





## ORIGINAL RESEARCH

## Behavioural drivers influencing emergency department attendance in Victoria during the 2020 COVID-19 pandemic: A mixed methods investigation

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## Abstract

**Objective:** To identify behavioural drivers and barriers that may have contributed to changes in ED attendance during the first 10 months of the coronavirus disease 2019 (COVID-19) pandemic in Victoria.

**Methods:** We conducted a mixed methods analysis of patients who attended one of eight participating EDs between 1 November 2019 and 31 December 2020. A random

sample of patients were chosen after their visit and invited to participate in an online survey assessing behavioural drivers and barriers to attendance. The study timespan was divided into four periods based on local and world events to assess changes in attitudes and behaviours over this period.

**Results:** A total of 5600 patients were invited to complete the survey and 606 (11%) submitted sufficient information for analysis. There were

## Key findings

- Concerns about the safety of the ED were greatest during periods of high community infections.
- COVID-19 related concerns were a frequent reason for why patients delayed their ED presentation.

significant differences in participants' attitudes towards healthcare and EDs, levels of concern about contracting and spreading COVID-19 and the influence of mask wearing. Patients expressed more concern about the safety of an ED during the largest outbreak of COVID-19 infections than they did pre-COVID, but this difference was not sustained once community infection numbers dropped. General concerns about hospital attendance were higher after COVID than they were pre-COVID. A total of 27% of patients specifically stated that they had delayed their ED attendance.

**Conclusion:** Patients expressed increased concerns around attending ED during the first 10 months of the 2020 COVID-19 pandemic and frequently cited COVID-19 as a reason for delaying their presentation. These factors would be amenable to

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mitigation via focussed public health messaging.

**Key words:** *attitudes, COVID-19 pandemic, emergency department, healthcare, patients.*

## Introduction

During the first year of the coronavirus disease 2019 (COVID-19) pandemic, early Australian data suggested a reduction of between 25 and 37% in patients attending Australian ED for non-COVID-19-related conditions.<sup>1–3</sup> This mirrored international findings related to both the COVID-19 pandemic<sup>4–7</sup> and severe acute respiratory syndrome (SARS, 2003) epidemic.<sup>8–10</sup> The reasons for this reduction are unclear; however, in addition to potential changes in illness and injury patterns, it is possible that behavioural changes related to government-mandated restrictions on socialisation, concerns about unnecessary exposure to potentially infectious patients, fears of overburdening hospitals and changes in patterns of healthcare consumption may have also contributed.

Patient behaviours relating to ED attendance can be influenced by factors unrelated to illness. Previous experience with ED care<sup>11</sup> and pre-existing sociodemographic, socioeconomic and psychosocial factors<sup>12–15</sup> appear to be important. External factors such as the time of day, season and weather conditions also play a role.<sup>16–18</sup>

Additionally, different population groups vary in the degree to which they seek medical care from a primary care physician (PCP) *versus* an ED.<sup>11</sup> A decrease in PCP capacity, such as that which was observed during the initial phases of the COVID-19 pandemic,<sup>19</sup> might logically be expected to increase ED utilisation even when offset by conversion to telemedicine,<sup>19–21</sup> yet the sharp drop in ED attendances suggests that this did not occur.

The extent to which ED attendance was impacted by changes in illness and injury epidemiology (such as fewer workplace or sporting injuries, fewer non-COVID communicable diseases and a reduction in road traffic-related accidents) and altered patient behaviours due to the pandemic is unknown. The present study aimed to identify behavioural drivers and barriers that may have contributed to changes in ED attendance during the first 10 months of the COVID-19 pandemic in Australia, when community transmission remained comparatively low.<sup>22</sup>

## Methods

### Study design

Patients who attended one of eight participating EDs (Table 1) for emergency care between 1 November 2019 and 31 December 2020 were invited to complete a survey following their ED visit (Appendix S1). The survey evaluated behaviours, attitudes

and decision-making processes relating to their ED attendance during this period.

