

## Vital signs monitoring in Australasian emergency departments: Development of a consensus statement from ACEM and CENA



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### ABSTRACT

**Background:** Emergency Department (ED) care is provided for a diverse range of patients, clinical acuity and conditions. This diversity often calls for different vital signs monitoring requirements. Requirements often change depending on the circumstances that patients experience during episodes of ED care.

**Aim:** To describe expert consensus on vital signs monitoring during ED care in the Australasian setting to inform the content of a joint Australasian College for Emergency Medicine (ACEM) and College of Emergency Nursing Australasia (CENA) position statement on vital signs monitoring in the ED.

**Method:** A 4-hour online nominal group technique workshop with follow up surveys.

**Results:** Twelve expert ED nurses and doctors from adult, paediatric and mixed metropolitan and regional ED and research facilities spanning four Australian states participated in the workshop and follow up surveys. Consensus building generated 14 statements about vital signs monitoring in ED. Good consensus was reached on whether vital signs should be assessed for 15 of 19 circumstances that patients may experience.

**Conclusion:** This study informed the creation of a joint position statement on vital signs monitoring in the Australasian ED setting, endorsed by CENA and ACEM. Empirical evidence is needed for optimal, safe and achievable policy on this fundamental practice.

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### Introduction

Vital signs are an objective set of measurements of a person's physiological status. They are usually simple to collect and provide a valuable way to monitor acute hospital patients for potential clinical

instability [1]. In Australia and New Zealand, vital signs monitoring usually involves, but is not limited to, regular assessment, documentation, interpretation and tracking of temperature, heart rate, blood pressure, respiratory rate, blood oxygen saturation and conscious state [2]. Often, additional observations such as pain and capillary refill time are included [3].

The frequency with which vital signs monitoring is conducted in acute hospital inpatient wards is often based on the patient's clinical status as well as traditional local practice conventions. While some interventions (e.g., blood product transfusion) and post-operative care require more frequent monitoring, the minimum recommendations for the routine frequency of monitoring range from 4–12 hourly in hospital inpatient wards [2,4].

Care is provided for a more diverse range of patients and problems in emergency departments (ED) than those in acute hospital

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inpatient wards [5]. This diversity often calls for different vital signs monitoring requirements. These may change depending on the circumstances that a patient experiences during an episode of ED care. Different stages of a patient's ED stay (e.g., during triage, before being seen by the treating clinician, prior to separation from the ED), a change in the patient's physiological status (when previously measured vital signs are outside normal parameters), or administration of various ED interventions (e.g., procedural sedation or a medication expected to alter vital signs) may prompt a change in the type and frequency of vital signs monitoring required.

There is evidence that some vital signs are monitored less frequently than every 2 hours in ED. [6,7] Furthermore, decisions about when to assess and reassess vital signs are often informed by a combination of factors such as expert opinion at the local level [8], nurses' mental models, feelings of unexplainable concern, knowledge and clinical reasoning [8,9]. Decisions about reassessment as well as the feasibility of appropriate monitoring are also impacted by clinical workload, ED infrastructure and workforce resources [10].

While studies designed to describe the frequency of vital signs assessment in the ED continue to be published [7,11], there are currently no consensus recommendations on the frequency with which these assessments should be performed in the Australasian emergency care context. A minimum acceptable clinical standard will enable benchmarking, and allow EDs to determine whether current staffing levels are sufficient to meet these standards.

The aim of this study was to describe expert consensus on vital signs monitoring in the Australasian setting to inform the content of a joint Australasian College for Emergency Medicine (ACEM) and College of Emergency Nursing Australasia (CENA) position statement on vital signs monitoring in the ED.

## Methods

### *Ethical consideration*

Ethical approval was sought and approved by Monash University Human Research Ethics Committee (project ID: 26623) 5 October 2020.

### *Setting and participant recruitment*

The College of Emergency Nursing Australasia (CENA) and the Australasian College for Emergency Medicine (ACEM) are the two peak professional bodies representing emergency nursing and emergency medicine respectively in Australia and Aotearoa New Zealand. A purposive sampling method was used to recruit panel members with expertise representative of emergency care across Australasia. Panellists with relevant expertise were nominated by the CENA Research Committee, the ACEM Quality and Patient Safety Committee, and ACEM Research Committee. Nominated experts were invited by each committees' secretariat to contact the researchers to express their interest in study participation. Those who contacted investigators were provided with a study explanatory statement (including background to the study) and study workshop schedule details.

### *Study design*

A 4-hour nominal group technique (NGT) workshop with two follow up surveys were used to address the aim of the study. Much like the Delphi method [12], the NGT is a commonly used consensus development research technique [13,14]. However, the NGT is based upon a face-to-face consensus building workshop with an expert panel facilitated by the researchers. An online version of the workshop was used to allow experts from geographically disparate regions of Australasia to participate, and to comply with government

restrictions related to non-essential gatherings during the COVID-19 pandemic. A trial version of the workshop with four content experts was conducted prior to the day to evaluate the effectiveness of the workshop schedule, check face validity and meaning error, as well as the feasibility of conducting the workshop schedule as an online session. This process resulted in several modifications to the data collection procedure, online data collection platforms and instruments, team and facilitator roles, together with improvements to the workshop schedule (e.g., background information, workshop objectives, facilitator prompts).

Online consent forms and a demographics survey were completed by participants prior to attending the workshop.

