

# Trends in presentations to a private emergency department during the first and second waves of the COVID-19 pandemic in Australia

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## Abstract.

**Objective.** The COVID-19 pandemic in Australia coincided with an early trend of reduced visits to the emergency department (ED), but to determine which patients presented less requires closer evaluation. Identifying which patient groups are presenting less frequently will provide a better understanding of health care utilisation behaviours during a pandemic and inform healthcare providers of the potential challenges in managing these groups.

**Methods.** This single-centre retrospective study examined trends in presentations in 2020 to a private, mixed paediatric and adult ED in an inner city suburb within the state of Victoria that treats both COVID-19 and non-COVID-19 patients. The 2019 dataset was used as a reference baseline for comparison. All analyses were performed using baseline characteristics and triage data.

**Results.** The total number of visits to the ED dropped from 24 775 in 2019 to 22 754 in 2020, representing an overall reduction of 8%. Significant reductions in daily presentations and admissions from the ED were observed in the months immediately following the peak of the two COVID-19 waves in the state of Victoria. Visits by those in the 0- to 17-year age group, triage categories 4 and 5 and musculoskeletal presentations were also reduced for most of 2020. Gastrointestinal/abdominal and urological/renal presentations were reduced immediately after the first COVID-19 wave, whereas infectious diseases visits were reduced during and after the second COVID-19 wave.

**Conclusions.** These findings add to the growing body of evidence regarding emergency care underutilisation during the COVID-19 pandemic. Reduced private ED presentations were observed overall and in paediatric patients, lower acuity triage categories, musculoskeletal, abdominal/gastrointestinal and urological/renal presentations during the first wave, whereas infectious disease cases were reduced during the second wave.

**What is known about the topic?** During the first and second waves of COVID-19 in Victoria, ED visits were reduced in the public sector across all diagnostic categories and all triage categories. The effect of the COVID-19 pandemic on private ED attendance is less well known.

**What does this paper add?** Total visits to the private ED during the first and second waves of COVID-19 were reduced across all major diagnostic categories except cardiac presentations. During this same period, visits for triage categories 4 and 5 were significantly reduced.

**What are the implications for practitioners?** ED underutilisation during the initial two waves of the COVID-19 pandemic is apparent in both the private and public sector. Patients should be encouraged not to delay seeking urgent medical care during the pandemic.

**Keywords:** COVID-19, pandemic, delayed diagnosis, reduced visits, emergency care, emergency department, private, public health.

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## Introduction

Since the first case of COVID-19 on 25 January 2020 in Australia, emergency doctors were preparing for a first wave that was expected to place a huge burden on emergency departments (ED). Instead, a trend of reduced ED attendances began to emerge. Although the variance in ED presentations across age groups, triage and diagnostic categories is becoming clearer, less so is an understanding of the downstream complications of decreased ED care. There is a paucity of literature with regard to private ED presentations during the pandemic and how these may differ to those in the public health system. Patients within private health care often have higher household incomes and health literacy, which may influence their decisions to seek medical care in a private hospital.<sup>1</sup>

Early in the pandemic during the month of May, two public EDs in Melbourne observed a reduction of 37% in patient presentations.<sup>2</sup> This reduction was across all triage categories and diagnostic groups, but was more pronounced among lower acuity presentations. In Sydney, the onset of the pandemic coincided with reduced presentations to four public EDs by 25%, with fewer hospital admissions also being observed.<sup>3</sup> The impact on private EDs in Australia is less well known.

This study reviews the trends in presentations to an Australian private ED during the COVID-19 pandemic and uses the previous year as a baseline reference. A comparison of the two waves of COVID-19 is made in an effort to understand which patient groups presented less frequently and why this may have occurred. The identification of these patients will allow an understanding of community behaviours during the pandemic and may help identify the potential challenges of managing these groups in future pandemics.