The study timespan was divided into four periods pragmatically, based on local and world events: a pre-COVID period characterised by infrequent cases among overseas visitors and few cases of local transmission (1 November 2019 to 10 March 2020); an initial wave of infections that commenced with the World Health Organization (WHO) declaring COVID-19 a global pandemic (11 March to 12 May 2020); a second wave of infections that coincided with the largest Victorian outbreak in 2020 (13 May to 31 August 2020); and 'COVID normal', a period in which there were no local COVID cases (1 September to 31 December 2020).

Ethical approval was obtained from the Alfred Hospital Human Research Ethics Committee (project number: 474/20) and governance approved at all participating sites.

### Survey tool

Survey questions were adapted from an established behavioural questionnaire and created using behavioural survey design methodology by a behavioural science expert (BW), reviewed and modified by content experts within the research group and reviewed by a community representative for readability.<sup>23,24</sup> Questions were grouped into eight discrete subgroups that related to behaviours and

**TABLE 1.** *Site ED characteristics*

Health service	Site name	ED type	Total ED attendances during 2020
Eastern Health	Box Hill Hospital	Mixed – metro	63 081
	Angliss Hospital	Mixed – outer metro	35 508
	Maroondah Hospital	Mixed – outer metro	50 421
Monash Health	Monash Medical Centre	Mixed – major tertiary	75 659
	Dandenong Hospital	Mixed – outer metro	59 933
	Casey Hospital	Mixed – outer metro	62 363
Barwon Health	University Hospital Geelong	Mixed – regional	68 913
The Royal Children's Hospital	The Royal Children's Hospital	Children – major tertiary	66 946

attitudes that the participant had at the time of the specific ED attendance in question: demographic information (seven questions), reason for decision to attend ED (three questions), behaviours relating to the individual's healthcare utilisation (five questions), attitudes to EDs (five questions), social expectations around ED attendance (one question), emotions experienced at the time of ED attendance (one question), general factors that might influence ED attendance (nine questions) and the physical environment of the ED (six questions). Items consisted of a combination of free-text responses, binary options, selection from lists and five-point Likert scales, with responses for the latter ranging from 'strongly agree' to 'strongly disagree' (Appendix S1). The survey was collated in a secure web-based research data collection and management tool called Research Electronic Data Capture (REDCap).<sup>25,26</sup>

### Participants and recruitment

A convenience sampling method was employed to recruit participants who had attended a wide range of hospitals (Table 1), including a large regional hospital and a dedicated paediatric hospital. Six health services (eight EDs) across Melbourne and regional Victoria contributed: Eastern Health (Box Hill Hospital, Angliss Hospital, Maroondah Hospital), Monash Health (Monash Medical Centre, Dandenong Hospital, Casey Hospital), Barwon Health (University Hospital Geelong) and The Royal Children's Hospital. Planned data collection at two additional sites (Alfred Hospital and The Royal Melbourne Hospital) was aborted due to delays in obtaining necessary approvals and an information technology issue that prohibited participant interaction with the REDCap survey tool. Local administrative data were used to identify all ED presentations retrospectively at each site during the study period. The list of presentations was then manually filtered to exclude deceased patients, current inpatients, patients requiring translators, patients transferred to other hospitals, patients brought to the ED by police and patients from residential aged care

facilities. A final random sample of 50 patients from each month was then created from each of the eight participating sites using an Excel-based random number generator. These patients were contacted via short messaging service (SMS; seven sites) or registered post (one site) and invited to complete the survey by opening a web link to the REDCap survey instrument. For the seven sites that used SMS messaging, a single reminder message was sent 7 days later. Designated guardians were contacted for paediatric presentations. Due to the need to capture comparative behaviours and attitudes that predated the COVID-19 pandemic, there was a large variation ranging from less than 1 to 12 months between a patient's ED attendance and invitation to participate in the study. This varied from site to site and between time periods, but it was generally longer for patients who had attended during the first 6 months of the study period. As the study was exploratory and no precedent existed prior to its planning, it was not possible to power the present study to detect a specific outcome. A 10% response rate was anticipated.