### *Nominal group technique workshop*

The workshop was facilitated by two of the research team members (JM, SC) with extensive expertise and experience with group work facilitation. Two members of the research team (MU, LK) recorded fieldnotes, transcribed and collated ideas and collapsed/combined overlapping constructs generated by the panel. Technical issues related to conducting the workshop online were managed by CJC.

The workshop commenced with an overview of the schedule, background to the research (including current evidence related to vital signs monitoring in ED), and a description of the objectives of the session. The panel were then posed the question: "What should the standards for the frequency of vital signs assessment in Australasian emergency departments look like?" The NGT workshop followed the steps described by Delbecq and Van de Ven (1972) [15] as follows:

#### 1. Individual generation of ideas.

During this step, the panel were asked to silently write down their ideas in response to the question in a text editing document for 15 minutes, using the last 2 minutes to summarise their ideas into brief sentences.

#### 2. Recording of all participants' ideas.

Moving from person to person, panellists were asked to read a summary sentence of one of their ideas, then paste their summary text into the online platform Padlet™ [16]. The text from each idea was visible to the panel and each idea was copied verbatim into a shared document by members of the research team. This process was repeated in a round-robin format until no new ideas were identified. Panellists were permitted to use this time to generate new ideas but were asked to wait their turn before sharing them. During this step, no discussion, debate or comments were permitted about the ideas being recorded. This step was designed to facilitate a democratic approach and ensured all participants were provided with the opportunity to share their ideas without any concerns regarding judgement from other participants. Duplicates were omitted unless a different emphasis or variation of the idea was evident.

#### 3. Group discussion of all generated ideas.

All ideas generated in the previous step were displayed to the panel on a shared online document. Each idea was discussed for logic, meaning and relevance. Duplicate ideas were removed or merged during a facilitated discussion. In keeping with the technique, facilitators ensured that all panellists had an equal opportunity to discuss their agreement / disagreement with the ideas and the creators of each idea were permitted, but not required, to explain or clarify their ideas. Any member of the panel was permitted to explain or clarify ideas during the discussion. With recommendations from the panel, the research team summarised, re-phrased and collapsed or combined overlapping constructs during this discussion.

During a predetermined panel comfort break, the research team populated an online polling and ranking survey on the Qualtrics™ platform [17] with the ideas created during step 3.

#### 4. Voting and ranking of ideas.

The panel was provided with a clickable link to the poll / ranking survey and asked to rank the ideas in order of importance (1 being most important). When voting was complete, the panel's mean rankings were then displayed back to the group as online figures and tables via the Qualtrics public report sharing function.

5. Group discussion of the vote outcomes (including additions and further merging of overlapped concepts).

A facilitated discussion with the panel was conducted to establish if the ranking of ideas generated during step 4 accurately represented the panel's opinions and rankings. This step was also used to further refine any of the statements generated during step 3.

During this step, two research team members (CJC, LK) populated items in a pre-designed 'vital signs decision table' survey. The items in the survey were based on the statements generated and ranked in the previous steps and panel members were asked to recommend if vital signs; i) should be assessed, are not generally indicated, or consider/ask supervisor, and; ii) the frequency with which vital signs should be reassessed. Each item also included an optional free text box for "Any other comments". An additional, and optional, free text item was included at the end of the survey asking, "Are there any additional stages or circumstances that patients may experience during an episode of ED care that you would like to add to the table?".

6. Voting on the frequency of vital signs in the emergency department.

Based upon the ideas generated and ranked in the previous steps, panel members were provided with the vital signs decision table survey link. When voting was complete, the decision table results were again displayed back to the group as online figures and tables and a facilitated discussion with the panel was conducted to establish if the survey results accurately represented the panel's consensus opinion. This final discussion was important to ensure meaning was maintained and clarity in recommendations was achieved.

#### Follow up surveys

Panel members were invited to complete a final two-part survey to reach consensus on two items that did not reach consensus during the workshop. All results from steps 5 and 6 remained available to the panel during this final survey. In the first part of the survey, participants were asked to revote on any items that had not yet achieved consensus, using the same side-by-side matrix type question from the original decision table survey.

The second part of the final survey sought the panel's agreement on circumstances when blood pressure should be measured for children in the ED. Agreement was measured using a 5-point Likert-type scale anchored at one end with "strongly agree" (1) and at the other end with "strongly disagree" (5). There was also an optional free text item asking for any other situations where children's blood pressure should be measured.

A final report of the outcomes of the panel's consensus building was disseminated to all participants in the form of a draft joint ACEM and CENA position statement for final feedback and endorsement prior to broader stakeholder consultation from both Colleges. Broader College consultation comprised rigorous and repeated stakeholder review by relevant College committees and councils which included representation from New Zealand and most Australian states and territories (2 CENA, 4 ACEM) between December 2021–December 2023.

