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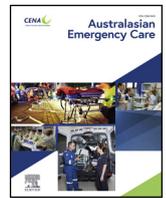
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## Research paper

# Emergencies within hospital wards: An observational study of the non-technical skills of medical emergency teams

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## ABSTRACT

**Background:** Medical emergency teams are essential in responding to acute deterioration of patients in hospitals, requiring both clinical and non-technical skills. This study aims to assess the non-technical skills of medical emergency teams during hospital ward emergencies and explore team members perceptions and experiences of the use non-technical skills during medical emergencies.

**Methods:** A multi-methods study was conducted in two phases. During phase one observation and assessment of non-technical skills used in medical emergencies using the Team Emergency Assessment Measure (TEAM<sup>TM</sup>) was conducted; and in the phase two in-depth interviews were undertaken with medical emergency team members.

**Results:** Based on 20 observations, mean TEAM<sup>TM</sup> ratings for non-technical skill domains were: 'leadership' 5.0 out of 8 ( $\pm 2.0$ ); 'teamwork' 21.6 out of 28 ( $\pm 3.6$ ); and 'task management' 6.5 out of 8 ( $\pm 1.4$ ). The mean 'global' score was 7.5 out of 10 ( $\pm 1.5$ ). The qualitative findings identified three areas, 'individual', 'team' and 'other' contributing factors, which impacted upon the non-technical skills of medical emergency teams.

**Conclusion:** Non-technical skills of hospital medical emergency teams differ, and the impact of the skill mix on resuscitation outcomes was recognised by team members. These findings emphasize the importance non-technical skills in resuscitation training and well-developed processes for medical emergency teams.

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## Background

The clinical expertise and non-technical skills of medical emergency teams are fundamental for patient safety in responding to emergencies in hospitals. These teams consist of medical and nursing staff tasked with the evaluation and immediate management of patients after an emergency alert by a hospital staff member that a patient has clinically deteriorated. [1]

In hospital clinical deterioration and cardiac arrest is common and requires skilled teams for emergency management. [2] Research has largely focused on clinicians' technical skills, how-

ever, there is increasing recognition that adverse patient events can be attributed to inadequacies in non-technical skills [3]. The importance of non-technical skills in healthcare is endorsed within safety and quality standards both internationally [4] and within Australia [5]. Non-technical skills include leadership, communication, teamwork, task management, critical thinking, decision making and situational awareness, and can be collectively defined as "the cognitive, social and personal resource skills that complement technical skills, and contribute to safe and efficient task performance". [6] (p.376).

Previous studies have found that outcomes of medical emergencies can be impacted by the non-technical skills of medical emergency teams, especially leadership. [2,7] Other research has found effective teamwork and communication to be associated with safe, high quality care delivery, supporting the need for non-technical skills team training. [8] Improving the non-technical skills of medical emergency teams has also been found to improve technical abilities, particularly when external stressors are present. [9] The use of standard assessment tools has been shown to be valu-

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able in assessing medical emergency team performance in both simulated and clinical settings. [10]

In order to advance the body of research undertaken in clinical emergencies, the aims of this study were (i) to assess the non-technical skills (leadership, communication and teamwork) of medical emergency teams during hospital ward emergencies and (ii) to explore the perspectives and experiences of team members of non-technical skills during hospital emergencies.

## Method

### Study design and setting

This multi-method study was conducted in two phases, the first phase comprised observation of the use non-technical skills in medical emergencies, and in the second phase semi-structured interviews with medical emergency teams' members explored their perceptions and experiences of non-technical skills. The participants were doctors and registered nurses who were in the hospital medical emergency team.

The study was conducted at an Australian private acute metropolitan hospital with over 700 beds, (excluding emergency department) delivering care to over 70,000 patients per year, with an average of 44 medical emergencies per month. The hospital medical emergency team is formed from a pool of medical and nursing staff from ICU and CCU, including Registered Nurses (RN), resident medical officers (RMOs) and medical registrars.