### Analysis

Data were extracted from REDCap. Quantitative analysis was performed in SPSS (version 27; IBM, Armonk, NY, USA). Responses were removed if they contained insufficient data for analysis or were unable to be interpreted. Categorical data (sex, age, education level, discharge status and symptoms prior to ED presentation) were examined using summary statistics. Chi-squared analysis was used to determine differences between the four time periods, analysis of variance (ANOVA) was used to compare each Likert scale variable for the four time periods and Tukey's post hoc analysis was conducted on variables with significant *P* values to determine differences between time periods. The use of parametric statistical measures in conjunction with Likert scales is commonly accepted presuming a sample size of sufficient size.<sup>27</sup> A content and thematic analysis was conducted for qualitative variables. Two authors (PB and ESA) independently coded the data and developed themes,

which they discussed until a consensus was obtained.

## Results

### Participant flow through study

A total of 5600 patients were contacted to complete the survey, 700 via mail and 4900 via text message. A total of 1205 (22%) opened the link, of whom 606 (11%) submitted sufficient usable information for inclusion in the analysis.

### Demographics

A detailed breakdown of participant demographics for all time periods is shown in Table 2. Most respondents were adults aged 18 and over (98%), female (70%) and discharged home from the ED (50%). The respondents across time periods did not differ significantly according to sex, education, discharge status or between children and adults. Fifty-three percent ( $n = 323$ ) of the respondents experienced symptoms for less than 6 h prior to presenting, with the majority (65%) stating that they did not delay their presentation to the ED.

### Comparisons between study periods

Across the four time periods, there were significant differences in participants' attitudes towards healthcare and EDs, levels of concern about contracting and spreading COVID-19 and the influence of mask wearing (Table 3). Participants reported that they considered EDs to be safer before COVID-19 (mean Likert = 4.1) than in time period 3 (May–August 2020, mean Likert = 3.7). Participants were also less concerned about attending health services generally before COVID (mean Likert = 3.6) compared with all post-COVID time periods (mean Likert scores = 3.6, 3.1, 3.2, 3.2, respectively). Participants were more concerned about attending the ED in time periods 2 and 3 (11 March to 12 May and 13 May to 31 August 2020, mean Likert scores = 3.0, 3.1) compared

TABLE 2. Detailed breakdown of patient demographics for all time periods

Demographics	All		Period 1		Period 2		Period 3		Period 4	
	N	%	N	%	N	%	N	%	N	%
<b>Hospital</b>										
Angliss Hospital	89	15	22	16	13	16	19	11	35	16
Box Hill Hospital	102	17	26	19	14	18	30	18	32	15
Casey Hospital	56	9	8	6	2	3	20	12	26	12
Dandenong Hospital	61	10	11	8	1	1	20	12	29	13
Maroondah Hospital	99	16	20	14	21	27	29	17	29	13
Monash Medical Centre	71	12	18	13	4	5	17	10	32	15
Royal Children's Hospital	61	10	13	9	13	16	18	11	17	8
University Hospital Geelong	62	10	18	13	10	13	17	10	17	8
Left blank	5	1	2	1	1	1	0	0	2	1
Total	606	100	138	100	79	100	170	100	219	100
<b>Age</b>										
0–10	6	1	3	2	1	1	1	1	1	0
11–17	4	1	2	1	0	0	1	1	1	0
18–30	69	11	15	11	11	14	17	10	26	12
31–40	137	23	41	30	16	20	30	18	50	23
41–50	138	23	27	20	17	22	46	27	48	22
51–60	111	18	24	17	12	15	35	21	40	18
61–70	72	12	17	12	10	13	18	11	27	12
71–80	57	9	6	4	11	14	21	12	19	9
81–90	11	2	2	1	1	1	1	1	7	3
91–100	1	0	1	1	0	0	0	0	0	0
Total	606	100	138	100	79	100	170	100	219	100
<b>Paediatric or adult attender</b>										
Child attender	154	25	36	26	20	25	42	25	56	26
Adult	452	75	102	74	59	75	128	75	163	74
Total	606	100	138	100	79	100	170	100	219	100
<b>Sex</b>										
Female	425	70	102	74	52	66	120	71	151	69
Male	171	28	35	25	26	33	49	29	61	28
Prefer not to say	6	1	1	1	0	0	0	0	4	2
Non-binary	4	1	0	0	1	1	1	1	3	1
Total	606	100	138	100	79	100	170	100	219	100
<b>Education</b>										
Any level of high school	167	28	27	20	19	24	52	31	69	32
Certificate/diploma	192	32	46	33	26	33	58	34	62	28
Bachelor's degree	169	28	43	31	21	27	41	24	64	29
Master's degree	65	11	20	14	10	13	17	10	18	8
PhD	13	2	2	1	3	4	2	1	6	3
Total	606	100	138	100	79	100	170	100	219	100