#### Data analysis

Data from the group work were analysed during steps 3 and 5 of the NGT workshop through facilitated discussion, voting and ranking. Good consensus was considered at  $\geq 80\%$  [18] for responses (yes, not generally indicated, consider or ask supervisor) for each

**Table 1**  
Participant demographics, experience, and workload (N = 12).

		Nurses (n = 7)	Doctors (n = 5)	Total
Gender	Female	6	3	9
	Male	1	2	3
Role*	Clinical	5	5	10
	Research	4	4	8
	Education	4	1	5
	Other (not specified)	1		1
Workplace type*	Hospital	5	5	10
	University	4	2	6
	Research facility		1	1
	Public	7	5	12
	Private	1	1	2
Emergency department type	Not for profit		1	1
	Adult only	2	1	3
	Paediatric		1	1
Location	Mixed	5	3	8
	Metropolitan	4	2	6
State/territory/region	Regional	3	3	6
	New South Wales	4	1	5
	Queensland	1	2	3
	Tasmania	1	2	3
	Victoria		1	1
Age (years)			Median	(IQR)
Experience (years)	Years in current role		43	(37, 48)
	Years of emergency care experience		9	(3, 17)
			17	(10, 21)
Workload per week (hours)	Clinical		20	(8, 20)
	Research		18	(4, 28)
	Other (not specified)		12	(10, 21)

\* Some participants reported having more than one role and/or workplace

item. Data from the group work and the surveys were analysed using descriptive statistics.

#### Results

Fifteen emergency care experts were invited to take part in the study. A total of 12 individuals (7 nurses, 5 doctors) accepted the invitation and participated in the NGT workshop and follow up surveys. The median age of participants was 43 (IQR: 37, 48) years. Of the 12 participants, 10 had worked in the ED for more than 10 years (median=17 (IQR: 10, 21)). Ten participants worked in a part-time clinical role. Most worked in mixed emergency departments across four different Australian states, half worked in a regional setting while the other half worked in metropolitan hospitals (Table 1).

In answering the question "What should the standards for the frequency of vital signs assessment in Australasian emergency departments look like?", steps 3–5 generated 14 statements about vital signs monitoring in the ED. The statements are presented in rank order (Table 2).

Participants were asked to select whether vital signs monitoring should occur for each patient circumstance (item) in the decision table. While data were missing (no response) on several of the items (Fig. 1a and b), good consensus was achieved for all item responses, except items 1.2, (70%), 1.13 (64%), 1.14 (64%) and 1.19 (70%).

When asked to indicate the frequency with which vital signs should be monitored for each circumstance in the decision table, consensus opinion did not exceed 80% for any of the circumstances. There were 46 free text responses to "Any other comments". The majority (40, 86.9%) of these indicated that frequency of vital signs monitoring would depend on the individual "patient's condition" that there could be "exceptions to the rule" and "more information" was needed. The remaining comments from a single participant were about including pain assessment as a regular vital sign for

**Table 2**  
Ranked expert panel statements about vital signs monitoring (N = 12).

Rank**	Ideas/statements	Mean rank**
1	Vital signs at triage are required if they will inform Australasian Triage Scale (ATS) category allocation and/or disposition decisions.	3.75
2	Every patient requires a full set of vital signs at some point during an episode of emergency department (ED) care.	4.42
3	Full set of ADULT vital signs comprises conscious state (ACVPU or GCS), respiratory rate, oxygen saturation, pulse/heart rate, blood pressure and temperature (other observations such as pain score, capillary refill time as clinically indicated).	5.25
4	Full set of PAEDIATRIC vital signs comprises conscious state (ACVPU or GCS), respiratory rate, oxygen saturation, pulse/heart rate, capillary refill time, blood pressure and temperature (other observations such as pain score as clinically indicated).	6.08
5	The frequency of vital signs monitoring (after triage but before being seen by treating clinician*) is based on the patient's acuity in accordance with ATS category or risk of deterioration.	6.50
6	Patients should have vital signs monitored and displayed graphically at a frequency which enables vital signs trends to be tracked over time.	7.58
7	Every patient needs a set of vital signs within 30 min prior to separation from ED (i.e., discharge, admission, transfer)	7.83
8	Vital signs should be monitored pre- and post-interventions according to the anticipated patient response to the intervention (e.g., sedation, cardioversion, fluid bolus).	7.83
9	Early warning tools should inform vital signs frequency in accordance with site clinical deterioration policy and include information about the response or action required when thresholds for abnormality are reached (e.g., emergency response, Clinical Review Criteria, MET calling criteria, Between the Flags).	8.50
10	Minimum decision points for changes to frequency of vital signs monitoring include (1) During triage; (2) Time that treating clinician reviewed patient; (3) Patient moved to a different ED location (e.g., change of cubicle); (4) Seen by inpatient team or bed request made; (5) Nursing shift handover.	9.33
11	Senior nursing or medical staff may amend the frequency of vital signs according to patient acuity and prolonged stay in ED (this decision should be documented in the patient medical record).	10.17
12	Where available, feasible and reliable, vital signs monitoring should be automated and integrated into electronic medical record systems which includes a graphical information display so that vital signs trends can be tracked over time.	10.50
13	Vital signs should be taken on at least two occasions in patients considered 'high risk' (infant aged < 3 months, pregnant patients >20/40 gestation, patients aged > 65 years, patients with behavioural / psychiatric / drug & alcohol related presentations, unplanned ED re-presentation (for the same problem) within 72 h.	10.58
14	All EDs should have their own escalation policy for patients where thresholds for vital signs abnormality are reached.	10.58

ACVPU - alert, confusion, verbal, pain, unresponsive; GCS - Glasgow Coma Scale \*The term *treating clinician* refers to any health profession (e.g., Nurse, Doctor, Physiotherapist) responsible for the patient's discharge/separation from ED. \*\*As ranked by panel regarding importance of idea, 1 being most important.

monitoring. Responses (recommended frequency of vital signs) for each item are shown in Fig. 2a and b.