### The study instrument

This study utilised the 12-item Team Emergency Assessment Measure (TEAM<sup>TM</sup>) to rate the non-technical skills of 'leadership' (2 items), 'teamwork' (7 items), 'task management' (2 items) (including situation awareness), and a 'global' score, each by a five-point Likert scale rating (0=never/hardly ever; 1=seldom; 2=about as often as not; 3=very often; 4=always/nearly always). [11,14] The TEAM<sup>TM</sup> instrument has been recognised as a valid, feasible and reliable tool in simulation studies [11–14] and hospital emergencies. [2,14–16] During the observation additional data including call duration and location, reasons for the call, and other observations were recorded.

### Ethical approval

The study was approved by the Hollywood Private Hospital Research Ethics Committee (HPH529) and by the Edith Cowan University Human Research Ethics Committee (ECU18720).

### Phase 1 – Observation of Medical Emergencies

Prior to the study, two nurse clinician-observers (EW & AC) were trained in the use of the Team Emergency Assessment Measure (TEAM<sup>TM</sup>) instrument by reading the TEAM<sup>TM</sup> brochure on 'how to use TEAM' and independently assessing several video-recorded hospital emergencies. This was conducted until consensus was reached between the observers. Both observers work in the intensive care unit at the participating hospital. During the data collection phase (June 2018 to April 2019) medical emergencies were evaluated by one of the two clinician-observers if criteria were met (Fig. 1). Both observers were placed on the MET call alert system informing them of when a call occurred.

### Phase 2 – Qualitative interviews

During the second phase (March 2019 to June 2019) a convenience sample of medical emergency team members (not involved

#### Inclusion criteria:

- Medical emergencies where medical emergency teams were called to respond from Monday to Friday, between 0600 and 1500.

#### Exclusion criteria:

- Medical emergency where due to patient safety, the clinician-observer is required to assist
- The clinician-observer is not available at the time of the call as their usual duties may be compromised.
- No more than one medical emergency to be assessed in any one day.

**Fig. 1.** Inclusion and exclusion criteria for selecting medical emergencies for observation.

in phase one of the study) were recruited to participate in semi-structured interviews. The interviews were conducted by member of the research team (RG) who had no association with the participants. A participant information sheet was provided to participants and written consent obtained. The interview questions focused on participant perceptions and experiences of non-technical skills. Additional information regarding professional experience, training, and attendance at medical emergencies was collected through a background information form prior to the start of the interview. Participant interviews were audio-recorded and transcribed verbatim.

### Data analysis

Phase one data were analysed using IBM-SPSS Version 26 and descriptive statistics were generated to describe and summarise event characteristics and TEAM<sup>TM</sup> ratings. Additional observer comments were analysed using a qualitative content analysis approach and interview transcriptions from phase two were analysed using a general inductive thematic approach. [17] Two researchers independently generated initial open codes (RG & RS) and identified potential themes then met to review, refine and consolidate codes and themes.

## Results

### Phase 1 – Observation of Medical Emergencies

The twenty medical emergencies observed occurred for varied reasons in both medical and surgical wards, and a median number of four team members attended each call (Table 1).

### TEAM<sup>TM</sup> ratings and event characteristic outcomes

From the observations, the mean TEAM<sup>TM</sup> scores were: 'overall'  $33.1 \pm 6.3$  out of a maximum possible 44; 'leadership'  $5.0 \pm 2.0$  of a possible 8; 'teamwork'  $21.6 \pm 3.6$  of a possible 28; and 'task management'  $6.5 \pm 1.4$  of a possible 8 (Table 2). The mean 'global' score out of 10 was  $7.5 \pm 1.5$  (Table 2). The highest scoring individual items were (of a possible 4): 'the team leader maintained a global perspective' (within the 'leadership' aspect: mean  $2.6 \pm 1.1$ ); 'the team acted with composure and control' (within the 'communication' aspect: mean  $3.5 \pm 0.5$ ); and 'the team followed approved standards and guidelines' (within the 'task management' aspect: mean  $3.4 \pm 0.8$ ). A high uni-dimensional validity was also confirmed by a mean inter-item correlation of 0.489, on average measures an Intra-class Correlation Coefficient of 0.907, and strongly significant item-to-total-score associations ( $r=0.633$  to 0.903). The scale's reliability was high, indicated by a Cronbach alpha of 0.909. Results therefore indicate that the scale is reliable when used to examine teamwork in the current sample.