(Continues)

TABLE 2. Continued

Demographics	All		Period 1		Period 2		Period 3		Period 4	
	N	%	N	%	N	%	N	%	N	%
Discharge location										
Discharged home	300	50	73	53	40	51	82	48	105	48
Admitted to short stay	142	23	25	18	18	23	37	22	62	28
Admitted to hospital	144	24	35	25	20	25	48	28	41	19
Transferred out	20	3	5	4	1	1	3	2	11	5
Total	606	100	138	100	79	100	170	100	219	100
Delay to ED presentation										
Delayed <6 h	323	53	76	55	48	61	88	52	111	50
6–12 h	68	11	18	13	7	9	20	12	23	10
12–24 h	63	10	15	11	5	6	22	13	21	10
1–3 days	79	13	15	11	9	11	20	12	36	16
3–5 days	23	4	6	4	6	8	7	4	4	2
>5 days	47	8	8	6	4	5	11	6	24	11
Left blank	3	0.50	0	0.00	0	0.00	2	1.18	1	0.45
Total	606	100	138	100	80	100	170	100	220	100

with time period 1 (mean Likert score = 3.5), but not time period 4 (mean Likert score = 3.2). Participants were more concerned of coming into contact with an infectious person post-COVID-19 (mean Likert scores = 3.2, 3.2, 2.9 time periods 2–4, respectively), than before (mean Likert score = 2.7). However, participants did not report any significant difference between any time periods with respect to concerns about becoming ill from contact with other patients and spreading COVID-19 unknowingly. Patients who presented to an ED between 13 May and 31 August 2020 (time period 3) expected face masks to be mandatory for all patients and visitors within the ED, differing significantly from pre-COVID periods.

### Reasons to delay trip to ED

One hundred and sixty-two participants (27%) reported delaying their ED visit. Of these, 159 respondents (26%) provided free text information detailing one or more reasons for the delay. From these responses, seven main factors were identified

which increased the likelihood of a delayed ED presentation. These included a belief that their condition was not serious or would improve, concerns around being exposed to COVID-19, expectation of a negative hospital experience based on previous experience, logistics, seeking alternative prior medical advice, hospital avoidance due to anxiety or apathy, and not wanting to burden the health system (Table 4).

### Discussion

This survey of adult and paediatric patients from eight Victorian EDs compared patient behavioural responses and attitudes in relation to ED attendance, sampled from a period that extended from 3 months before to 10 months after the WHO declared COVID-19 a pandemic. Participant attitudes and behavioural outcomes were similar across the study population but varied by time period. In particular, despite also flagging that mandatory mask wearing provided a degree of reassurance, patients expressed more concern about the safety of an ED during the largest

outbreak of COVID-19 infections than they did pre-COVID, but this difference was not sustained once community infection numbers dropped. General concerns about attending a hospital or an ED were higher during all periods after COVID than they were pre-COVID, and no differences were observed in attitudes around general hygienic measures (handwashing, physical distancing). Approximately quarter of patients provided specific reasons for delaying their ED attendance.

In line with our findings, Nab *et al.*<sup>28</sup> specifically reported COVID-19-related delays due to behavioural changes in Dutch patients seeking ED care during the Netherlands' initial COVID-19 wave. Nab *et al.*<sup>28</sup> reported a smaller proportion of their participants indicated that they delayed their presentation (20% *vs* 27%), than our sample but a greater proportion mentioned specific COVID-19-related concerns when doing so (45.4% *vs* 17%). Likewise, a small qualitative study of paediatric caregivers in London by Watson *et al.*<sup>29</sup> described delays in decision to seek care during the COVID-19



TABLE 3. Comparison of behavioural factors influencing ED attendance between time periods

