

## ORIGINAL RESEARCH

# Toxicology presentations to a tertiary unit in New South Wales during the COVID-19 pandemic first wave: A retrospective comparison study

Rachel WC NG <sup>1</sup>, David EMMERIG,<sup>1</sup> Mark Daniel SALTER,<sup>1,2</sup> Amith SHETTY<sup>3,4</sup> and Naren GUNJA<sup>1,2</sup>

<sup>1</sup>Department of Clinical Pharmacology and Toxicology, Western Sydney Health, Sydney, New South Wales, Australia, <sup>2</sup>Discipline of Emergency Medicine, Sydney Medical School, The University of Sydney, Sydney, New South Wales, Australia, <sup>3</sup>The Westmead Institute for Medical Research, The University of Sydney, Sydney, New South Wales, Australia, and <sup>4</sup>Patient Experience and System Performance Support Division, NSW Ministry of Health, Sydney, New South Wales, Australia

## Abstract

**Objective:** To compare presentation numbers, class of exposure, poison severity score (PSS) and drugs ingested by patients in a tertiary toxicology service during the first wave of the COVID-19 pandemic to the corresponding time periods in 2018 and 2019.

**Methods:** A retrospective cohort observational study of patients admitted or consulted to the Western Sydney Toxicology Service (WSTS) from ED during February to May in 2018–2020. Patient age, sex, triage category, time and date of arrival, mode of arrival, type of poisoning, discharge location, length of stay and PSS were collected from WSTS database and electronic medical records. The total number of ED presentations, hospital admissions and toxicology admissions were gathered from hospital-based data services.

**Results:** There was an overall increase in toxicology presentations in February to May 2020 ( $n = 441$ ) compared to 2019 ( $n = 333$ ) and 2018 ( $n = 255$ ). The daily rate of presentations increased in March to May 2020 with an overall rate ratio

of 1.42, 95% confidence interval 1.23–1.63,  $P < 0.001$ . There was an increase in presentations across all drug types. From March to April 2020, there was significantly higher number of daily presentations for recreational drugs use compared to 2018.

**Conclusion:** There was a relative increase in toxicology presentations during the COVID-19 pandemic compared to an overall decrease in presentations to ED. Recreational drug use increased significantly during the pandemic compared to 2018.

**Key words:** COVID-19, pandemic, poisoning, presentations, toxicology.

## Introduction

The COVID-19 pandemic has had a dramatic impact on healthcare utilisation globally. In the weeks following the first COVID-19 case detection in Australia on 25 January 2020, a number of public health restrictions were introduced in New South Wales (NSW) including restrictions on international and interstate travel. These restrictions

## Key findings

- In this Western Sydney cohort, there was a relative increase in toxicology presentations during the COVID-19 pandemic compared to an overall decrease in presentations to ED.
- There was a lower toxicology admission rate compared to overall hospital admission rate in 2020.
- Recreational drug use increased significantly during the pandemic compared to 2018.

correlated with an overall decrease in ED presentations in NSW, with some centres reporting up to a 25% reduction compared to the equivalent period in 2019.<sup>1</sup> Similar reduced healthcare utilisation trends were also observed in other states in Australia and internationally. The Centre for Disease Control and Prevention (CDC) reported a 42% reduction in presentations to ED in the USA from 21 March 2020 to 25 April 2020.<sup>2</sup> A study from New Zealand demonstrated significant reductions in presentations across three different hospitals in the one health district during their lockdowns. Notably, the reduction was greater as the lockdown level was increased and significant decreases in lower acuity presentations combined with a small decrease in high-acuity presentations.<sup>3</sup>

Correspondence: Dr Rachel WC Ng, Department of Clinical Pharmacology and Toxicology, Western Sydney Health, Westmead, NSW 2145, Australia. Email: [rachelwaichung.ng@health.nsw.gov.au](mailto:rachelwaichung.ng@health.nsw.gov.au)

Rachel WC Ng, BMed, MD, MMed (Crit Care), Emergency Medicine Advanced Trainee; David Emmerig, MBBS (Hons), MMed (Crit Care), Emergency Medicine Advanced Trainee; Mark Daniel Salter, MBBS (Hons), PGDip (Med Tox), FACEM, Clinical Toxicologist, Clinical Lecturer; Amith Shetty, FACEM, PhD, Emergency Physician, Honorary Research Fellow; Naren Gunja, MBBS, MSc, FACEM, FACMT, Clinical Toxicologist, Clinical Associate Professor.

Accepted 8 August 2022

At the same time, the nature of ED presentations changed. The proportion of presentations related to trauma, myocardial infarction and stroke to Australian hospitals was lower for several months following the introduction of lockdown measures; there were similar findings in the UK, Italy, Hong Kong and the USA.<sup>4–9</sup> Data regarding presentations related to illicit drug use and mental health have been inconsistent within different states in Australia.<sup>1,10,11</sup> Internationally, trends have been towards reduced mental health presentations to ED and a reduced suicide rate.<sup>12–14</sup> The proportion of illicit drug-related presentations has also been reported to be higher following the onset of the pandemic.<sup>15</sup> A survey conducted by the CDC showed 13.3% of participants started or increased substance use to cope with emotions or stress secondary to COVID-19.<sup>16</sup>

To date, there are no data examining whether the nature or severity of presentations to a toxicology service changed during the COVID-19 pandemic period in Australia. In this retrospective cohort observational study, we aim to investigate the potential impact that the COVID-19 pandemic has had on the epidemiology of toxicology-related presentations to the EDs in Western Sydney.