**Table 1**  
Characteristics of 20 observed medical emergencies.

Primary reason for medical emergency (events)	Number of events per call reason	Number of events per time period Time 1, Time 2, Time 3 <sup>a</sup>	Number of events per ward type medical, surgical	Duration of call mean min:sec ± SD (median, range)	Number of team members mean ± SD (median, range)
Decreased GCS	1	0, 1, 0	1, 0	20 <sup>b</sup>	3 <sup>b</sup>
Arrhythmias / Atrial fibrillation	4	0, 3, 1	1, 3	26:45 ± 13:30 (28:30, 10-40)	4.8 ± 1.5 (4, 4-7)
Respiratory distress / Respiratory failure / Acute pulmonary oedema	4	2, 0, 2	3, 1	28:45 ± 20:58 (20, 15-60)	3.8 ± 0.5 (4, 3-4)
Hypotension	9	3, 3, 3	4, 5	28:20 ± 17:08 (30, 10-60)	3.8 ± 0. (4, 3-5)
Cardiac arrest	1	1, 0, 0	1, 0	14 <sup>b</sup>	5 <sup>b</sup>
Vasovagal episode	1	0, 1, 0	0, 1	10 <sup>b</sup>	4 <sup>b</sup>
Total	20	6, 8, 6	10, 10	26:03 ± 15:47 (20, 10-60)	4 ± 0.9 (4, 3-7)

<sup>a</sup> Time 1: 0600-0859, Time 2: 0900-1159, Time 3: 1200-1459.<sup>b</sup> One event only; no standard deviation, median or range.**Table 2**  
The TEAM™ rating outcomes (n = 20).

	Mean ± Std. Dev.	Minimum	Maximum	Median (IQR)
Q1. The team leader let the team know what was expected of them through direction and command	2.5 ± 1.1	1	4	3 (1.3-3.0)
Q2. The team leader maintained a global perspective	2.6 ± 1.1	1	4	3 (1.3-3.0)
Q3. The team communicated effectively	2.8 ± 0.8	1	4	3 (2.3-3.0)
Q4. The team worked together to complete the tasks in a timely manner	2.8 ± 1.0	1	4	3 (2.0-3.0)
Q5. The team acted with composure and control	3.5 ± 0.5	3	4	3.5 (3.0-4.0)
Q6. The team morale was positive	3.5 ± 0.5	3	4	3 (3.0-4.0)
Q7. The team adapted to changing situations	3.0 ± 0.6	2	4	3 (3.0-3.0)
Q8. The team monitored and reassessed the situation	3.2 ± 0.8	1	4	3 (3.0-4.0)
Q9. The team anticipated potential actions	3.0 ± 0.6	2	4	3 (3.0-3.0)
Q10. The team prioritised tasks	3.1 ± 0.7	2	4	3. (3.0-4.0)
Q11. The team followed approved standards and guidelines	3.4 ± 0.8	1	4	3.5 (3.0-4.0)
Leadership (max 8)	5.0 ± 2.0	2	8	6 (3.0-6.0)
Teamwork (max 28)	21.6 ± 3.6	14	27	21 (19.3-25.0)
Task Management (max 8)	6.5 ± 1.4	3	8	6.5 (6.0-8.0)
Global Rating (max 10)	7.5 ± 1.5	4	10	7.5 (6.0-9.0)
Overall Score (max 44)	33.1 ± 6.3	19	43	32 (29.5-38.8)

Likert ratings for questions 1-11: 0=never/hardly ever; 1=seldom; 2=about as often as not; 3=very often; 4=always/nearly always. Leadership = combined total of questions 1-2, maximum possible score 8; Teamwork = combined total of questions 3-9, maximum possible score 28; Task Management = combined total of questions 10-11, maximum possible score 8. Overall Score = combined total of questions 1-11, maximum possible score 44.