		Time period 1		Time period 2		Time period 3		Time period 4	
		N	Mean ± SD	N	Mean ± SD	N	Mean ± SD	N	Mean ± SD
Behaviour	1	137	4.5 ± 0.88	77	4.5 ± 0.97	165	4.4 ± 1.1	211	4.4 ± 0.99
			What is the likelihood that you would attend an ED in general for a health concern that requires urgent attention? (1 = very unlikely, 5 = very likely)						
	2	137	2.0 ± 1.1	77	1.9 ± 1.1	165	2.1 ± 1.1	211	2.1 ± 1.1
			I would have preferred to use an emergency telehealth compared with attending an ED (1 = strongly disagree, 5 = strongly agree)						
	3	137	2.5 ± 1.3	77	2.4 ± 1.3	165	2.7 ± 1.3	211	2.6 ± 1.3
			I would have preferred to attend a GP than go to the ED (1 = strongly disagree, 5 = strongly agree)						
Attitude	1	133	4.1 ± 0.91	76	3.9 ± 0.98	161	3.7 ± 1.0	203	3.9 ± 0.99
			When I presented I thought EDs were safe places (1 = strongly disagree, 5 = strongly agree)						
	2	133	3.6 ± 1.1	76	3.1 ± 1.1	161	3.2 ± 1.1	203	3.2 ± 1.2
			I was concerned about attending health services when I presented to ED (1 = very concerned, 5 = very unconcerned)						
	3	133	3.5 ± 1.1	76	3.0 ± 1.2	161	3.1 ± 1.2	203	3.2 ± 1.2
			I was concerned about attending an ED when I presented to the ED (1 = very concerned, 5 = very unconcerned)						
	4	133	4.0 ± 1.0	76	3.9 ± 1.0	161	3.9 ± 1.0	203	3.9 ± 1.1
			I was confident in the ED system when I presented to the ED (1 = no confidence at all, 5 = very confident)						
	5	133	1.9 ± 0.97	76	2.1 ± 1.1	161	2.0 ± 1.0	203	2.1 ± 1.1
			I wondered if it might be considered irresponsible to attend an ED when I attended (1 = strongly disagree, 5 = strongly agree)						
Social norms	1	132	4.5 ± 0.72	76	4.5 ± 0.64	160	4.5 ± 0.71	201	4.5 ± 0.76
			At the time I attended the ED, people who are important to me would have approved of me attending the ED (1 = strongly disagree, 5 = strongly agree)						
Emotions	1	132	2.6 ± 1.2	76	2.9 ± 1.3	160	2.7 ± 1.26	201	2.7 ± 1.2
			At the time of my ED attendance I was nervous to attend the ED (1 = strongly disagree, 5 = strongly agree)						
Influencing factors	1	131	2.8 ± 1.2	75	2.8 ± 1.2	157	2.9 ± 1.2	201	2.9 ± 1.2
			When I visited the ED I was worried about the health system being overloaded (1 = strongly disagree, 5 = strongly agree)						
	2	131	2.7 ± 1.2	75	3.2 ± 1.3	158	3.2 ± 1.2	201	2.9 ± 1.3
			When I visited the ED I was worried about coming into contact with someone who was infectious (1 = strongly disagree, 5 = strongly agree)						
	3	131	2.5 ± 1.2	75	2.9 ± 1.3	158	2.9 ± 1.2	201	2.8 ± 1.3
			When I visited the ED I was worried about becoming ill from contact with other patients (1 = strongly disagree, 5 = strongly agree)						

(Continues)

