Oxygen Saturation (%) *write* **SpO_2** *value in box*	≥ 96			
	94-95			
	92-93			
	≤ 91			

3.1.4. Heart rate

Document heart rate using a 'X' in the relevant box of the graphing area. Each row of the graphing area for heart rate corresponds to a numerical range of ten (e.g. a heart rate in the 70s, 80s, 90s). This enables clear identification of the relevant coloured zone in the event that the heart rate value falls exactly on the line between zones (i.e. a heart rate of 40, 50, 90, 110, 120 or 130 beats per minute).

Heart Rate (bpm) *mark* **HR** *with X write value if off scale*	Write if ≥ 140			
	130s			
	120s			
	110s			
	100s			
	90s			
	80s			
	70s			
	60s			
	50s			
	40s			
	30s			

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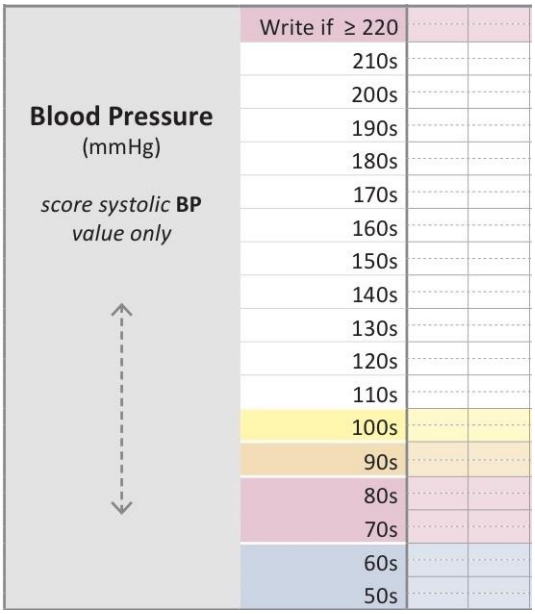
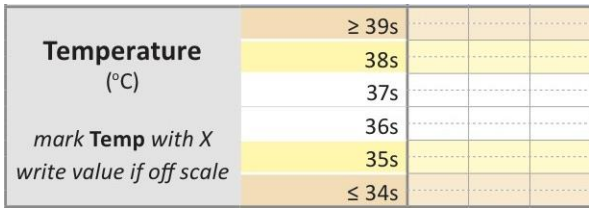
3.1.5. Blood pressure

Only the systolic blood pressure is used to trigger escalation however both systolic and diastolic blood pressure must be documented. Document blood pressure using arrows connected with a dotted line in the relevant boxes of the graphing area. Each row of the graphing area for blood pressure corresponds to a numerical range of ten (e.g. a blood pressure in the 90s, 100s, 110s). This enables clear identification of the relevant coloured zone in the event that the blood pressure value falls exactly on the line between zones (i.e. a blood pressure 70, 90, 100, 110 or 220mmHg).



3.1.6. Temperature

Measure temperature using a consistent method each time (e.g. oral, axillar, tympanic, rectal). Document temperature using an 'X' in the relevant box so that trends can easily be detected over time.



3.1.7. Level of consciousness

Level of consciousness is assessed using AVPU (Alert / responds to Voice only / responds to Pain only / Unresponsive) and documented on the chart using a tick in the relevant box of the graphing area on the chart. You need to wake patients to assess level of consciousness. If the patient wakes normally from sleep and is alert on waking, then that is documented as 'Alert'. If you think a patient has low clinical risk and does not need to be woken to record a full set of vital signs at night, then document this in their clinical record.

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Level Of Consciousness mark LOC with ✓				
	Alert			
	Voice			
	Pain			
	Unresponsive			

3.2. Modifying calling criteria

Modifications may be made to the NZEWS triggers for individual patients when chronic disease, drug therapies, or other factors cause their vital signs to fall outside of the normal range on the national vital signs chart.

When making modifications the clinician must consider the clinical risk to the patient if vital sign abnormality is normalised. Clinical risk can be mitigated by ensuring modifications are discussed with a senior clinician and reviewed at regular intervals so they remain appropriate as the patient's condition changes. The duration of all modifications must be documented to ensure that timely clinical review is undertaken.

