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Ability of the Australian general public to identify common emergency medical situations: Results of an online survey of a nationally representative sample

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ABSTRACT

Objective: To investigate the Australian general public's ability to identify common medical emergencies as requiring an emergency response.

Methods: An online survey asked participants to identify likely medical treatment pathways they would take for 17 hypothetical medical scenarios (eight emergency and nine non-emergency). The number and type of emergency scenarios participants correctly suggested warranted an emergency medical response was examined. Participants included Australian residents (aged >18 years; n=5,264) who had never worked as an Australian registered medical doctor, nurse or paramedic.

Results: Most emergencies were predominately correctly classified as requiring emergency responses (e.g. Severe chest pain, 95% correct). However, non-emergency medical responses were often chosen for some emergency scenarios, such as a child suffering from a scalp haematoma (67%), potential meningococcal disease (57%), a box jellyfish sting (40%), a paracetamol overdose (37%), and mild chest pain (26%). Participants identifying as Aboriginal or Torres Strait Islander suggested a non-emergency response to emergency scenarios 40% more often compared with non-indigenous participants.

Conclusions: Educational interventions targeting specific medical symptoms may work to alleviate delayed emergency medical intervention. This research highlights a particular need for improving symptom identification and healthcare system confidence amongst Aboriginal and Torres Strait Islander populations.

KEYWORDS

Ambulance; Emergency; Emergency Department; Recognition; Symptom

INTRODUCTION

The Australian healthcare system ranks amongst the best in the world with respect to access, equity and healthcare outcomes.[1] While still there are substantial challenges facing Australian healthcare, particularly given the ongoing rise in emergency department (ED) overcrowding[2] and ambulance ramping[3] which limit access to emergency healthcare services in the community,[4] typically the Australian general populace will have access to emergency healthcare should they require it. In the event of a medical emergency necessitating immediate/near-immediate emergency intervention, the average person can call Triple Zero (000) and request assistance from paramedics via an emergency ambulance. Alternatively, people can self-present to a hospital ED.

The contention that patients should have the right to access emergency healthcare when they feel the need is commonplace.[5] However, given the ongoing and extreme demands placed on emergency healthcare services in Australia,[6] many discourage the use of emergency healthcare services as far as possible for lower acuity conditions.[7] Undoubtedly an appropriate balance needs to be struck between risk aversion (i.e. engaging with emergency healthcare services for medical situations that may be low-acuity in nature) which may unnecessarily tie-up emergency healthcare service resources when they could be freed up for more high-acuity conditions, and emergency healthcare service avoidance which has the capacity to exacerbate medical situations.

People may choose to not engage with emergency healthcare services due to factors such as perceived or known costs,[8] fear of infectious disease transmission,[9] medical distrust,[10] or simply not realising a particular set of circumstances necessitates emergency medical

intervention, oftentimes first trying to remedy situations themselves or through other less timely primary care pathways (e.g. General Practice).[11]

A number of common emergency medical situations such as stroke,[12] acute myocardial infarction[13] and sepsis[14] have been demonstrated to have been poorly identified as emergencies by members of the general public. While community education efforts[12] and large-scale public health information campaigns[15] can work to improve awareness, knowing where best to target education efforts is paramount.

We sought to gauge the extent to which a nationally representative sample of Australians could identify common emergency medical situations and suggest utilisation of an appropriate medical emergency pathway.

METHODS

Participants

Prospective participants included any Australian resident aged greater than 18 years who was not currently nor had ever before worked as an Australian registered medical doctor, nurse or paramedic. Participants were recruited through an online market research company *PureProfile,* which maintains an active membership list of more than one hundred thousand Australians who have signed up to complete online surveys and other forms of market research for small financial reimbursement.

Ethics Approval

Ethics approval was granted by the Edith Cowan University Human Research Ethics Committee (#2020-01958).