## Methods

### Study design

This retrospective cross-sectional study involved presentations to a private ED of a 508-bed acute care hospital in the state of Victoria, Australia. The ED is located in an inner city suburb of Melbourne and ranks in the highest decile of the Australian Index of Relative Socioeconomic Advantage and Disadvantage, denoting a high socioeconomic status.<sup>4</sup> In order to examine the effect of COVID-19 on presentations patterns to the ED, data for 2019 were used as a baseline dataset for comparison purposes.

Data obtained from the ED's database included demographic data, year of presentation, month of presentation, age group, admission status, mode of arrival, category of presenting complaint and triage code. Age groups were 0–17, 18–64 and  $\geq 65$  years. Grouping of triage diagnoses into categories such as respiratory and cardiovascular were conducted similar to the method described by Dinh *et al.*<sup>5</sup> Triage codes were as per the Australasian Triage Scale (ATS).<sup>6</sup> The number of daily confirmed cases in our geographical state was obtained from the

Victorian State Government's website for the Department of Health and Human Services (<https://www.coronavirus.vic.gov.au/victorian-coronavirus-covid-19-data>, accessed 11 April 2021).

### Statistical analysis

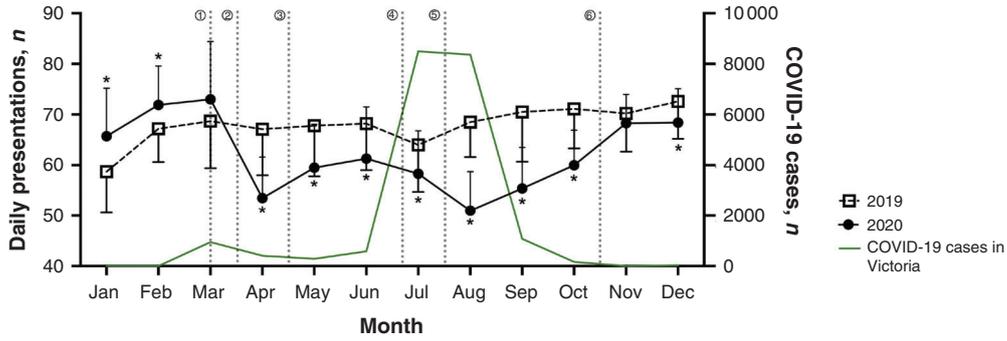
Continuous data were assessed for normality using descriptive statistics and normality testing. The difference in mean daily presentations between 2019 and 2020 is expressed as mean difference with 95% confidence intervals (CIs). Statistical testing for mean difference was performed using Student's *t*-test. Two-tailed  $P < 0.05$  was considered significant. Statistical analyses were conducted using SPSS 23 for Macintosh version 23.0 (IBM Corp., Armonk, NY, USA).