Develop policy guidance to ensure practice around the documentation of modifications is appropriate for your local population and hospital context. This includes articulating which clinicians are able to document a modification and expectations for timely review.

Appropriate modifications are shown in figures 2 and 3 below.

Figure 2: Example of EWS modification for supplemental oxygen after anaesthesia

Vital sign (use abbreviation)	Accepted values and modified EWS	Date and time	Duration (hours)	Name and contact details
Oxygen	EWS 0 if 2 L/min or less	3/5/17 11:30	4 hrs	N. Riviera #6137
Reason: Post-anaesthesia				

Figure 3: Example of EWS modification for supplemental oxygen in chronic disease

Vital sign (use abbreviation)	Accepted values and modified EWS	Date and time	Duration (hours)	Name and contact details
Oxygen	EWS 0 if 4 L/min or less	3/5/17 14:40	until discharge	D. Ramoray #6785
Reason: COPD on home oxygen				

3.3. Calculating the NZEWS and using single parameter triggers

Deterioration can be detected using a calculated Early Warning Score (EWS) derived from the seven vital sign parameters, or by a single vital sign parameter in the red or blue coloured zones.

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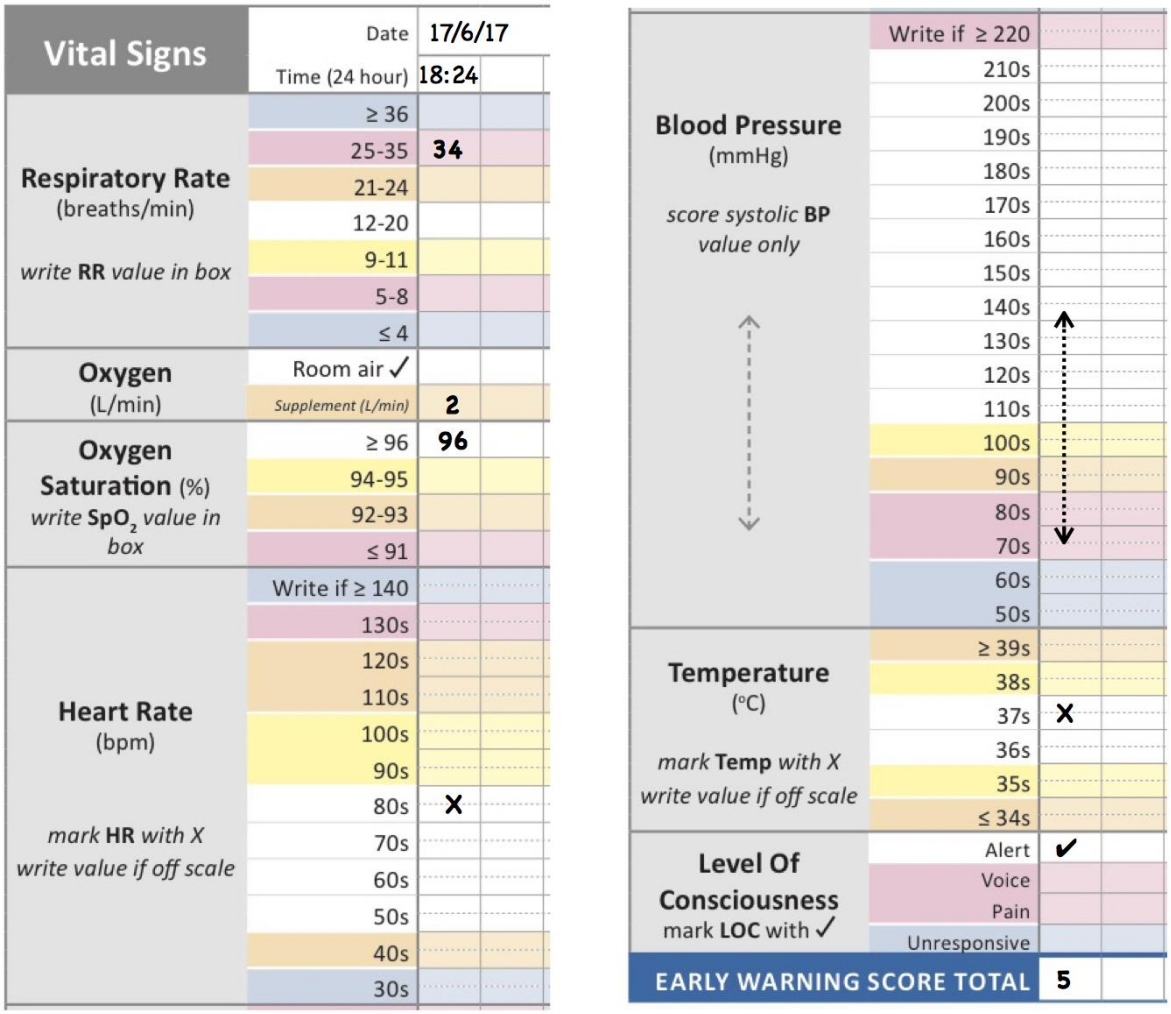
Each vital sign parameter has coloured zones (yellow, orange and red) that are associated with a score of 0-3. The score for each of the seven vital sign parameters is added together to give a total NZEWS. The total NZEWS is used to trigger action according to the escalation pathway. The blue zone is not associated with a score as any parameter in the blue zone indicates severe deterioration and should immediately prompt a rapid response call.