Materials

Recognition of emergency medical situations

Participants were presented with 17 hypothetical medical scenarios (Table 1) re-purposed from a previous Australian investigation[16] exploring the general public's ability to correctly categorise emergency versus non-emergency medical scenarios. A panel of prehospital and/or emergency medicine clinicians (n=5; personal contacts of the research team) reached 100% consensus on their interpretation of whether scenarios warranted an emergency (i.e. call an ambulance or attend an ED) or non-emergency healthcare response pathway.[16] This process involved the clinical panel meeting with members of the research team as a group, in-person and were presented with each of the 17 scenarios. Following presentation of a scenario, clinicians were asked to (confidentially) write down whether they felt the scenario should or should not warrant an emergency medical response. Where responses were not 100% unanimous across the panel, research team members were to facilitate discussion until consensus was reached.

Of the 17 scenarios, eight were identified as emergencies by the clinician panel, and the remaining nine were considered non-emergencies. For the present research study, the nine 'non-emergency' scenarios were hidden amongst 'emergency' scenarios and displayed to study participants as 'red herrings' to make distinguishing the emergency medical scenarios less obvious. Scenario display order was universal across study participants; however, all 17 scenarios were randomly mixed to provide a finalised scenario display order.

The panel also expressed concern over the ability of members of the general public to contextualise scenario characteristics based on text alone and suggested combining scenario

text with graphical images. Incorporation of images alongside text improves comprehension of information being presented, particularly amongst those with low literacy.[17] Thus, graphical images of each medical scenario were presented alongside scenario text. Photos were either sourced from stock photos (Dreamstime.com), or original creations taken with a 12-megapixel wide-angle camera found on an Apple iPhone X (Cupertino, California) taken by members of the research team. Original images created by the research team utilised unpaid personal contacts, who provided written consent for the images to be employed as part of the research.

In response to each of the 17 scenarios, participants could choose from a list of nine pre-determined options (standardised across scenarios; Table 2) they believed they would likely undertake should they be presented with each scenario in real life. For the eight 'emergency' scenarios, calling 000 for an ambulance or attending the ED were coded as (correct) emergency response options, with all others coded as (incorrect) non-emergency response options. Participants were also provided an 'Other' option allowing them to type in open-ended responses if they felt their response would differ from one of those already provided. Open-ended responses were coded as (correct) emergency responses options if participants indicated calling for an ambulance or attendance at an ED. All other legible responses were coded as a non-emergency response option.

All medical scenarios, corresponding images and response options were piloted with a sample of 15 personal contacts of the research team who met study inclusion criteria, ensuring equal spread across gender, age and residence location (i.e. metropolitan versus rural). No misinterpretations of medical symptoms, images or response pathways were noted as a result of this pilot process.

125 Table 1. Non-emergency and emergency scenario text presented to participants

	Scenario number	Short scenario Title	Full scenario text
Non-emergency scenarios	2	Flu	A 45-year-old male has flu-like symptoms. He has a mild fever, cough, headache, runny nose and feels tired.
	4	Older person bruising	A 77-year-old woman knocks herself against the kitchen table, and a large bruise immediately appears on her thigh.
	6	Lego in ear canal	A 4-year-old girl has a Lego piece stuck in her ear canal.
	7	Stubbed toe	A 25-year-old male is playing football with his friends in his backyard with his bare feet. He stubs his toe on a brick. There is blood and he suggests it is throbbing quite painfully.
	10	Alcohol intoxication	A 22-year-old male is conscious, not injured and has drunk a substantial amount of alcohol on a night out.
	11	Woman in labour	A 33-year-old woman is 9 months pregnant and goes into early stages of labour. Her waters have broken, and she feels uncomfortable.
	12	Back pain	A 40-year-old man with a 6-month history of back pain wakes up in the middle of the night with a sore back and has run out of pain killers. The man is in quite a bit of pain.
	14	Cut finger	A 42-year-old man has cut his finger while chopping vegetables, and the bleeding is controlled with pressure.
Emergency Scenarios	1	Box Jellyfish sting	Whilst in Northern Queensland, a boy is stung by a Jellyfish while swimming at the beach, and large welts appear on his arm.
	3	Snake bite (unidentified)	A 50-year-old woman has been bitten on her ankle by an unidentifiable snake.
	5	Mild chest pain	A 40-year-old woman is experiencing mild chest pain. She does not think it is indigestion or a strained muscle.
	8	Stroke	A 67-year-old man is slurring his words; he has not drunk any alcohol.
	9	Severe chest pain	A 52-year-old man has severe chest pain, is sweating and grey in colour.
	13	Paracetamol overdose	A 32-year-old female has taken 10 regular paracetamol tablets in the last 12 hours, and is feeling extremely unwell. She has abdominal pain and feels nauseous.
	15	Child head haematoma	A 3-year-old boy has fallen off the couch and bumped his head. He began crying immediately and a golf-ball size lump with a bruise promptly appears.
	16	Potential meningococcal disease	A 4-year-old girl has woken up with a high temperature, feels hot to touch, has a really sore neck and a headache which Panadol is not relieving.
	17	Older person hip pain	A 80-year-old woman fell out of bed, is now unable to get up and is complaining of hip pain on her right side.