TABLE 3. Continued

	Time period 1		Time period 2		Time period 3		Time period 4	
	N	Mean ± SD	N	Mean ± SD	N	Mean ± SD	N	Mean ± SD
4	131	1.9 ± 0.92	75	2.3 ± 1.1	158	2.2 ± 1.1	201	2.0 ± 1.2
5	131	2.9 ± 1.3	75	2.8 ± 1.2	158	2.8 ± 1.3	201	3 ± 1.3
6	131	2.0 ± 1.1	75	2.1 ± 1.1	158	2.0 ± 1.1	201	2.2 ± 1.1
7	131	1.9 ± 1.1	74	2.0 ± 1.2	158	1.8 ± 0.96	201	1.9 ± 1.1
8	130	2.2 ± 1.3	75	2.2 ± 1.4	158	2.0 ± 1.2	201	2.1 ± 1.3
9	131	1.9 ± 1.1	75	2.1 ± 1.4	158	1.9 ± 1.3	201	1.9 ± 1.3
Decision factors								
1	130	2.9 ± 1.4	74	2.9 ± 1.5	155	3.3 ± 1.5	199	3.2 ± 1.6
2	130	2.9 ± 1.3	74	2.9 ± 1.4	155	3.1 ± 1.3	199	3.0 ± 1.4
3	130	3.1 ± 1.4	74	2.9 ± 1.5	154	3.3 ± 1.4	199	3.2 ± 1.5
4	130	2.9 ± 1.4	74	2.9 ± 1.4	155	3.2 ± 1.3	198	3.1 ± 1.4
5	130	3.2 ± 1.3	74	2.9 ± 1.3	155	3.2 ± 1.4	199	3.1 ± 1.4
6	130	2.9 ± 1.2	74	2.9 ± 1.3	155	2.9 ± 1.2	199	2.9 ± 1.3

TABLE 4. Reasons for ED visit delay: thematic categorisation and frequency of qualitative variables

Theme	n (%)	Examples	Time period
Belief that their condition was not serious or would improve	75 (41)	<p>“thought the bleeding was temporary” (ID 440)</p> <p>“thought I was overreacting” (ID 447)</p> <p>“thought it may have been muscular” (ID 230)</p> <p>“thought it might get better” (ID 19)</p> <p>“tried to get over it” (ID 501)</p> <p>“waiting to see if sleep improved symptoms” (ID 10)</p> <p>“fear and uncertainty around the COVID situation at the hospital, potential delays and exposure to virus” (ID 73)</p>	More common in time periods 3 ( <i>n</i> = 11; 41%) and 4 ( <i>n</i> = 11; 41%), than time period 2 ( <i>n</i> = 5; 18%)
Concerns about being exposed to COVID-19	27 (15)	<p>“... the second time I came back was a wait of about six hours before I went home and came back the next morning...” (ID 682)</p> <p>“I monitored my condition for a few hours to see if it would improve but it worsened. I also had to attend emergency previously during chemo and I know the wait times are long and it is very uncomfortable when you are already unwell. If I could have avoided it I would have, the waiting is understandable but very painful” (ID 484)</p>	
Expectation of a negative hospital experience based on previous experience (sometimes coupled with hospital avoidance and belief that their condition would improve)	27 (15)	<p>“I had no one to care for my son at the time of symptoms. Needed to wait for outside help to care for him so I could go to emergency” (ID 480)</p> <p>“[was] trying to do home treatment via discharge a few weeks before and under GP care” (ID 260)</p>	Spread across the four time periods
Logistics	20 (11) (Of these, 45% of respondents cited lack of childcare arrangements)	<p>“I was worried that they would want to admit me, and I could not do that as I would be leaving my husband at home with 6 children” (ID 244)</p> <p>“GP appointment was in the evening, children were already tired and I did not really think this is an emergency, so waited for the next day” (ID 419)</p> <p>“concerned it was nothing and did not wish to take up valuable resources” (ID 296)</p>	90% of these responses corresponded to time periods 3 and 4
Seeking alternative medical advice prior to attending (or advised by a health professional to wait)	18 (10)		
Hospital avoidance due to anxiety or apathy	6 (3)		
Not wanting to burden the health system	10 (5) (Of these, 30% involved uncertainty as to whether the condition warranted an ED visit)		



pandemic being driven by fear of exposure to COVID-19, driven by community perception, shared lived experiences and media portrayal. Other reasons for delay captured in our study may also relate indirectly to concerns around COVID-19. A thematic exploration at a community hospital in America by Wong *et al.*<sup>5</sup> describes five main themes associated with decreased ED attendance during the COVID-19 pandemic: hospitals seen as infectious reservoirs, patients not being informed about current risk mitigation efforts by hospitals, need for confirmation from a trusted source that it was 'ok to come in', national focus on extreme cases skewing perceptions of risk and delays among vulnerable groups due to social disconnection. It is likely that many of these concerns were captured under the additional themes identified in our study.