The actions corresponding to the trigger indicating the most severe level of deterioration must be taken. For example, if the total NZEWS was 5 but a single parameter lay in the 'red zone' on the chart, the action associated with the red zone should be taken. This is illustrated in Figure 5 where the total early warning score is 5 (triggering actions for the yellow zone on the escalation pathway) but because the single parameter of respiratory rate is in the red zone, those actions should be taken.

Figure 4: Example of when a single red zone parameter (respiratory rate) overrules the total early warning score



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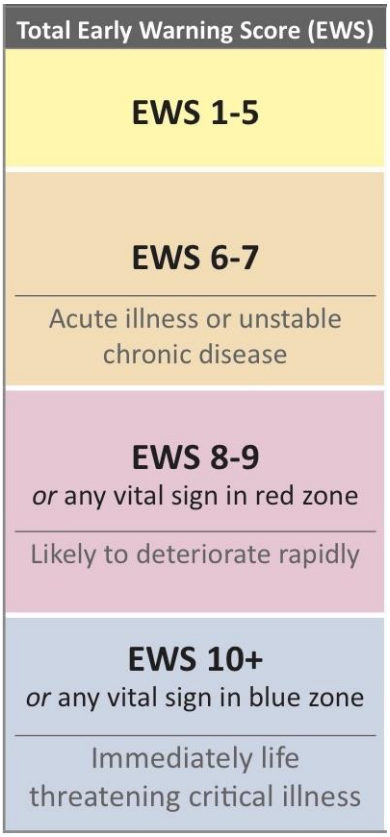
3.4. Escalating care

The actions corresponding to the trigger indicating the most severe level of deterioration **must** be taken. Rapid response calls (triggered by an individual parameter in the blue zone or total EWS 10+) should be made even when senior clinicians are already at the bedside. This is important for role-modelling and normalising a culture of calling for help. Care should also be escalated based on clinical concern or worry, regardless of a patient's vital signs or NZEWS. This includes bypassing the usual escalation process and making a rapid response call when seriously concerned.

Figure 5: Escalation pathway



Escalation of care is triggered either by an aggregate early warning score calculated from all seven core vital signs, or from a single significantly abnormal parameter. Any vital sign that falls into a zone indicating significant deviation from the norm (i.e. in the red or blue zones) triggers the action associated with that zone. The action triggering the most senior clinical review should be taken.

For example, a single parameter in a red zone would score a total NZEWS of three. A total EWS of three would trigger the action equivalent to the yellow zone on the escalation pathway, however with a single parameter in the red zone, the action for the red zone should be taken.