**Table 3**  
Exemplars additional observations of non-technical skills.

Category	Observation Exemplar – ‘what worked well’	Observation Exemplar – ‘what didn’t work well’
Leadership	Team leader directed tasks to specific members - asked name & used it. Plan clarified.	Team leader changed throughout, no clear handover, tasks were allocated without confirmation of completion.
Communication	Clear instructions from team leader.	No one introduced themselves to anyone, 5 doctors in attendance, 2 ward nurses, 1 ICU nurse, very little team talk, no one explicitly stated they were the leader.
Team Structure	Fewer people.	Family member in room – no one acknowledged her. Too many people – 12 in room: team, nurse, home team.

As part of the observations of the medical emergencies, the assessor also recorded ‘what worked well’ and ‘what didn’t work well’ in non-technical skill performance. The analyses of comments identified three main themes: ‘communication’, ‘leadership’ and ‘team structure’ (exemplars in Table 3).

### Phase 2 – Qualitative interviews

Seven medical emergency team members (registered nurses n=4 and doctors n=3) participated in the interviews. Five interviews were conducted including one interview with three participants to accommodate participant availability. Five of the seven participants completed the background information form. Of those, three were Registered Nurses, each with from 15 to more than 20 years’ experience, while two were first year Registered Medical Officers (RMOs) on a ten-week rotation at the hospital. Three participants reported completed medical emergency training courses (two at the hospital being studied and one at another hospital in

Western Australia). One of the three had also attended Australian Resuscitation Council Advanced Life Support training through a tertiary institution. All five participants who completed the background information form had attended a medical emergency at the study hospital in the past 3 months.

Three broad themes and sub-themes were identified from analyses: (1) ‘individual contributions’ (‘knowledge and perspectives of non-technical skills’ and ‘individual experiences’); (2) ‘team contributions’ (‘barriers and enablers to teamwork’, ‘barriers and enablers to team communication’ and ‘barriers and enablers to leader in control’); and (3) ‘other contributing factors’ (‘situational awareness’ and ‘need for training’) (Table 4).

### Theme 1: Individual Contributions

**Subtheme 1A: Knowledge and perspectives of non-technical skills.** Participants described a range of non-technical skills they considered necessary to medical emergency teams, including leadership, progressive planning, communication, situational awareness, clar-

**Table 4**  
Description of themes and subthemes.

Theme	Subtheme	Description
Individual contributions	Knowledge and perspectives of non-technical skills	The knowledge and perspectives of non-technical skills of the medical emergency team member.
	Individual experiences	The personal experiences practicing non-technical skills of the medical emergency team member.
Team contributions	Barriers and enablers to teamwork	Functional, helpful or effective team dynamics, and dysfunctional, problematic or ineffective team dynamics.
	Barriers and enablers to team communication	Effective communication styles that facilitate processes and outcomes, and ineffective communication styles that inhibit or adversely affect processes and outcomes.
	Barriers and enablers to having a leader in control	Directing and supporting team members through effective leadership, or lack of direction and support through ineffective or absent leadership.
Other contributing factors	Situational awareness	Awareness of people and resources within the environment.
	Need for training	Training to support non-technical skills for medical emergency team members.

ity of roles and goals, assertiveness, remaining calm, emotional regulation, insightfulness, prioritising, taking control, organisation and delegation, and rapport.