Most participants (92 %) *strongly agreed* or *somewhat agreed* that blood pressure should be measured for children with any of the suspected problems/circumstances (see [list under 2.1 of the position statement](#)).

The optional free text item elicited three additional circumstances where children's blood pressure should be measured (1. known or suspected sepsis, 2. Australasian Triage Scale (ATS) category 1 or 2 trauma presentations, 3. overdose).

The panel's review of the final study outcomes report (draft joint position statement) yielded the need for minor additional clarifying statements and modifications to phrasing and syntax. Subsequent reviews by relevant CENA (2) and ACEM (4) committees and councils resulted in several additions to content (e.g., indications and conditions for BP monitoring) and minor formatting and copy edits. The outcome from this process is shown in the final CENA- and ACEM-endorsed joint position statement (see [Appendix One](#)).

## Discussion

This study sought to describe expert consensus on vital signs monitoring in the Australasian ED setting and inform the content of a joint Australasian College for Emergency Medicine (ACEM) and College of Emergency Nursing Australasia (CENA) position statement on vital signs monitoring in the ED. Achieving this required the in-depth exploration, description and consensus of expert opinion to generate recommendations for practice and policy that have not previously existed. The highly variable nature of ED patients, presenting problems and the broad range of circumstances where vital signs monitoring may be required, demanded a consensus-generating process that allowed participants to openly voice their ideas as well as consider, debate, combine and vote on a range of complex ideas.

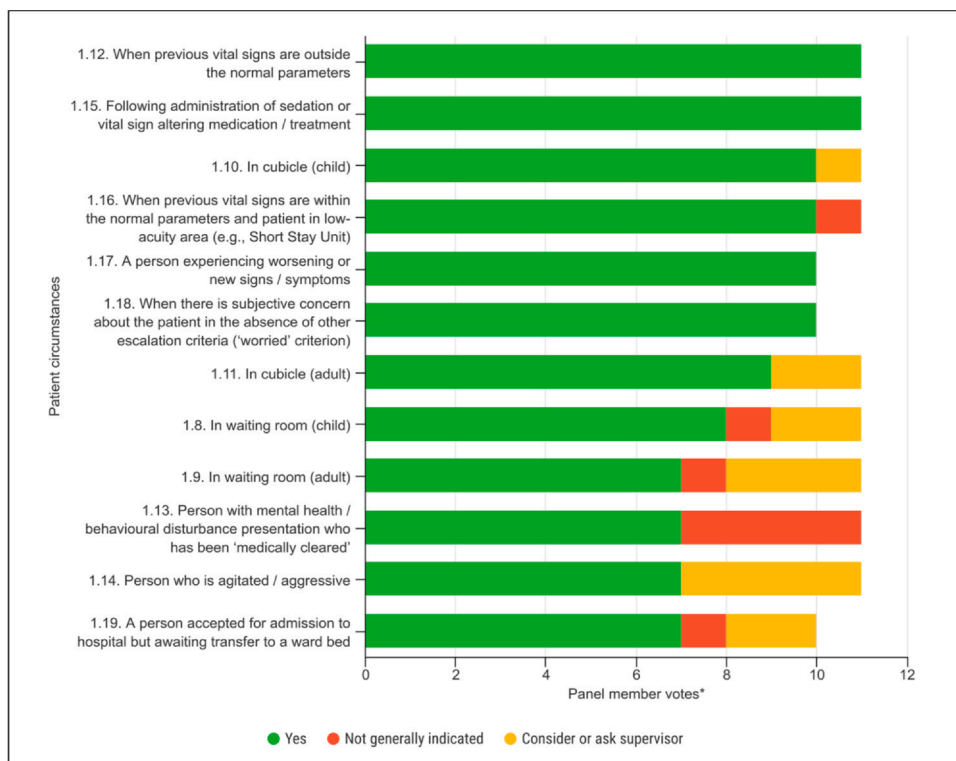
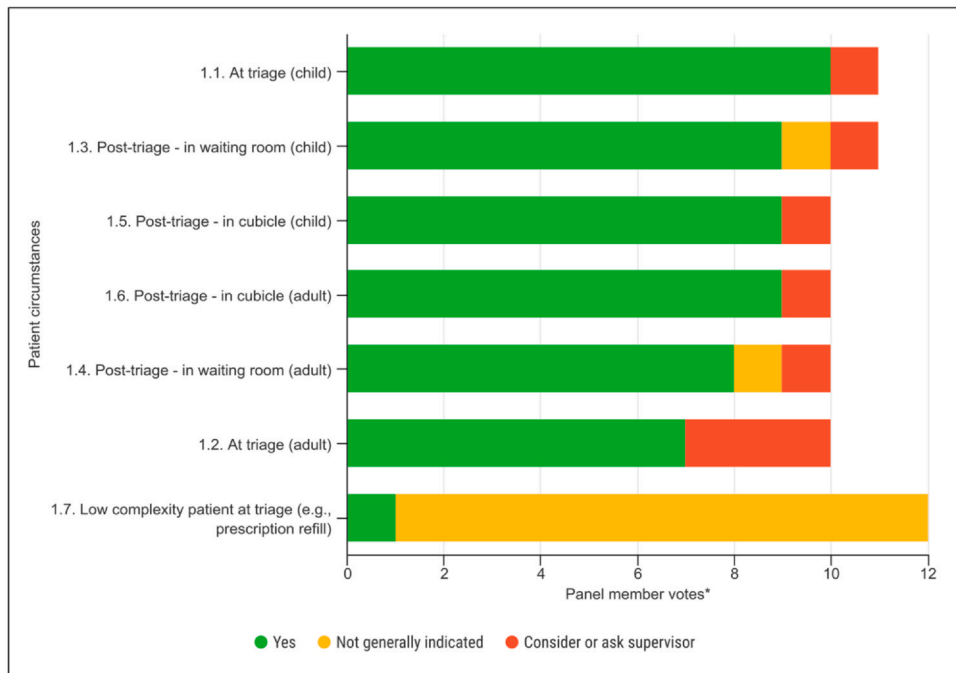
There are several consensus-building methods frequently used in healthcare research such as consensus development panels, the nominal group technique and the Delphi method [19]. Unlike the Delphi method, which involves two or more rounds of surveys set