Similarly, if there were four parameters falling into the red zone, each would score 3 and therefore reach a total EWS of 12. In this case the action for a total EWS of 10+ (a rapid

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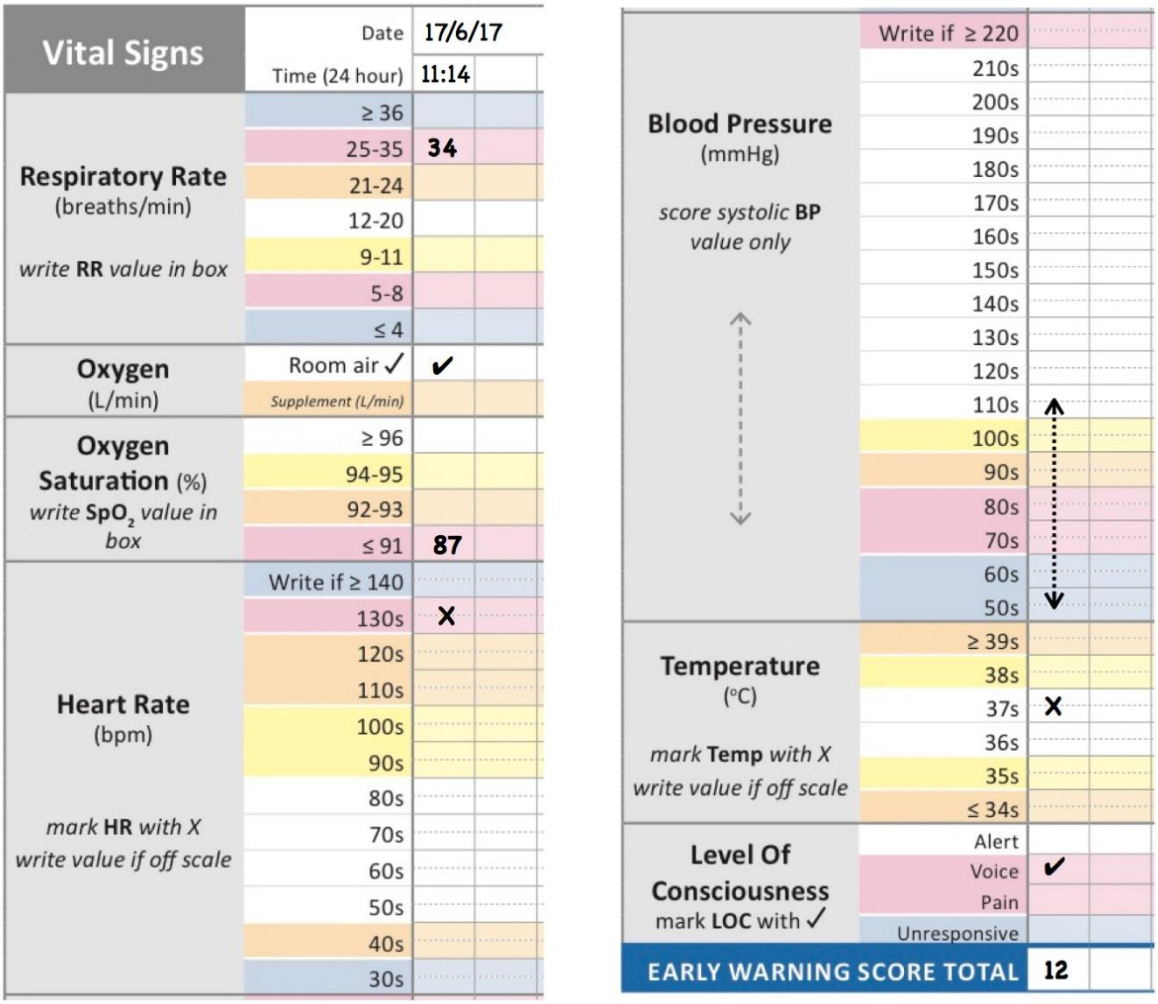
response call) would be taken rather than the action for the red zone. This is illustrated in Figure 7 below.