“...organisation and leadership and being able to delegate people to tasks. And to be able to prioritise the tasks.” – Doctor, Interview 3

Participants also discussed personal interpretations of effective leadership, communication and teamwork. Leadership was described as communicating effectively, focusing on the situation, delegating, making your leadership role known, seeing the bigger picture, allocating roles appropriately, giving feedback, directing, leading positively, having competency, and effectively assessing the situation.

“...an effective leader is a good communicator who delegates, who should be hands off as far as possible, steps back, sees the whole picture, picks people to do different roles and according to their capabilities, closes the loop and basically can give feedback to the team on where we are at, like, ‘oh this has been done, this has been done.’ – Doctor, Interview 1

Effective communication was described as clear and precise communication, calm, slowed down, using people’s names, and closed loop (giving instructions and waiting for feedback).

“Effective communication to me is basically the closed-loop communication. So when you tell someone to do something, the other person should repeat what he or she should do, and to get back to you once it’s done.” – Doctor, Interview 5

Lastly, effective teamwork was described by participants as everybody knowing their role (role nomination), direction from the leader, supporting each other, delegating responsibilities, saying if you’re not competent or need assistance, getting tasks done, and stabilising the patient.

“So [teamwork] kind of ties into everything else. So having a leader who is communicating well, having a team who’s communicating well, and I think when you have a clear leader, instead of everybody just talking at once, it’s good to have somebody take control of the whole situation and then direct from there.” – Nurse, Interview 4

*Subtheme 1B: Individual experiences.* Participants talked about their personal experiences of practicing and observing non-technical skills within medical emergency teams. Some people expressed concern relating to team members readily accepting direction or being corrected. Some mentioned the importance of vocalising personal competencies, and equally, acknowledging gaps in skill. Participants identified a variety of factors that impacted negatively

on their individual experiences as medical emergency responders, such as team members not listening, poorly run calls or calls with adverse outcomes, lack of experience or training, competing demands and individual personalities.

“But yeah it also can occur that people allow their personality to come into play or their ego to come into play in that situation where I’ve witnessed the same and I’ve [said], ‘you’re going too slow, you need to go faster and harder’ and I say ‘fast and hard, fast and hard’ you know and they won’t because they think it’s 1 and 2 and, even though they’ve been trained otherwise. . . . and also conversely asking them to go slower. They get very cross when you try and say, bits, you know try and help with the tempo a little bit and some other things.” –Nurse, Interview 1

Similarly, the importance of acknowledging gaps in skill was also noted.

“...[if] somebody says, ‘Shock the patient’, you’ve got to [be able to] say, ‘Excuse me I don’t know how to do that’, step back and let that person continue.” – Nurse, Interview 2

### *Theme 2: Team Contributions*

*Subtheme 2A: Barriers and enablers to teamwork.* Factors reported as having an adverse effect upon effective teamwork included lack of a clear leader, lack of direction or shared plan, no or poor role allocation, too many medical emergency responders or extraneous staff, inefficiency, conflicting or unclear treatment plans, lack of team shift briefing or team member identification, multiple handovers, and a need for new or dedicated roles.

“...some treatment is best given, you know research may show that it’s best given as soon as possible. So if you’ve got inefficiency between the leader and the communication and the team, then the treatment that’s recommended might, you know, might not be given, or given too late. Because a patient, depending on the situation can deteriorate quickly. So it’s just important, yeah, that people know, you know, what they need to do at the time [and] they just need to work out which algorithm they’re following, and go from there.” – Doctor, Interview 3

The number of people in the room was also seen as an ongoing challenge which led to distracting conversations and loss of focus on the patient. Ad-hoc teams were identified as a particular challenge, especially when staff responding to a call couldn’t identify their medical emergency colleagues.