## Results

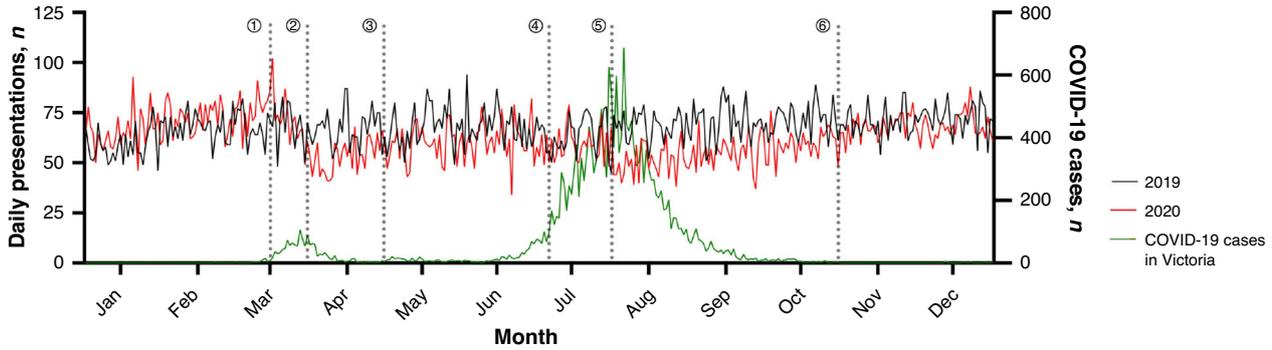
In all, there were 22 754 visits to the ED in 2020, down from 24 775 visits in 2019, representing a reduction of 8%. Compared with 2019, a higher number of mean daily presentations was observed from January to March in 2020, although the difference in March was not statistically significant (mean difference +7 (95% CI 2.5, 11.5;  $P < 0.001$ ), +4.6 (95% CI 0.8, 8.5;  $P < 0.001$ ) and +4.3 (95% CI -1, 9.6;  $P = 0.1$ ) in January, February and March respectively; Fig. 1). In March, the first wave of COVID-19 in Victoria reached its peak at 949 monthly cases (Fig. 2). In the following month, daily ED attendances decreased significantly by 13.6 (95% CI -18.1, -9.1;  $P < 0.001$ ) compared with the previous year, and daily ED attendances remained low until July. The monthly COVID-19 case numbers surged as the second wave hit Victoria, with 8493 cases in July and 8368 cases in August. The mean daily presentations to the ED in August decreased significantly (by 17.4; 95% CI -21.1, -13.7;  $P < 0.001$ ) and remained significantly low until October compared with the previous year (mean difference -15.1 (95% CI -19.7, -10.4;  $P < 0.001$ ) and -11.1 (95% CI -15.0, -7.4;  $P < 0.001$ ) in September and October respectively; Fig. 1). Daily visits recovered in November 2020, but were significantly lower in December 2020 compared with December 2019 (mean difference -1.8 (95% CI -5.3, 1.5;  $P = 0.285$ ) and -4.1 (95% CI -7.7, -0.6;  $P = 0.024$ ) in November and December respectively). Beginning on 11 December 2020, there was an outbreak of 31 cases in Victoria.

### Admissions

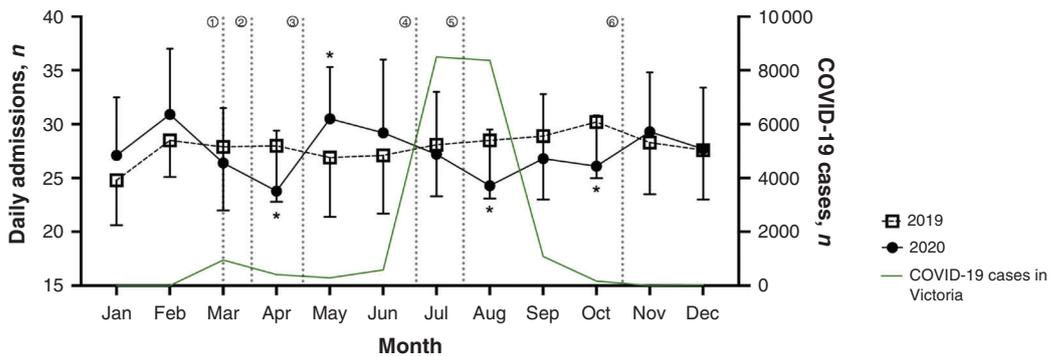
Admissions from the ED did not follow the trend of increased ED attendances seen in the first quarter of the year. However, following the first COVID-19 wave, April 2020 observed a significant decrease of 4.2 daily admissions (95% CI -6.9, -1.4;  $P = 0.004$ ) compared with 2019 (Fig. 3). Immediately after, in May 2020, a significant increase of 3.6 daily admissions (95%



**Fig. 1.** Mean ( $\pm$ s.d.) daily presentations to the emergency department in 2019 and 2020, with the number of COVID-19 cases in Victoria over the same period in 2020. \* $P < 0.05$  compared with 2019. The timeline of COVID-19 restrictions was as follows: ①, introduction of 1.5-m social distancing measures; ②, only four reasons to leave home (shopping for food or supplies, medical care and caregiving, exercise, essential work or study); ③, restrictions eased, with the opening of restaurants and shops with indoor gatherings of up to 20 people allowed; ④, reintroduction of restrictions with the same four reasons to leave home; ⑤, addition of curfew between 8 pm and 5 am; ⑥, no restrictions to leave home with travel limit of 25 km radius and re-opening of restaurants and shops.