Figure 6: Example of when the total early warning score overrules a single parameter red zone trigger



4. Design and printing information

This section provides information about design and print requirements for the National New Zealand NZEWS vital signs chart. Localisation of the escalation pathway is required before clinical use. A small number of additional amendments are allowable and can be made according to locally agreed policy and practice.

- Required amendments
- Allowable amendments
- Colour specifications
- Print specifications

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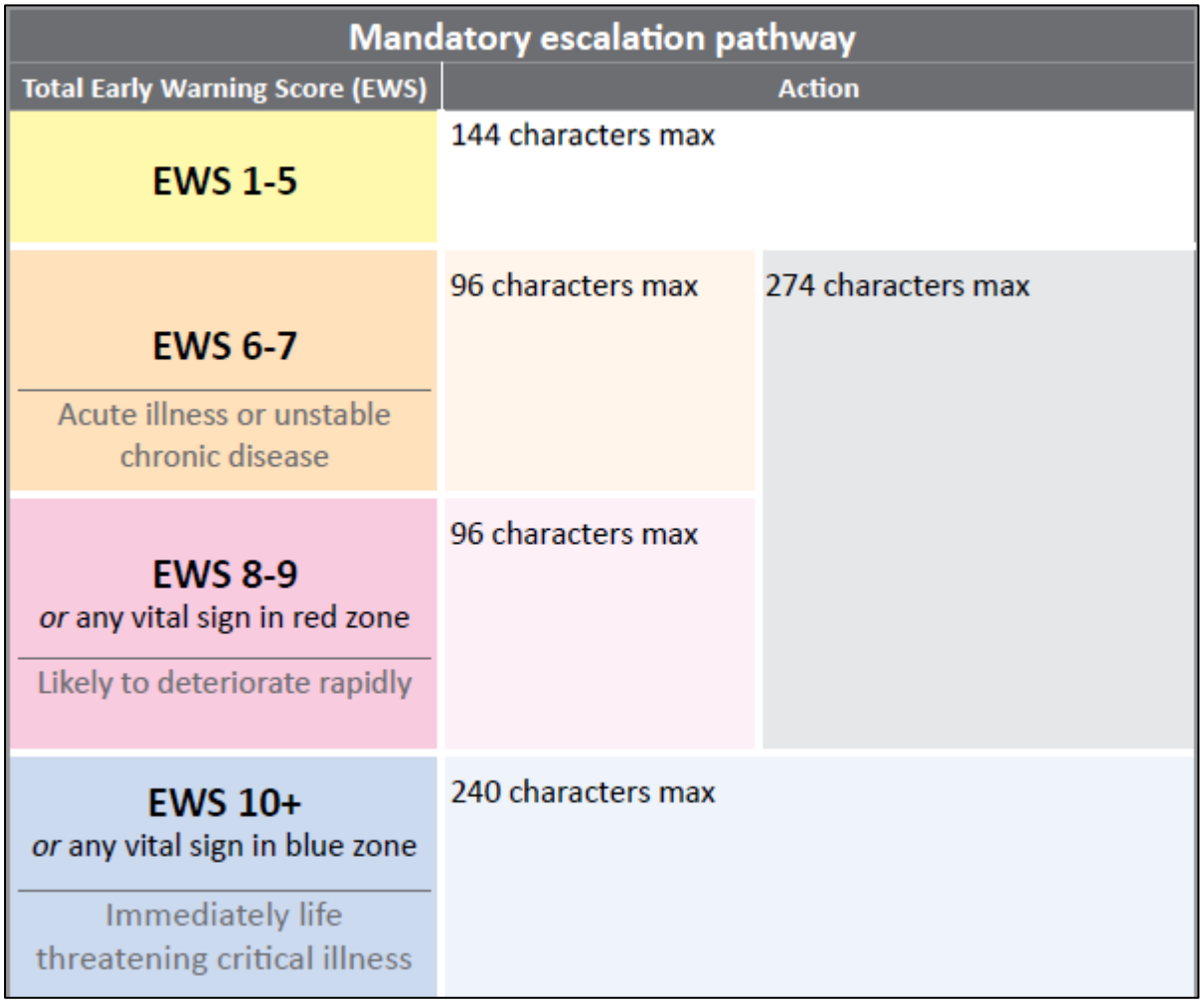
4.1. Required amendments