against predetermined categories, the nominal group technique (NGT) is generally used to generate ideas which do not already exist [13]. For this reason, the NGT technique was considered to be most appropriate to address the study aim. Furthermore, conducting the workshop online created a unique opportunity to assemble an expert panel from four different Australian States spanning 17,000 km, an undertaking which would have been highly impractical (in the setting of COVID-19 travel restrictions) and costly if conducted face-to-face.

Consistent policy and practice are the cornerstone to providing equitable access to high quality and safe care in the ED [20]. In the absence of adequate evidence for optimal recommendations for the frequency of vital signs monitoring in the ED, our study provides practical expert recommendations for consistent ED policy and practice. This is a fundamental piece of the emergency care safety and quality architecture, which has not been addressed elsewhere.

While the outcomes from this study have been translated into recommendations for practice and endorsed by the two peak professional bodies representing emergency medicine and emergency nursing in Australasia, it is important to acknowledge that consensus opinion on the frequency of vital signs monitoring did not exceed 80 % for any of the circumstances that a patient may experience during an episode of ED care. However, this is not a surprising outcome given the panel's free text comments related to needing more clinical information about individual patients to make a thoroughly informed recommendation. This highlights that entirely protocolised 'one size fits all' recommendations for patients with discrete care needs and dynamic physiological trajectories risks oversimplifying the complex nature of decisions about, and factors impacting on the frequency of vital signs monitoring in the ED. Furthermore, while monitoring vital signs is a crucial aspect of patient surveillance, it is only one part of the process used to identify and respond to physiological deterioration in patients. Equally as important are nursing assessment skills, knowledge, and clinical reasoning to mitigate the risk of harm to patients.

Decisions about vital signs monitoring are influenced by several factors that relate to patient and clinician characteristics, as well as those associated with the ED environment. These include, but are not limited to, the patient's initial triage category [6], their clinical



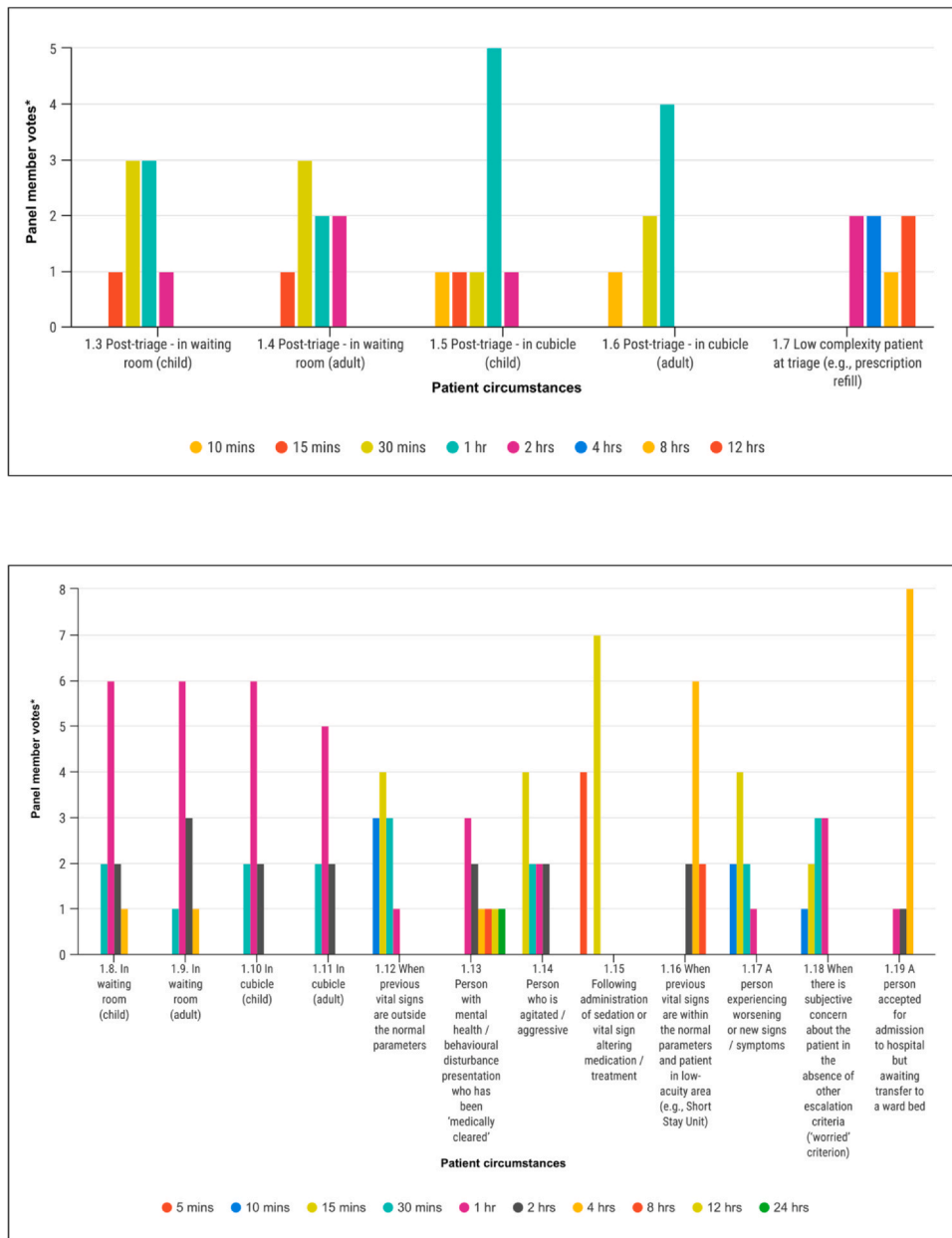
**Fig. 1.** a. Recommended vital signs monitoring requirements, **before** initial review by treating ED clinician (N = 12). \*Note missing data (panel member votes) for all patient circumstances except item 1.7. b. Recommended vital signs monitoring requirements, **after** initial review by treating ED clinician (N = 12). \*Note missing data (panel member votes) for all patient circumstances.