To our knowledge, ours is the largest study focusing specifically on behavioural drivers relating to COVID-19 ED attendance. However, it is unclear whether patients from areas with different rates of COVID-19 infection, or from rural or disadvantaged areas, may have behaved differently. In their survey of community residents during the first 4 weeks of the South Korean COVID-19 outbreak, Lee and You<sup>30</sup> found that females, those aged in their 50s and patients from urban areas were all more likely to avoid healthcare due to COVID-19-related concerns. These differences in age and sex were not apparent in the specific behavioural concerns expressed among the ED attenders who responded to our study, although it is possible that this was due to inherent limitations in our study design. We did not include a rural subset in our data collection.

### Limitations

Our study has significant limitations which are inherent in the subject matter, study design and population. In aiming to study behavioural drivers, it would have been best to study both ED attenders and non-attenders, with a validated survey tool. The survey used in the present study was purpose

built and while drew from validated tools, was not tested prior to use. A parallel study designed to explore behavioural drivers in ED non-attenders was unable to be completed due to complexities in obtaining relevant approvals in the short time frame afforded by the evolving pandemic. Without this data, we can only describe the experience of patients who actually presented to the ED at some stage and cannot comment on the behaviours of patients who failed to attend. Furthermore, we do not know whether the differences that we observed have real clinical significance.

There was a significant delay between ED presentation and sending out the questionnaires, which may have created recall bias within responses. Due to logistical challenges, the delay was between 1 and 12 months from presentation and invitation to participate. It is possible that individuals' responses were further influenced by the media and events that occurred during the period of time between ED discharge and invitation, and therefore the responses given may not truly reflect the participants true feelings and beliefs at the time of presentation. It is also possible that as the pandemic continued, individuals became less concerned about COVID-19 and the values recorded during later time periods are underestimations of participants' true concerns. There is clear response bias with 70% of the participants being female, however, it has been demonstrated that females are more likely to participate in online surveys than males.<sup>31–33</sup> No rural EDs participated in the present study, so it is not possible to know if differences exist in this setting. Similarly, due to study resource limitations, we excluded patients who required translators which may have created selection bias due to differences in the degree by which people from diverse culture and language backgrounds utilise EDs and healthcare in general. Our study had a low response rate of 11%, which may have improved through participants receiving the invitation to participate closer to their ED discharge date.

Another important limitation is the fast pace at which the pandemic

unfolded, and with it the variables which we studied. We concluded data collection on 31 December 2020, when the majority of the population were still unvaccinated, and before the prominent COVID-19 variants (Delta and Omicron) arrived in Australia. Today's post-COVID-19 world is different and this snapshot of behavioural drivers during the early COVID-19 pandemic may not be applicable to current ED attendance behaviours. Nevertheless, it is likely that many of the behaviours observed in the present study are not COVID-19 specific and have relevance to any population events that receive significant media attention. In particular, future public health messaging around EDs being safe places to seek medical treatment could assist in mitigating concerns during these events. Also, as we were informed by the Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS) outbreaks, future pandemic planning and response will draw on COVID-19 literature, and the results from our study can assist decision makers and public health messaging.

### Conclusion

Patients attending a Victorian ED during the first 10 months of the 2020 COVID-19 pandemic expressed increased concerns around attending an ED or health service. Concerns relating to the safety of EDs were greatest during the period of highest community infections, and while mask wearing appeared to provide some level of reassurance, it did not fully mitigate these concerns. COVID-19-related concerns were frequently cited as reasons for delayed presentation to ED, which has the potential for associated adverse health consequences. All these factors would be amenable to mitigation via focussed public health messaging.

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### Author contributions

PB, SC, DC, HR, GA, RDM, JS, AMR, BW contributed to concept and audit design. PB, ESA, DC, SC, JS, SDG contributed to data collection. PB, ESA, GA, SC, SDG contributed to data analysis. All the authors contributed to manuscript writing and revision and read and approved the final manuscript.

### Competing interests

SC is a section editor for *Emergency Medicine Australasia*.

### Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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### Supporting information

Additional supporting information may be found in the online version of this article at the publisher’s web site:

**Appendix S1.** Study survey.