The escalation action pathway must be amended to reflect local systems and practice. The language used must be unambiguous, with expected actions and responses briefly and clearly articulated for each level of physiological abnormality. The vital sign chart is provided as an editable PDF document. There is a maximum character count for each box in the escalation pathway. This is provided in Figure 8 below.

Figure 7: Editable escalation pathway maximum character count



An example of an escalation pathway is provided in Figure 9 overleaf. This is an example only. Use the escalation mapping tool to work through developing your local escalation pathway.

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Figure 8: Example escalation pathway

Mandatory escalation pathway		
Total Early Warning Score (EWS)	**Action**	
EWS 1-5	Consider increasing vital sign frequency. Discuss with senior nurse. Manage pain, fever and distress.	
EWS 6-7 Acute illness or unstable chronic disease	House officer review within 30 minutes. Inform nurse in charge.	Monitor vital signs every 30 minutes until EWS <6 and/or ongoing monitoring plan documented. Consider involving SMO.
EWS 8-9 *or* any vital sign in red zone Likely to deteriorate rapidly	House officer review within 15 mins, discuss with SMO. Inform nurse in charge.	Monitor vital signs every 15 minutes until EWS <8 and/or ongoing monitoring plan documented. Consider involving ICU.
EWS 10+ *or* any vital sign in blue zone Immediately life threatening critical illness	Put out a rapid response call by dialing 777 and stating 'rapid response call', the patient's name and location. Stay with the patient and manage immediately life-threatening issues. Inform the SMO and the patient's family.	

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4.2. Allowable amendments

In addition to inserting your local escalation pathway into the editable vital sign chart, there are a number of other allowable amendments. These are listed in the table below.

Table 1: Allowable amendments to chart area

Chart area	**Allowable amendment**
Left margin	For scanning purposes, a barcode or QR code may be added at the bottom of the left margin.
Central column of the graphing area	'RRT' may be replaced with a locally relevant acronym or number (for example, '777' or 'MET').
Additional parameters section	**Up to two** locally relevant additional parameters may be added. It is recommended that the selected parameters require trends to be monitored over time and at the same frequency as vital signs. In acute hospital wards where analgesic medications are routinely used it is strongly recommended that one of the additional parameters should be pain score at rest and on movement.
Top right of the chart	A black and white version of the organisational logo may be added to the left of the patient label. Coloured logos must not be used as they add visual clutter and detract from the main purpose of the chart.

4.3. Colour specifications

CMYK (cyan, magenta, yellow and black) and RGB (red, green, blue) are two different ways of achieving a particular colour. Most printers print in CMYK colour and most screens display RGB colour. The charts were designed using CMYK colour because they are intended for print use. The CMYK colour values listed in the table below are used at 60 percent tint on the graphing area of the vital sign chart to enable clear documentation with a black or blue ball point pen. The colour values are used at 100 percent tint in the other sections of the chart such as the columns to the right and left of the graphing area, and the left hand column of the escalation pathway.

You may, on occasion, want to use the colours in a screen format and this means converting them to RGB values. Both the CMYK and RGB values for each of the chart colours are listed in the Table 2 overleaf. The CMYK and RGB colours have been used to shade the boxes in the table and you will see that there are minor differences. This is to be expected.

You can select RGB values in Word documents using the 'more colours' option in the shading or font colours tabs. Open 'more colours' then select 'custom' and insert the RGB values.