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Table 2: Scenario response options provided to participants

Call 000 for an Ambulance
Go to the Emergency Department
Make an appointment to visit a GP
Talk to a pharmacist
Make an appointment at a COVID clinic
Call Healthdirect or Nurse-On-Call
Provide first aid
No immediate action but monitor situation
Other

Demographics

Participants were asked their age, gender, whether or not they identified as Aboriginal or Torres Strait Islander, their highest level of education, whether they lived in a metropolitan or rural setting, their employment status, household annual income, whether or not they had any dependent children, whether or not they suffered from any chronic illness or had a disability. Participants were also asked to complete the Brief Emotional Experience Scale (BEES)[18] as a measure of emotional wellbeing. The BEES, validated amongst 326 Australian adults, comprises of three positive (Happy, Calm, Confident) and three negative (Worried, Sad, Afraid) emotional adjectives rated on a four-point scale (1) Not at all (2) A little bit (3) Quite a bit (4) A lot. An overall emotional wellbeing score is calculated by summing across the positive and negative adjectives separately and then subtracting the negative score from the positive score. The overall score can range from negative nine to positive nine where a higher score indicates greater emotional wellbeing.[18]

Procedure

Participants were sent an invitation to participate in the research through their online *Pureprofile* account. Eligible *Pureprofile* members already enrolled to receive online surveys through their online portal account select which surveys they complete from a list of available options. Survey invitations give no indication of survey content or corresponding organisations

involved. Members choose which surveys they will or will not complete based on approximated survey length and financial reimbursement.

The online survey was active from November 19 to December 2, 2020, facilitated through the *Qualtrics* survey platform. Upon completion of the survey, *Pureprofile* facilitated financial reimbursement for participant's time to the value of AUD $4.20. Estimated time to complete the survey was 20 minutes.

Analysis

The number of emergency scenarios correctly attributed an emergency response was calculated (scored out of nine). Descriptive statistics were calculated and significant differences within groups determined using t-tests and one-way ANOVAs. Generalised linear modelling assuming binomial distribution (link= logit) was used to study the relationships between key demographic variables and the number of emergency scenarios correctly identified as warranting an emergency medical response.

RESULTS

A total of 6,723 individuals began the online survey. Of these, 109 did not proceed past the first page containing a detailed participant information letter. A further 30 were removed for identifying as under 18 years of age, a further 112 for not being an Australian resident, and a further 752 for suggesting they had previously worked in Australia as a registered doctor, nurse or paramedic. Lastly, a further 89 were removed as they completed demographic information only. This left a final sample of 5,631 eligible participants. A total of 5,264 participants provided data for all 17 scenarios. Given no significant differences were noted across any demographic factors (e.g. age, gender, income, BEES score) for those that did and did not

provide responses to all 17 medical scenarios, missing data was deemed missing completely at random and subsequently removed. Demographics for the final sample are outlined in Table 3.

Table 3: Final sample demographics with correct categorisations of emergency scenarios