**Fig. 2.** Daily presentations to the emergency department in 2019 and 2020. The timeline of COVID-19 restrictions was as follows: ①, introduction of 1.5-m social distancing measures; ②, only four reasons to leave home (shopping for food or supplies, medical care and caregiving, exercise, essential work or study); ③, restrictions eased, with the opening of restaurants and shops with indoor gatherings of up to 20 people allowed; ④, reintroduction of restrictions with the same four reasons to leave home; ⑤, addition of curfew between 8 pm and 5 am; ⑥, no restrictions to leave home with travel limit of 25 km radius and re-opening of restaurants and shops.



**Fig. 3.** Mean ( $\pm$ s.d.) daily admissions from the emergency department in 2019 and 2020, with the number of COVID-19 cases in Victoria over the same period in 2020. \* $P < 0.05$  compared with 2019. The timeline of COVID-19 restrictions was as follows: ①, introduction of 1.5-m social distancing measures; ②, only four reasons to leave home (shopping for food or supplies, medical care and caregiving, exercise, essential work or study); ③, restrictions eased, with the opening of restaurants and shops with indoor gatherings of up to 20 people allowed; ④, reintroduction of restrictions with the same four reasons to leave home; ⑤, addition of curfew between 8 pm and 5 am; ⑥, no restrictions to leave home with travel limit of 25 km radius and re-opening of restaurants and shops.

CI 1.0, 6.2;  $P = 0.007$ ) was observed, followed by no significant changes in June (+2.1; 95% CI -1.0, 5.2;  $P = 0.191$ ) and July 2020 (-0.9; 95% CI -3.6, 1.7;  $P = 0.477$ ). With the onset of the second wave, further significant decreases in daily admission numbers were observed in August (-4.1; 95% CI -6.8, -1.4;  $P < 0.003$ ) and October 2020 (-4.0; 95% CI -6.5, -1.5;  $P = 0.002$ ). No significant change in admissions was observed in September (-2.0; 95% CI -5.1, 1.0;  $P = 0.183$ ) or November (+1.0; 95% CI -1.6, 3.6;  $P = 0.456$ ).

### Demographics

Following the peak of the first wave, the month of April had reduced daily visits in the 0- to 17-year age group compared with 2019 (-5.0; 95% CI -6.8, -3.2;  $P < 0.001$ ; Supplementary Figure S1). This trend persisted throughout the year, with recovery in November, when there was no significant change compared with the previous year (95% CI -1.0 -2.9, 0.9;  $P = 0.291$ ). The 18- to 64-year age group also had reduced visits in April 2020 (-4.5; 95% CI 6.7, -2.2;  $P < 0.001$ ), but numbers recovered in the following months. The largest reduction in visits for the 18- to 64-year age group occurred following the second COVID-19 wave in August (-7.5; 95% CI -9.6, -5.3;  $P < 0.001$ ), with reduced numbers persisting until November. In the  $\geq 65$ -years age group, similar reductions in daily visits were observed in April 2020 (-4.4; 95% CI -7.3, -1.5;  $P < 0.001$ ), but no significant changes occurred in the months following the second COVID-19 wave.