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Table 2 : Chart colours

Chart colours	C	M	Y	K	R	G	B
Yellow	0	0	40	0	255	255	153
Orange	0	12	27	0	255	224	186
Red	0	25	0	0	255	192	216
Blue	18	9	0	0	209	232	255

4.4. Print specifications

The following specifications are recommended:

- Paper size A3
- Landscape and double sided
- Fold Z folded (folded in half - 21cm and then folded back on itself – 10.5cm)
- Hole punches left-hand side two holes
- No print offset required
- Minimum paper quality 100gsm

5. Audit

The paper-based audit form is attached at Appendix 1. The purpose of audit is to sample the process of using the chart in order to identify areas for improvement. In the early stages of chart implementation, audit should be frequent. It is recommended that 10 charts per clinical area per week are sampled. Audit should be random to reduce bias e.g. audit charts for patients in evenly numbered beds one week and odd the next.

Conducting the audit in the clinical areas also provides an opportunity to receive and provide on-the-spot feedback, and provide additional one-to-one teaching about chart use as needed. Audit findings should be fed back to each clinical area and to the clinical governance group overseeing the patient deterioration program.

Further information and tools to support measurement and audit of your recognition and response system are available from the Commission's website.

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6. Appendix 1: Audit tool

National vital sign chart audit tool

Instructions

How to use the audit tool

1. Please circle 'Yes' or 'No' for each question
2. Once the audit is completed, add the total number of 'yes' responses for each question and capture in **No. of Yes responses** column
3. See the operational definitions for detail of what is required for each question

Patient selection

1. Audit 10 patient charts per week
2. Select patients for audit who have been in the ward or unit for a minimum of 24 hours
3. Review the last 24 hours of vital sign charting and associated documentation in the clinical record

If you identify adverse events or near misses that have not been previously reported (e.g. failures to recognise, escalate or respond to deterioration), follow the usual organisational reporting guidelines

Question #													
	Hospital:												
	Ward:												
	Date:												
	Audit questions	**Patient number→**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**No. of Yes responses**
		Operational definitions											
	Recognition												
1	Did the frequency of vital sign monitoring comply with (or exceed the requirements of) current policy?	Current policy refers to the vital sign and early warning score policy applicable to the patient during the period of the audit. This may be determined by the organisational minimum standard, the escalation pathway, specialty, or procedural requirements (e.g. post-operative vital sign policies).	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	

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2	Was the core vital sign set completed with the most recent set of vital signs?	The core vital sign set includes all the vital signs required to calculate the early warning score (respiratory rate, oxygen requirement, oxygen saturation, heart rate, blood pressure, temperature, level of consciousness using the AVPU scale).	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	
3	Was the early warning score (EWS) calculated correctly for the most recent set of vital signs?	Circle 'Yes' only if • The total EWS is calculated • The EWS is calculated correctly • Any valid modification is correctly applied in the EWS calculation.	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	
4	Were any modifications made to the early warning score triggers? *(if yes, complete questions 4a and 4b)*	Modifications must be documented in the modifications box on the vital sign chart.	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	
4a	Was a rationale and duration for the modification documented? *(clinical requirements)*	Circle 'Yes' only if both the rationale and duration for the modification are documented on the chart.	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	
4b	Did the person making the modification legibly date and sign it, and record their designation and contact details? *(documentation requirements)*	Circle 'Yes' only if all the documentation requirements are completed (legible date, signature, designation and contact details).	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	

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	Escalation and response												
5	Did the patient reach any of the triggers for escalation in the 24-hour audit period?*(If no, audit is complete; if yes, complete questions 5a-c)*	Circle 'Yes' if the patient had a total EWS of 6 or more, or a single parameter trigger in the red or blue zone during the audit period.	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	
5a	Did escalation occur according to the pathway?	If more than one escalation was triggered in the 24-hour audit period, select the most recent for inclusion in the audit. Circle 'No' for any deviation from the agreed escalation pathway.	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	
5b	Did the response occur according to the pathway?	Circle 'Yes' if the responder attended in the time frame specified on the escalation pathway. Circle 'No' for any deviation from the agreed response pathway.	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	
5c	Did the responder complete documentation requirements (according to local policy)?	Circle 'Yes' only if all documentation requirements are completed according to local policy (for example, this may include documenting an assessment and plan for ongoing care in the clinical record and completing a rapid response call sticker).	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	

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