Demographics	N (%)	Mean (SD)	p-value
Gender			**<0.001**
Male	2232 (42.7)	6.30 (2.04)	
Female	3018 (57.3)	6.44 (1.61)	
Missing	14 (0.3)	-	
Age			**< 0.001**
18-35	1415 (26.9)	5.77 (1.90)	
36-55	1725 (32.8)	6.17 (1.92)	
56+	2124 (40.3)	6.96 (1.44)	
State or Territory			
Australian Capital Territory	91 (1.7)	6.33 (1.75)	**<0.001)**
New South Wales	1523 (28.9)	6.42 (1.90)	
Northern Territory	7 (0.1)	6.14 (1.47)	
Queensland	1040 (19.8)	6.58 (1.67)	
South Australia	554 (10.5)	6.51 (1.55)	
Tasmania	127 (2.4)	6.34 (1.82)	
Victoria	1318 (25.0)	6.32 (1.80)	
Western Australia	604 (11.5)	5.97 (1.96)	
Aboriginal/ Torres Strait			**<0.001**
Yes	162 (3.1)	4.33 (2.88)	
No	5065 (96.2)	6.44 (1.72)	
Missing	37 (0.7)	-	
Residency			**< 0.001**
Metropolitan	4088 (77.7)	6.28 (1.85)	
Regional	1176 (22.3)	6.72 (1.61)	
Relationship status			**<0.001**
Married	2725 (51.8)	6.40 (1.87)	
De facto	702 (13.3)	6.33 (1.63)	
Single	1634 (31.0)	6.31 (1.79)	
Missing	203 (3.9)	-	
Level of education			**< 0.001**
Did not graduate High school	470 (8.9)	6.88 (1.55)	
High school	1069 (20.3)	6.70 (1.62)	
Trade or TAFE	1548 (29.4)	6.60 (1.61)	
Undergraduate	1391 (26.4)	6.09 (1.88)	
Postgraduate	786 (14.9)	5.73 (2.13)	
Income earner			**<0.001**
Yes	2996 (56.9)	6.15 (1.87)	
No	2166 (41.1)	6.72 (1.64)	

*Income****			**< 0.001**
$1 - $10,399	107 (2.3)	6.34 (2.17)	
$10,400 - $15,599	70 (1.5)	6.16 (1.89)	
$15,600 - $20,799	141 (3.0)	6.65 (1.52)	
$20,800 - $31,199	474 (10.0)	6.75 (1.63)	
$31,200 - $41,599	386 (8.1)	6.76 (1.56)	
$41,600 - $51,999	454 (9.6)	6.63 (1.66)	
$52,000 - $64,999	440 (9.3)	6.36 (1.81)	
$65,000 - $77,999	427 (9.0)	6.40 (1.83)	
$78,000 - $ 103,999	781 (16.5)	6.26 (1.84)	
$104,000+	1467 (30.9)	6.08 (1.88)	
Missing	517 (9.8)	-	
Children under 18			**< 0.001**
Yes	1502 (28.5)	5.96 (2.06)	
No	3762 (71.5)	6.54 (1.67)	
Chronic condition			0.567
Yes	1863 (35.4)	6.62 (1.83)	
No	3401 (64.6)	6.25 (1.78)	
BEES-Total score			**<0.001**
Positive score	3112 (70.5)	6.48 (1.73)	
Zero score	1191 (13.2)	6.11 (2.02)	
Negative score	961 (16.3)	6.38 (1.74)	
Disability			**< 0.001**
Yes	674 (12.8)	6.41 (2.18)	
No	4525 (86.0)	6.38 (1.74)	

* Bold text denotes significant association at 5% level of significance

The most common emergency scenarios for which a non-emergency response was selected were ‘Child head haematoma’ (67.4%), ‘Potential meningococcal disease’ (56.8%), ‘Box Jellyfish sting’ (40.1%), ‘Paracetamol overdose’ (36.9%) and ‘Mild chest pain’ (25.9%) (Table 5). Of those participants not suggesting an emergency response to the ‘Child head haematoma’ scenario (n=3546, 67.4%), almost a third (n=1096, 30.9%) suggested they would take no immediate action. A further 24% (n=845) suggested they would administer first aid, and 25% (n=878) suggested they would make an appointment with a GP. For the ‘Potential meningococcal disease’ scenario, 42% (n=1,260) of participants who did not choose an emergency response suggested they would make an appointment with a GP. A further 30% (n=888) would place a call to Healthdirect (or similar) and 19% (n=564) would attend a COVID-19 testing clinic. With respect to the ‘Box Jellyfish sting’ scenario, more than half

(n=1,302, 57%) of participants who did not choose an emergency response suggested they would apply first aid in response. A further 14% (n=299) would call Healthdirect (or similar) and 13% (n=275) would make an appointment with a GP. For those not suggesting an emergency response to the 'Paracetamol overdose' scenario, calling Healthdirect (or similar) was the most common response (n=1,043, 54%), followed by making a booking with a GP (n=499, 26%). Lastly, 45% (n=613) of participants not suggesting an emergency response to the 'Mild Chest Pain' scenario chose to make a booking with a GP. In addition, 30% (n=412) chose to place a call to Healthdirect (or similar).