status [21], and the clinical reasoning, experience and expertise [22,23] of the person performing vital signs monitoring [24]. Overall clinical workload, ED overcrowding [25] and clinical resource constraints (e.g., monitoring equipment, staffing) [26] may also influence the frequency of vital signs monitoring.

In view of the above considerations, we recommend that the output from this study should be complemented by expert clinical

reasoning, organisational support to eliminate systemic barriers to timely vital signs monitoring and evidence-based national and local policy specific to the ED context [2].

We see this study’s principal outcome (the joint position statement) as a valuable, and ‘live’, document that should be adjusted over time as empirical evidence for the optimum standard and frequency of vital signs monitoring in the ED setting becomes available.



**Fig. 2.** a. Recommended vital signs monitoring frequencies, **before** initial review by treating ED clinician (N = 12). \*Note missing data (panel member votes) for all patient circumstances. b. Recommended vital signs monitoring frequencies, **after** initial review by treating ED clinician (N = 12). \*Note missing data (panel member votes) for all patient circumstances.

To this end, our results provide a set of standardised outcome measures for future research related to safety, assessment and monitoring of patients at risk of harm from physiological deterioration in the ED. This is an important first step toward providing ED patient vital signs monitoring recommendations that are evidence-based, person-centred and achievable.

**Limitations**

There are limitations to this study that should be considered when interpreting the findings and outcomes we report. Our study sample consisted of twelve emergency care experts, and therefore, caution should be used when generalising the outcomes to all emergency care settings. However, while there is no consistent recommendation for NGT panel size in the literature, pioneers in this method have arbitrarily recommended groups of 7–10 [27], and many NGT studies use 5–12 members [28]. Other researchers

instrumental in the development of the technique have also described that as group numbers increase, interpersonal differences can lead to heterogeneity which lengthens the consensus generating process with diminishing returns on the quality of the outputs [29]. While panel numbers in any NGT are small, a strength of this study was the ability to recruit expert participants working in a range of settings with considerable emergency expertise and years of experience. Furthermore, the endorsement of the NGT findings by both Colleges, representing emergency clinicians across Australia and New Zealand, suggests that our findings are robust and of pragmatic clinical value.

When designing the study, the researchers made every effort to represent emergency nurses and doctors nationally and internationally through consultation with, and recommendations for informants from CENA and ACEM. However, despite best efforts to recruit expertise representing the remote Australian context and that of New Zealand, we acknowledge that poor recruitment from these regions may have limited

the quality of the research outcomes as they relate to Australasia more broadly.

There is also potential during studies involving groups (e.g., focus groups) for dominant participants to exert inequitable influence on the outcomes during data collection. While NGT incorporates several design elements to minimise this risk (e.g., round robin collection of ideas without discussion or debate, anonymised voting on ideas), anonymity could not be provided when participants discussed and debated the ideas in round three. This had the potential to limit participants' willingness to express their ideas and views. However, the extensive expertise and experience of the facilitators to moderate these discussions was such that all panellists appeared to be forthcoming with their views and collegiate in their support for each other's ideas.

## Conclusion

The nominal group technique is a practical and reliable method of generating consensus on and recommendations for decisions about emergency care such as how frequently vital signs should be monitored in the emergency care setting. However, the complexity experienced by our panel and key stakeholders in ultimately achieving expert agreement highlights the urgent need for empirical evidence to inform safe and achievable policy for this fundamental practice and underwrites good clinical judgement.

This study has enabled the creation of a nationally endorsed position statement on vital signs monitoring in the Australasian emergency department setting.

## Ethics approval

Ethical approval was sought and approved by Monash University Human Research Ethics Committee (project ID: 26623) 5 October 2020.

## Funding

This study was funded by a Monash University Nursing and Midwifery Research Development Grant.

## Appendix



Australasian College  
for Emergency Medicine

College of Emergency Nursing Australasia / Australasian College for Emergency Medicine

# Joint Position Statement on Vital Signs Monitoring in Emergency Departments

## Purpose and scope

This document describes the position of the College of Emergency Nursing Australasia (CENA) and the Australasian College for Emergency Medicine (ACEM) on vital signs monitoring in emergency departments (EDs) in Australia and Aotearoa New Zealand. The purpose of the document is to provide a minimum set of principles and recommendations about the frequency of vital signs monitoring.