“...unfortunately when the rapid response team arrives, the people that were there at the time don’t step away and allow

the rapid response team to take over. Hence there's been times when I've had six nurses around a patient, and as [the] nurse that's come for the rapid response, I have to then say, 'okay, I just need the nurse looking after this patient, and I will stay with her, the rest of you can you all please leave', because we couldn't even breathe in the room [because] it was overcrowded." – Nurse, Interview 2

Conversely, participants reported practices that had a positive effect on teamwork including good rapport, communication, identification of roles, summarising and verbalising the case, controlling the numbers in the room, and having clear definition and allocation of roles. Some recommended introducing a 'gatekeeper' role to deal with overcrowding as well as shift pre-briefing as a way to resolve challenges experienced with identifying medical emergency team members.

"...[having] a good rapport with the other team members. More often if you find a leader who is willing to communicate, to introduce their roles, their names, you find that the team works better in that MET call." – Doctor, Interview 5

*Subtheme 2B: Barriers and enablers to team communication.* Reported barriers to effective team communication included not listening, cross-communication, aggressiveness, no or poor hand-over (at commencement and conclusion of medical emergency calls), not observing patient directives, the need for a leader or better leadership, and not respecting the patient. Multiple conversations between subgroups of staff was also noted as an impediment. A lack of closed-loop communication was mentioned by several participants as a key barrier to effective team communication.

"...and sometimes there's been a lack of closed-loop communication, in that someone will just ask a question generally, and then nobody will respond which obviously isn't the best." – Nurse, Interview 4

All participants offered ideas and strategies to improve team communication including using closed-loop communication, adequate volume, non-verbal cues, and communicating clearly and calmly.

"...[what would improve] teamwork I think just using closed-loop communication, which we know we should be doing, is helpful." Nurse, Interview 4,

*Subtheme 2C: Barriers and enablers to having a leader in control.* Reported factors that impacted upon effective leadership were a lack of one clearly appointed leader or poor leadership, undervaluing of individuals, no debriefing, and not stepping back to allow another to lead. The lack of an appointed leader was a key issue for all participants. Some reported observing team members reluctance to allow another to lead and noted that the order of team members arrival at the event was a complicated factor. Conversely, most participants also described experiences of effective leaders who facilitated enhanced teamwork and communication, and who were valued and respected by their medical emergency peers.

"...our intensivists [are] always very, generally they are always very inclusive and always want to know if we have anything to add, if we have any concerns, we're always included in decision making." – Nurse, Interview 1

### Theme 3: Other contributing factors

*Subtheme 3A: Situational awareness.* Other elements reported by participants as impacting upon medical emergency teams were the severity of the call, levels of patient distress, the presence of

family members in the room, and a lack of physical space due to overcrowding.

"[If] things go wrong and you've got 16 people in the room [you can't] reach stuff. You can't, you know, if you need to jump on the patient's chest all of a sudden and shock the patient, and there's just too, you know, it's, I'll say a safety risk. And ultimately your patient [is] at risk." – Nurse, Interview 1

*Subtheme 3B: Need for training.* The need for additional training in both non-technical skills and essential medical emergency skills was highlighted. Participants suggested e-learning and simulation training utilising 'mock' scenarios, interprofessional training, and site-specific staff induction. Simulation training was viewed as an opportunity for discussion, assigning and practicing different roles, involving the whole multidisciplinary team, and evaluating non-technical skills. E-learning was recommended for consolidation of resuscitation knowledge and for site-specific induction, particularly for staff members on temporary rotations at the hospital.

"I think training to help elucidate the concepts of good communications, how a MET call should go and how a MET call should be conducted, where the positions should be and the follow up after [a] MET call. The whole process of a MET call, the pre, post, the pre, during and the post MET call is good." – Doctor, Interview 5

## Discussion

Non-technical skills are fundamental to the performance of medical emergency teams responding to emergencies within the hospital. This study has completed a real-time evaluation of the non-technical skills in twenty medical emergencies in an acute private hospital. Based on the outcome of TEAM<sup>TM</sup> ratings, the overall performance of the teams observed was lower compared to other studies conducted in emergency departments. [2,14,18] The teams observed in this study were ad-hoc teams with a mean number of four attending team members (ranging from one to seven), different to other studies with 3-20 clinicians in attendance, potentially explaining the difference in scores.[18] Our findings indicated that when there were too many staff involved it had a negative effect on the non-technical skills, this is similar to other studies who have identified where there were too many staff, this impacted effective team function, leadership and communication.[18,19]