201 Table 4 – Number and proportion of response options for each Emergency scenario

Scenario number	Scenario Title	Emergency responses			Non-emergency responses						
		Call 000	Go to ED	Total Emergency	GP	Pharmacist	COVID clinic	Healthdirect	First aid	No action	Total Non-Emergency
1	Box Jellyfish sting	2183 (41.5%)	971 (18.4%)	3154 (59.9%)	275 (5.2%)	135 (2.6%)	37 (0.7%)	299 (5.7%)	1203 (22.9%)	155 (2.9%)	2110 (40.1%)
3	Snake bite	3637 (69.1%)	1014 (19.3%)	4651 (88.4%)	118 (2.2%)	26 (0.5%)	23 (0.4%)	79 (1.5%)	340 (6.5%)	27 (0.5%)	613 (11.6%)
5	Mild Chest Pain	2985 (56.7%)	913 (17.3%)	3898 (74.1%)	613 (11.6%)	28 (0.5%)	72 (1.4%)	412 (7.8%)	46 (0.9%)	195 (3.7%)	1366 (25.9%)
8	Stroke	4090 (77.7%)	686 (13.0%)	4776 (90.7%)	245 (4.6%)	33 (0.6%)	23 (0.5%)	109 (2.1%)	29 (0.6%)	48 (0.9%)	488 (9.3%)
9	Severe chest pain	4635 (88.1%)	342 (6.5%)	4977 (94.5%)	93 (1.8%)	32 (0.6%)	46 (0.9%)	63 (1.2%)	34 (1.2%)	19 (0.4%)	287 (5.5%)
13	Paracetamol overdose	1493 (28.4%)	1846 (35.1%)	3339 (63.4%)	499 (9.5%)	137 (2.6%)	0 (0.0%)	1043 (19.8%)	33 (0.6%)	213 (4.0%)	1925 (36.6%)
15	Child head haematoma	348 (6.6%)	1370 (26.0%)	1718 (32.6%)	878 (16.7%)	54 (1.0%)	0 (0.0%)	673 (12.8%)	845 (16.1%)	1096 (20.8%)	3546 (67.4%)
16	Potential meningococcal	628 (11.9%)	1647 (31.3%)	2275 (43.2%)	1260 (23.9%)	81 (1.5%)	564 (10.7%)	888 (16.9%)	62 (1.2%)	134 (2.5%)	2989 (56.8%)
17	Older person hip pain	4530 (86.1%)	274 (5.2%)	4804 (91.3%)	179 (3.4%)	26 (0.5%)	21 (0.4%)	143 (2.7%)	55 (1.0%)	36 (0.7%)	460 (8.7%)

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The mean score (out of 9) for the number of emergency scenarios for which participants correctly suggested they would call 000 for an ambulance or attend an ED was 6.38 (SD=1.80). Table 4 depicts the results of the multivariate analysis demonstrating the impact of demographic variables on suggestions of emergency responses to emergency scenarios. Females were 3% better able to suggest an emergency response to emergency scenarios than males. Participants aged 36–55 years and 56+ years were 7% and 17% better (respectively) at correctly suggesting emergency responses compared to those aged 18–35 years.

Those living in rural/remote locations were 4% better able to identify emergency responses compared to those living in metropolitan locations. Additionally, there was a 29% reduction in the odds of suggesting correct emergency responses among participants who identified as Aboriginal and/or Torres Strait Islanders compared to those who did not identify as such. Lastly, those with a university qualification were 9% less able to correctly suggest an emergency response to emergency scenarios.