### Triage category

In the first quarter of 2020, increased daily visits in ATS categories 2 and 3 were observed. In April, following the peak of the first wave, significant reductions were observed in ATS category 4 (-8.3; 95% CI -11.2, -5.4;  $P < 0.001$ ) and ATS category 5 (-3.6; 95% CI -5.9, -1.3;  $P < 0.001$ ). This trend continued until November 2020, when only ATS category 4 observed a significant increase in daily visits (+2.8; 95% CI 0.1, 5.4;  $P = 0.037$ ). Compared with 2019, ATS category 3 visits decreased significantly after the peak of the second wave, with -5.0 daily visits in August (95% CI -7.8, -2.3;  $P < 0.001$ ), and remained reduced for the remainder of the year. Since the first wave, no significant changes in visits occurred in ATS categories 1 and 2 compared with the previous year, except in July 2020, when there was a significant increase in ATS category 2 visits (+1.5; 95% CI 0.2, 2.7;  $P = 0.02$ ).

### Category of presentation

Mean daily presentations in the respiratory category increased significantly in January 2020 (+1.7; 95% CI 0.7, 2.6;  $P = 0.001$ ) and then again in March 2020 (+4.2; 95% CI 2.1, 6.2;  $P < 0.001$ ; Table S1). A prolonged trend of reduced daily visits was observed in the musculoskeletal category, which first decreased in April (-4.1; 95% CI -6.3, -1.9;  $P < 0.001$ ) and then briefly recovered in July. With the onset of the second COVID-19 wave, musculoskeletal presentations immediately declined in August (-7.0; 95% CI -9.2, -4.8;  $P < 0.001$ ) and September (-3.5; 95% CI -5.4, -1.6;  $P < 0.001$ ) with recovery in the subsequent months (Table S1). Following the peak of the first COVID-19 wave, April 2020 also had reduced presentations in the

abdominal/gastrointestinal category (-2.6; 95% CI -3.9, -1.2;  $P < 0.001$ ) and the urological/renal category (-1.2; 95% CI -1.8, -0.6;  $P < 0.001$ ). During the second wave, daily cases of infectious diseases were reduced in July (-1.1; 95% CI -2.1, 0;  $P = 0.037$ ) and September (-1.7; 95% CI -2.9, -0.4;  $P = 0.008$ ). Trends were unchanged between 2019 and 2020 for other categories of presentations.

### Discussion

We report a significantly decreased number of overall presentations to a private ED in 2020 compared with the previous year. Following the peak of both COVID-19 waves in Victoria, daily visits to the ED dropped significantly, with a similar trend also observed with admissions from the ED. Compared with 2019, daily visits recovered in November 2020 but were significantly reduced again in December, which coincided with the smaller outbreak that occurred in Melbourne (Fig. 1).

Initial travel restrictions began in Victoria on 24 March 2020, when citizens were notified that they could only leave home for essential reasons (i.e. work, grocery shopping, medical appointments and limited outdoor exercise), with the majority of overseas travel also banned.<sup>7</sup> These restrictions were associated with a 13% decrease in presentations to the ED compared with the previous week (Fig. 1). This trend was also observed after England's first COVID-19 lockdown, and similar findings have been observed in previous pandemics.<sup>8-12</sup> Australian government authorities provided information regarding COVID-19 transmission early in this pandemic, but the long-term ramifications of delaying health care utilisation were not immediately highlighted.<sup>13,14</sup>

Paediatric ED attendances decreased after the first wave to as many as nine fewer daily presentations in May and remained low throughout the second wave. Similar findings were observed in Italy and Germany, where paediatric visits to the ED decreased by  $>60\%$  compared with recent years.<sup>15,16</sup> Although parents were likely concerned about the likelihood of viral transmission by bringing their child to ED, school closures during the lockdown would likely also have resulted in less infectious disease spread and minor trauma.