The qualitative findings focused on three areas, 'individual', 'team', and 'other' contributing factors, providing further insight into the perceptions and experiences of medical emergency team members. Participants had a good understanding of the importance of non-technical skills, were reflective of their experiences in resuscitation, and provided valuable insights into the barriers and enablers affecting how leadership, teamwork and communication were carried out. Individual characteristics of team members, including experience, knowledge and competence of non-technical skills, were identified as important contributors to the success of medical emergency teams, and this is also reported in other studies. [7,20]

Successful leadership of teams was identified as being challenging at times, particularly where there was a lack of clear direction and delegation of tasks by the team leader or no obvious leader at all; both negatively impacted communication with the team. Porter, Cant and Cooper [18] conducted a focus group with nurses following ratings of medical emergencies, and found that team composition and resuscitation leadership were critical factors for effective team function in resuscitation events. The pivotal role of leadership in medical emergencies has been clearly confirmed. [21–23]

The current study also found team members identified challenges of the designated team as they came together as ad-hoc teams with little or no knowledge of individual team member's skills, and often came together for the first time in varied areas in the hospital in response to a medical emergency. However, despite the ad-hoc team structure, some staff found leadership, teamwork and communication was adequate, though reported it varied across teams. Other studies have also found that ad-hoc teams are associated with ineffective leadership. [24,25]

The importance of communication in resuscitation has been widely reported [20,22,26] Participants in this study identified communication as a critical function of non-technical skills and they described the components of effective communication, viewing it as a vital for effective leadership and teamwork. Team Situational Awareness (TSA) has been identified as an important part of teamwork focused on team members identifying and communicating information about the emergency situation. [27] In this study participants highlighted the need for teams to be situationally aware of not only the emergency but of family members who may be present, as this was at times overlooked.

Perceptions of the importance of non-technical skills appeared to be similar between disciplines, with nurses and doctors identifying similar strengths and areas for improvement of medical emergency teams. Both groups also recognised non-technical skills as critical to successful team performance and the delivery of high-quality care in medical emergencies. These findings highlight the need for strategies to further develop non-technical skills, through multi-disciplinary training and processes for allocating well-defined team roles. The importance of providing training to improve non-technical skills in resuscitation is recognised within international guidelines [28,29], and has been found to improve performance in simulated resuscitation training. [26,30,31] The use of the Team Emergency Assessment Measure has also been shown to be a valuable tool as part of training for non-technical skills. [2,18]

### Limitations

The observation and convenience participant sample from one private hospital limits the generalisability of the findings. The awareness by the medical emergency team of being observed, particularly by a known observer, may have impacted on team performance. As the observations only occurred on weekdays, this is also identified as a shortcoming of the study.

### Conclusion

This study reinforces the need for evaluation of non-technical skill performance in medical emergency teams to inform practice development in order to improve patient safety and quality of care. These findings also highlight the importance of quality processes in hospitals for resuscitation including team structure, team briefings and education.

### Author Contributions

All authors contributed to the design of the study. EW, AC and RG conducted the data collection. RG and RS conducted the data analysis. KS, RG, and RS drafted the manuscripts. All authors contributed and approved the final manuscript.

### Funding

This work was supported by a Hollywood Private Hospital Research Foundation grant, Western Australia (RF119).

### Conflict of Interest

The authors declare no conflict of interest.

#### What is known?

The clinical expertise and non-technical skills of health professionals are fundamental aspects of patient safety and quality. Previous studies have found that outcomes of medical emergencies can be impacted by the non-technical skills of emergency teams, especially leadership.

#### What this paper adds?

These findings highlight the importance of quality processes for team structure, team briefings and education.

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