Table 5: Results of multivariable binomial model predicting demographic factors contribution to number of emergency scenarios for which emergency response pathways (i.e. 'Call 000 for an ambulance' or 'Go to the ED') were not chosen

Demographics	Estimate (SD)	Adj. odds (95% CI)	p-value
Gender			
Male	(ref)	(ref)	
Female	0.032 (0.015)	1.03 [1.00, 1.06]	**0.036**
Age			
18-35	(ref)	(ref)	
36-55	0.066 (0.020)	1.07 [1.03, 1.11]	**<0.001**
56+	0.155 (0.023)	1.17 [1.12, 1.22]	**<0.001**
Aboriginal/ Torres Strait			
Yes	(ref)	(ref)	
No	0.335 (0.048)	1.40 [1.27, 1.54]	**<0.001**
Residency			
Metropolitan	(ref)	(ref)	
Regional	0.040 (0.017)	1.04 [1.01, 1.08]	**0.020**

Relationship status			**<0.001**
Married	(ref)	(ref)	
De facto	0.030 (0.023)	1.03 [0.98, 1.08]	0.199
Single	0.007 (0.019)	1.01 [0.97, 1.04]	0.721
Other	-0.001 (0.038)	1.00 [0.93, 1.08]	0.979
Completed University			
Yes	(ref)	(ref)	
No	0.067 (0.016)	1.07 [1.04, 1.10]	**<0.001**
Income earner			
Yes	(ref)	(ref)	
No	0.003 (0.018)	1.00 [0.97, 1.04]	0.887
*Income****			
$1 - $10,399	(ref)	(ref)	
$10,400 - $15,599	-0.051(0.080)	0.95[0.81, 1.11]	0.527
$15,600 - $20,799	-0.010(0.067)	0.99[0.87, 1.13]	0.884
$20,800 - $31,199	-0.021(0.056)	0.98[0.88, 1.09]	0.704
$31,200 - $41,599	-0.006(0.057)	0.99[0.89, 1.11]	0.920
$41,600 - $51,999	-0.006(0.056)	0.99[0.89, 1.11]	0.918
$52,000 - $64,999	-0.026(0.057)	0.97[0.87, 1.09]	0.647
$65,000 - $77,999	-0.004(0.057)	1.00[0.89, 1.11]	0.941
$78,000 - $ 103,999	-0.005(0.055)	1.00[0.89, 1.11]	0.921
$104,000+	-0.009(0.054)	0.99[0.89, 1.10]	0.865
Children under 18			
Yes	(ref)	(ref)	
No	0.018 (0.020)	1.02 [0.98, 1.06]	0.352
Chronic condition			
Yes	(ref)	(ref)	
No	-0.035 (0.017)	0.97 [0.93, 1.00]	**0.037**
BEES-Total score			
Positive score	(ref)	(ref)	
Zero score	-0.026 (0.020)	0.97 [0.94, 1.01]	0.156
Negative score	0.004 (0.020)	1.00 [0.97, 1.05]	0.848
Disability			
Yes	(ref)	(ref)	
No	0.044 (0.024)	1.05 [1.00, 1.11]	0.068

* Bold text denotes significant association at 5% level of significance

DISCUSSION

This research built upon a previous Australian investigation,[16] utilising a more rigorous study methodology, providing further data strengthening the argument that the Australian general public experiences some difficulty in identifying some emergency medical symptoms. This

research also provides novel findings pertaining to certain demographic characteristics that may most benefit from targeted education initiatives for medical emergency recognition.

Overall, men were slightly less adept at correctly suggesting emergency scenarios warranted an emergency response. This result aligns with previous research suggesting men are less likely to utilise healthcare services (including emergency healthcare services), whilst at the same time participating in more high-risk behaviours.[19] This is particularly true of younger men [20], also aligning with our data suggesting younger participants were less likely to correctly suggest emergency responses to emergency scenarios than older participants. Of particular note was the finding that Aboriginal and Torres Strait Islander participants suggested emergency responses to emergency scenarios far less than non-Aboriginal and Torres Strait Islander participants. Interestingly, previous research suggests the proportion of ED presentations amongst Aboriginal Australians is high compared to general population proportions,[21] but also that Aboriginal Australians are more likely to leave EDs before receiving treatment. This may reflect experience of racism in healthcare as well as avoidance of healthcare until late in the disease due to mistrust and/or expectation of poor treatment.[22] Improving health literacy through interventions co-designed with Aboriginal and Torres Strait Islander community members, as well as working with health professionals to improve cultural empathy and communication about healthcare may work to improve confidence with and knowledge of when to engage with emergency healthcare services amongst these cohorts.[23]