It is the position of CENA and ACEM that all EDs should be staffed and resourced adequately by governments and private healthcare organisations to enable timely and equitable access to quality care throughout Australia and Aotearoa New Zealand. Both Colleges acknowledge that emergency care is provided in EDs with varied infrastructure and workforce resources (for example, regional, rural, and remote areas). These are factors that are likely to impact on the capacity of aligning care provision with this statement.

## CRediT authorship contribution statement

All authors of this paper have made substantial contribution to the research article. CJC was responsible for the: (1) conception and design of the study, (2) acquisition of data, (3) analysis and interpretation of the data, (4) drafting the article and (5) critical revision of the article. SC contributed to the (1) design of the study, (2) acquisition of data, (3) analysis and interpretation of the data, (4) drafting the article and (5) critical revision of the article. CC contributed to the: (1) design of the study, (2) drafting the article and (3) critical revision of the article. LK contributed to the: (1) design of the study, (2) acquisition of data, (3) drafting the article and (4) critical revision of the article. JM contributed to the (1) design of the study, (2) acquisition of data, (3) analysis and interpretation of the data, (4) drafting the article and (5) critical revision of the article. MU contributed to the (1) design of the study, (2) acquisition of data, (3) analysis and interpretation of the data, (4) drafting the article and (5) critical revision of the article.

## Declaration of Competing Interest

All authors are Fellows of CENA or ACEM.

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## Definitions

Vital signs:	The measurement of a patient's physiological observations including level of consciousness, respiratory rate, oxygen saturation, heart rate, blood pressure and temperature. In some circumstances, other patient physiological data are measured with these observations such as pain and capillary refill time. <sup>1</sup>
Vital signs monitoring:	The measurement, documentation, interpretation and tracking of patient vital signs. <sup>2</sup>

## 1. Introduction / Background

Vital signs are an objective set of measurements that are simple to collect and are a valuable tool to monitor acute hospital patients for clinical instability.<sup>3</sup> Vital signs monitoring in the ED provides essential information about the patient's physiological status, including trends over time, and informs decisions about patient care and disposition.

The recommended frequency of vital signs monitoring in acute hospital ward settings ranges from 4-12 hourly.<sup>2, 4</sup> However, EDs provide care for a more diverse range of patients, often with undifferentiated diagnoses and clinical scenarios, than acute hospital inpatient wards. This diversity calls for specific vital signs monitoring and assessment requirements, based on the clinical risk identified for each patient during an episode of ED care. Evolving circumstances may prompt a change in the type and frequency of vital signs monitoring required. Based on expert consensus from both Colleges, the CENA and ACEM joint position on vital signs monitoring in the ED is described in the following section.

## 2. Minimum standards for vital sign assessment in the ED

### 2.1. What constitutes 'a set' of vital signs?

Table 1  
Vital signs required in the ED

	Adults	Children <sup>‡</sup>
Conscious state (ACVPU or GCS)	Yes	Yes
Respiratory rate	Yes	Yes
Oxygen saturation	Yes	Yes
Pulse / heart rate	Yes	Yes
Blood pressure	Yes	As clinically indicated (see next page)*
Temperature	Yes	Yes
Capillary refill time	As clinically indicated	Yes
Pain score	Yes (as clinically indicated)	Yes (as clinically indicated)

Note: ACVPU (alert, confusion, verbal, pain, unresponsive); GCS (Glasgow Coma Scale)

<sup>‡</sup> Children are defined as aged 1 year to <13 years. Infants are defined as aged 0 to <1 year.<sup>5</sup>

While the utility of routine blood pressure (BP) monitoring in low acuity paediatric presentations to the ED has been questioned, many children presenting to the ED require BP monitoring.<sup>6</sup>

\*Indications for BP Assessment in children<sup>7</sup>:

- Critical illness, suspected sepsis and all Australasian Triage Scale (ATS)<sup>8, 9</sup> category 1 or 2 presentations.
- Detect hypotension in shock.
- Monitor vital signs indicating raised intracranial pressure.
- Detect complications of renal disease.
- Diagnosis or monitoring of cardiac disease.
- Detect complications of treatment (for example, high dose steroids).
- Detect BP measurements above the 95<sup>th</sup> centile in asymptomatic patients for follow-up and investigation. This may represent early onset of hypertension. BP can be affected by normal diurnal fluctuation, changes in physical activity and emotional stress.

\*Children with the following conditions should have a BP recorded in the ED:

- Head injury of any severity.
- Headache.
- Urinary tract infection – suspected or diagnosed.
- Proteinuria or haematuria.
- Acute or chronic renal failure.
- Moderate to severe dehydration.
- Sepsis.
- Haemorrhage.



- Abdominal masses.
- Seizure.
- Obesity.
- Known or suspected cardiac disease.

2.2. How often should vital signs be monitored?

All emergency department patients require at least one set of vital signs.

Vital signs should be monitored on at least two occasions in ‘high risk’ patients including, but not limited to:

- Infants aged <3 months.
- Pregnant patients >20/40 gestation.
- Indigenous patients >50 years<sup>10</sup> / Non-Indigenous patients aged >65 years.
- Unplanned ED re-presentation (for the same problem) within 72 hours of discharge.