Immediately after the first COVID-19 wave, ED visits by patients in both the 18- to 65- and  $\geq 65$ -years age groups decreased, which again raises the issue of whether health care underutilisation could translate to adverse patient outcomes. In Hong Kong, a delay was reported for ST-elevation myocardial infarction (STEMI) patients between the onset of symptoms and first medical contact, which was threefold longer in 2020 compared with the previous year.<sup>17</sup>

We also observed significant reductions for presentations in ATS categories 4 and 5 after the initial wave of COVID-19 that persisted throughout the second COVID-19 wave, with similar findings reported elsewhere.<sup>2,18</sup> There were eight fewer daily presentations in ATS category 4 in both April and August 2020, the months immediately following the peak of both COVID-19 waves. It is also possible that reduced human activity and increased personal hygiene measures led to less minor trauma and infectious diseases, and therefore the lower presentations numbers may be a reflection of the overall disease burden during this time.

With regard to presentation category, respiratory cases increased significantly in March 2020, with four extra presentations during the onset of the first COVID-19 wave, but did not increase again with the second wave, despite much larger numbers of confirmed COVID-19 cases. This may be due to patients with minor respiratory symptoms electing to attend various COVID-19 testing sites that were set up in the community as part of increased preparation for the second wave of cases.

Musculoskeletal cases had four fewer daily occurrences after the first wave and seven fewer daily cases immediately after the peak of the second wave. This was likely due to suspension of community sport and most people working from home, with similar observations recorded elsewhere in Melbourne and overseas in the US.<sup>2,19,20</sup> Although it is unclear why, significant reductions in visits were observed from the abdominal/gastrointestinal category (three fewer daily presentations) and the urological/renal category (one fewer daily presentation), with similar observations in France and the US.<sup>20,21</sup> Infectious diseases visits decreased by approximately two fewer daily cases following the peak of the second wave, likely due to the reduction in overseas travel and the enforcement of social distancing policies, which contributed to reduced rates of gastroenteritis and respiratory virus transmission. Cardiovascular presentations did not differ compared with 2019 across the entire study period and this may be due to chest pain generally being recognised in the community as serious enough to warrant presentation to the ED.<sup>22</sup> This is in contrast with findings in public EDs in Melbourne, which had reductions in all diagnostic categories; this disparity may be attributed to the perceived higher health literacy of the population served by the private ED in this study.

Although clinicians braced for a ‘rebound phenomenon’ of presentations later in the year, we did not observe an event as such at this private hospital ED. Presentations to this ED remained low after the second wave until the end of October compared with the previous year (Fig. 2). It is likely that there was a lingering public anxiety with regard to accessing private hospital medical services, which may require an extended period of time to overcome.

A limitation of our study is that it was a single-centre cross-sectional study. An additional challenge was determining the clinically relevant presentation category, because the diagnosis made in the ED is likely to be different from the International Classifications of Diseases (ICD)-10 discharge diagnosis. Certain codes entered into the computer system were non-specific and posed a challenge for creating clinically relevant subgroups as identified by Dinh *et al.*<sup>5</sup> For example, ‘shortness of breath’ was coded under the respiratory group but may be a feature of heart failure and would more appropriately belong to the cardiovascular group. The use of codes such as ‘pain’ and ‘other’ are not helpful in creating relevant subgroups, and the use of such terms should be limited where possible. Additional limitations of this study include that the hospital ED does not provide on-site psychiatric care, so this study does not capture the impact of COVID-19 on mental health presentations to the ED.

## Conclusion

A marked reduction in presentations to the private ED was observed in the months immediately after the first and second

waves of the COVID-19 pandemic in Victoria, Australia. ED attendances from paediatric patients and lower acuity triage categories were significantly lower after the first wave and remained low during the second wave. Musculoskeletal presentations were also low throughout the year, with significant reductions occurring immediately after each wave of COVID-19 reached its peak. Abdominal/gastrointestinal and urological/renal presentations were significantly reduced immediately after the first wave, and infectious diseases cases were reduced during and after the second wave.

## Data availability

The data that support this study will be shared upon reasonable request to the corresponding author.

## Competing interests

The authors declare that they have no competing interests.

## Declaration of funding

This research did not receive any specific funding.

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