This research identified several emergency scenarios that are oftentimes miscategorised as not warranting an emergency response by calling 000 for an emergency ambulance or attending an ED by the Australian general public. ‘Child head haematoma’, ‘Potential meningococcal disease’, ‘Box Jellyfish sting’, ‘Paracetamol overdose’ and ‘Mild chest pain’ each were

misclassified as non-emergencies by more than 25% of the study sample. These results align with a previous Australian investigation from which study scenarios were originally derived from, with 'Child head haematoma', 'Potential meningococcal disease', 'Box Jellyfish sting' and 'Paracetamol overdose' similarly often being miscategorised as non-emergencies in that study.[16] Such misclassifications can lead to individuals receiving delayed care in potentially life-threatening medical emergencies.

In the present study, the 'Child head haematoma' scenario (i.e. child with a head haematoma following a fall off a couch who cried immediately after impact), was the most heavily incorrectly classified emergency scenario (67% suggesting non-emergency response pathway). Interestingly, participants who had at least one dependent child were (9%) less likely to suggest the scenario warranted an emergency response compared to participants with no dependent children ($p<0.001$). Of additional interest was that more than half the participants did not choose to consult with a health professional of any kind in response to this scenario (30.9% suggested 'No immediate action but monitor the situation' and 24% suggested 'Provide first aid'). While it is true most children who present with a scalp haematoma will not have a clinically significant head injury, the presence of a scalp haematoma in seemingly minor head injuries has been found to increase the likelihood of intracranial injury [24].

A child with a high temperature, neck pain and persistent headache all of which were unrelieved by paracetamol (i.e. 'Potential meningococcal disease'), another child-related scenario, was also heavily misclassified (57% suggesting non-emergency response pathways). Again, participants with a dependent child were (7%) less likely to suggest an emergency response than participants with no dependent children ($p<0.001$). While undoubtedly further education pertaining to the dangers of scalp haematomas and meningococcal disease (particularly

amongst children) is warranted, this seems particularly so amongst parents who are more likely to encounter such circumstances. Mitigating harm somewhat for the 'Potential meningococcal disease' scenario was, unlike the 'Child head haematoma' scenario, the majority of participants did suggest they would seek advice from a healthcare professional (i.e. 42% suggested making a booking with a GP, 30% suggested a call to Healthdirect or similar).

Healthdirect has the additional benefit of receipt of immediate health advice which can then prompt people to adhere to a potentially more appropriate healthcare response pathway.[25] While the appropriateness of Healthdirect advice to engage with emergency healthcare services requires further investigation,[26] one study noted those attending a New South Wales ED following advice from Healthdirect were less likely to receive the lowest urgency triage category on arrival to the ED than those self-presenting.[27] Also of note for the 'Potential meningococcal disease' scenario was the comparatively high response selection of 'Make an appointment at a COVID clinic'. Eleven percent of participants chose this pathway for this scenario, with the next highest proportion of participants being 'Mild Chest Pain' for which 1.4% suggested making an appointment at a COVID clinic (<1% selected this option for all other emergency scenarios). The higher proportion selecting this pathway for the 'Potential meningococcal disease' scenario is likely due to the common symptoms of 'fever' and 'headache' between the two diseases, with fever being one of the most common symptoms of SARS-COV-2.[28]

The 'Box Jellyfish sting' (40%), Paracetamol overdose (36%) and 'Mild chest pain' (26%) scenarios were also commonly miscategorised as not warranting an emergency response. Box jellyfish reside in warm waters typical of Northern Australian coastline.[29] While education targeting these Australian states and territories specifically (WA, NT and QLD) would likely

be of most benefit, interstate (and international) travellers ideally would also be made aware of the dangers associated with box jellyfish encounters. Although, resource allocation to education in this area should be considered in light of associated mortality rates, given that lethal jellyfish envenoming is very rare (i.e. one reported in Australia every 3–4 years).[30]