Patients should have vital signs monitored and displayed graphically at a frequency that enables trends to be tracked over time (see Table 2). Suitable reference ranges should be used/displayed for paediatric and obstetric patients.

Vital signs should be monitored pre- and post-interventions according to the anticipated patient response to the intervention (for example, sedation, cardioversion, fluid bolus).

Where relevant, routine assessments (for example, neurovascular observations) and point of care testing (for example, blood glucose monitoring) should be used to complement vital signs monitoring.

Table 2  
Frequency of vital signs monitoring in ED

	Patient situation	Frequency of vital signs
<b>Prior to initial review by treating clinician†</b>	At triage - life-threatening / imminently life-threatening presentations (for example, ATS 1 or 2, major trauma, upper airway obstruction).	Vital sign measurement should not delay movement to appropriate treatment area (for example resuscitation bay).
	At triage.	Vital signs are required for all emergency department patients (except those defined below).
	After triage – in waiting room and treatment areas.	Repeat at intervals guided by triage category. <ul style="list-style-type: none"> <li>- Triage category 2 – every 10 minutes.</li> <li>- Triage category 3 – every 30 minutes.</li> <li>- Triage category 4 or 5 – every hour.</li> </ul>
	At triage - asymptomatic patients presenting with non-acute, non-emergent conditions (for example prescription refill, dressing change)	Vital signs are not generally indicated.
<b>After initial review by treating clinician.</b>	High-risk clinical situations including but not limited to: <ul style="list-style-type: none"> <li>- Previous set of vital signs abnormal or triggers local hospital emergency response.</li> <li>- Administration of medications known to affect conscious state, cardiovascular or respiratory status.</li> <li>- Agitation / aggression.</li> </ul>	Repeat every 15 minutes (or as per local hospital emergency response for deteriorating patients) until condition is deemed stable by treating clinician and no further active treatment is required. Note, agitated or aggressive patients may require control of behaviour with sedation before regular measurement of vital signs is safe and practicable.
	Other situations where close monitoring is required: <ul style="list-style-type: none"> <li>- Worsening or new symptoms.</li> <li>- Subjective concern in the absence of other escalation criteria ('worried').</li> </ul>	Repeat every 30 minutes until condition deemed stable and no further active treatment required.
	In waiting room and treatment areas.	Hourly vital signs until deemed clinically stable and at low risk of deterioration, then 2-hourly for 4 hours, then 4-hourly unless condition deteriorates.
	All patients prior to separation from ED (that is: admission, transfer, discharge).††	Within 30 minutes prior to leaving the ED <sup>5</sup> . Note, should not delay urgent transfer of unstable patients to another critical care area (for example, cardiac catheterisation lab, operating theatre, Intensive Care Unit).
<b>Patient admitted to the short stay / observation unit or waiting for admission to inpatient bed.</b>	Waiting for Intensive Care Unit bed.	Hourly or more frequently as indicated by patient's condition.
	Waiting for High Dependency / Telemetry Monitoring / Coronary Care inpatient bed.	Hourly for 4 hours, then 2-hourly unless patient's condition deteriorates.
	In short stay / observation unit or waiting for acute hospital ward bed.	2-hourly for 4 hours, then 4-hourly unless condition deteriorates.

<sup>†</sup>The term *treating clinician* refers to any health professional (for example, Nurse, Doctor, Physiotherapist) responsible for the patient's discharge/separation from ED.

<sup>††</sup>Excluding asymptomatic patients presenting with non-acute, non-emergent conditions (e.g., prescription refill, dressing change).

<sup>§</sup>Vital sign instability on discharge is associated with increased risk-adjusted rates of 30-day mortality and unplanned readmission.<sup>11</sup>

Senior nursing or medical staff (for example shift managers) and the treating clinician may amend the frequency of vital signs according to the patient's acuity (this decision should be documented in the patient's medical record). Minimum review and decision points for consideration of changes to frequency of vital signs monitoring include:

- 
- During triage.
  - Time that treating clinician<sup>†</sup> reviews patient.
  - Patient moved to a different area within the ED.
  - Consulted by inpatient team or bed request made.
  - Nursing shift handover
- Worsening / new symptoms<sup>††</sup> or subjective patient, relative or clinician concern in the absence of other criteria (e.g. 'worried' or parental concern).
  - Transition to palliative or end of life care
- 

### 2.3. ED systems for monitoring and responding to abnormal vital signs

Any abnormal vital sign, whether in ED or during pre-hospital care, may indicate the presence of an underlying acute or chronic health abnormality. ED clinicians should be aware of the normal range of vital signs applicable to specific patients.

All EDs must have an escalation policy for patients whose thresholds for vital signs abnormality are reached.

Early warning tools should inform vital signs frequency in accordance with site clinical deterioration policy and include information about the response or action/s required when thresholds for abnormality are reached (for example, emergency response, Clinical Review Criteria, Medical Emergency Team (MET) call criteria, Between the Flags). Vital signs trigger thresholds in hospital early warning tools (which are not specifically developed for EDs) are not the same as normal ranges for vital signs.

Where available, feasible and reliable, vital signs monitoring should be automated and integrated into electronic medical record systems that display graphical information so that trends can be tracked over time.

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<sup>‡</sup> If a patient's condition changes while waiting for treatment, or if additional relevant information becomes available that impacts on the patient's urgency, the patient should be re-triaged.<sup>3</sup>

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