Conversely, cardiovascular disease and associated acute complications are the leading cause of death globally, and associated mortality rate decreases noted over the past 40 years have begun to decline in Australia.[31] While fortunately the overwhelming majority of study participants (95%) correctly classified 'Severe chest pain' as warranting an emergency medical response, it is still somewhat troublesome more than a quarter of participants (26%) did not recognise mild chest pain as a potential emergency. An Australian study evaluating the National Heart Foundations mass media public awareness campaign advocating for ambulance use for chest pain noted increased calls for ambulance assistance for chest pain callouts amongst at-risk populations during the campaign[32] suggesting such campaigns can raise awareness. However, the same study also noted increased callouts to low-risk populations such as younger patients and those with suspected gastrointestinal disorders.

Lastly, 'Paracetamol overdose' was not suggested to warrant an emergency response by more than a third (36%) of study participants. It is unclear from these results whether participants were unclear that the suggested dosage presented in the scenario was unsafe (10 regular 500mg tablets in 12 hours; recommended dosage is 500–1000mg every 4–6 hours with no more than 4000mg across a 24-hour period)[33] or whether these participants lacked the baseline understanding that paracetamol in excess is unsafe. Paracetamol is the most frequent cause of liver failure in the Western world and the most commonly used drug leading to overdose.[34] Australian poison centres received more than 13,000 calls regarding paracetamol ingestion in

2015,[35] and hospital admissions related to paracetamol poisoning in Australia increased by an average of 3.8% each year between 2007 and 2017,[36] being more common amongst younger persons (particularly females).[37] Indeed, mean age of those incorrectly suggesting this scenario did not warrant an emergency response was lower than those suggesting it did (46.7 vs. 51.1 years respectively, $p<0.001$) with those aged 18–35 years most likely to suggest a non-emergency response.

Strengths and Limitations

Inherent strengths of this study include: (1) our ability to leverage trialled study materials (including medical scenarios) from a similar previously published investigation,[16] (2) the additional incorporation of graphics alongside text to improve contextualisation of medical scenarios, and (3), the representative nature of the Australian adult population from which data was derived. These aspects have notably improved the external validity of the study findings in comparison to the previous investigation.

However, this study is not without limitations. For example, participants were recruited via an online market research company which did include some small incentive for participation. While self-selection bias is unlikely to have impacted in any meaningful way on study results, we do acknowledge the non-random nature of the sampling frame. Further, it should be noted that, even with graphic images aiding contextualisation of textual medical scenarios, it is conceivable individuals could interpret scenarios in different ways. Scenarios utilised focussed on clinical information pertaining to primary health concerns but did not consider other potentially relevant aspects such as comorbidities or social issues. Also, data collection occurred in November/December 2020. Lastly, while national COVID-19 infection rates were (comparatively) low during this period, data was collected in the midst of a global pandemic,

whereby it has been suggested people have been less willing to engage with emergency healthcare services out of fear of exposure to SARS-CoV-2.[38] It is unclear the extent to which attitudes changing in retaliation of the COVID-19 pandemic may have impacted on study findings.

Conclusion

These limitations notwithstanding, this research outlines some clear medical symptoms for which targeted education initiatives, as well as education for healthcare professionals who provide health advice, could improve expedited necessary emergency medical treatment, particularly amongst those identifying as Aboriginal or Torres Strait Islander. Given associated incidence and severity, primary focus for educational interventions could target the symptom of chest pain, making clear even mild chest pain can be a clear symptom for myocardial infarction. To a lesser (yet still important) extent, educational interventions surrounding paracetamol overdose (both accidental and intended as self-harm) would be of benefit, as well as targeting parents for scalp haematomas and meningococcal disease amongst children. Provision of education initiatives targeting specific symptoms demonstrated to have poor understanding or recognition has the capacity to empower those suffering to seek necessary (or potentially necessary) emergency medical intervention in a timely fashion.

CREDIT STATEMENT

BM: Methodology, Writing – Original Draft **MH:** Investigation, Project administration **AM:** Validation, Visualisation **ES:** Conceptualisation, Methodology **EA-Y:** Formal analysis **DR:** Methodology **SR:** Methodology **MS:** Conceptualisation, Supervision

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COMPETING INTERESTS

No competing interests to declare.

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