## Methods

### Study objective

The aim of the study was to compare presentation numbers, class of exposure, poison severity score (PSS) and drugs ingested by patients in a tertiary toxicology service during the first wave of the COVID-19 pandemic (1 February 2020 to 31 May 2020 – 121 days) to the corresponding time periods in 2018 and 2019.

### Study design and setting

The study was a retrospective cohort observational study of patients admitted by or consulted to the Western Sydney Toxicology Service (WSTS) from the ED during the study period of February–May in 2018–2020. The Western Sydney health district incorporates four acute hospitals serving a

population of approximately 1.2 million people with a combined annual numbered census in 2019–2020 of 181 060 patients. Ethics approval was obtained from Western Sydney Local Health District Human Research Ethics Committee.

### Inclusion and exclusion criteria

All patients admitted or consulted within the WSTS during the study periods were included in the analysis. Patients were excluded if they had been admitted under a different specialty and referred for an in-hospital clinical toxicology consultation unrelated to their ED presentation.

### Data collection

All patient encounter details from referrals and admissions to the WSTS are recorded on the Western Sydney Toxicology Database. For the present study, we retrieved data from the database and also electronic medical records (eMR, Cerner Millennium®, Kansas City, MO, USA) to calculate proportions and overall trends comparison. Information reviewed for the study included patient demographics consisting of age, sex, triage category, time and date of arrival, mode of arrival, type of poisoning, discharge location, length of stay and PSS. The total number of ED presentations, hospital admissions and toxicology admissions were gathered from hospital-based data services.

### Data analysis

Data analysis was conducted using MedCalc® Statistical Software version 19.6 (MedCalc Software Ltd, Ostend, Belgium) and IBM SPSS Statistics version 26 (SPSS, Chicago, IL, USA). We report frequencies and percentages for categorical variables and mean  $\pm$  standard deviation (SD) for continuous variables.  $\chi^2$  or exact permutation tests were used to test for association between categorical variables. Analysis of variance or Kruskal–Wallis tests were used to test for differences in the distribution of continuous variables or ordered categorical variables by year of

presentation. A two-sided significance level of 5% was used throughout with no adjustment for multiple comparisons.

The mean number of referrals per day (total, deliberate self-poisoning [DSP] and recreational) and associated SD were calculated by calendar month and year status (2018, 2019, 2020). The 7-day centred moving average of the daily number of referrals was plotted for the period February–May by COVID year status. Because of an administrative error, daily referral numbers were missing for 10 days in May 2018. The moving averages and comparisons involving May 2018 were omitted because of missing data. Poisson models with a log link function and robust covariance estimate were used to assess the joint effects of the four-level factor of month (February–May) and year on the daily number of referrals. The monthly estimated rate ratios for 2020 *versus* 2018 and for 2020 *versus* 2019 and associated 95% confidence intervals (CIs) were used to quantify the changes from pre- to post-COVID periods. Plots of the autocorrelation and partial autocorrelation functions of the deviance residuals from the fitted log linear models were used to check for the presence of autocorrelation over time. No such serial association was evident.

## Results

### Overall presentation numbers and demographics

The mean age of patients presenting to the toxicology service were 35.8 years (SD = 17.6) in 2018, 35.7 years (SD = 16.8) in 2019 and 34.8 years (SD = 17.0) in 2020. There was no significant difference in age ( $P = 0.605$ ) or sex ( $P = 0.761$ ) of patients from 2018 to 2020. There was no significant difference in triage category ( $P = 0.975$ ) or PSS of patients ( $P = 0.086$ ) from 2018 to 2020. More patients were discharged home in 2020 (72.6%) compared to 2018 (63.9%) and 2019 (61.9%),  $P < 0.001$ . The proportion of patients presenting with DSP decreased over the study period while those using

TABLE 1. Summary of patient characteristics by year

Variable	2018 (n = 255)		2019 (n = 333)		2020 (n = 441)		$\chi^2$ P-value
	n	%	n	%	n	%	
Sex							
Male	129	50.6	164	49.2	229	51.9	0.761
Female	126	49.4	169	50.8	212	48.1	
Triage category							
1	43	16.9	63	18.9	77	17.5	0.972*
2	175	68.6	216	64.9	298	67.6	
3	25	9.8	51	15.3	56	12.7	
4	11	4.3	2	0.6	8	1.8	
5	1	0.4	1	0.3	2	0.5	
Type of exposure							
Deliberate self-poisoning	146	57.5	163	48.9	206	46.8	<0.001
Recreational	49	19.3	107	32.1	156	35.5	
Accidental	20	7.9	24	7.2	43	9.8	
Therapeutic misadventure	15	5.9	19	5.7	9	2.0	
Envenomation	10	3.9	6	1.8	13	3.0	
Chronic	6	2.4	7	2.1	1	0.2	
Iatrogenic	4	1.6	5	1.5	8	1.8	
Plant and mushroom	3	1.2	2	0.6	4	0.9	
Homicidal	1	0.4	0	0.0	0	0.0	
Type of ingestion							
Single drug	155	61.5	180	54.1	250	56.8	0.129
Polypharmacy	87	34.5	147	44.1	177	40.2	
Envenomation	10	4.0	6	1.8	13	3.0	
Poison severity score							
0	30	11.8	50	15.0	21	4.8	0.080*
1	133	52.2	159	47.7	248	56.2	
2	61	23.9	87	26.1	119	27.0	
3	30	11.8	35	10.5	53	12.0	
4	1	0.4	2	0.6	0	0.0	
Outcome							
Discharged home	163	63.9	206	61.9	320	72.6	<0.001
Transferred to psych	71	27.8	58	17.4	77	17.5	
Consult	8	3.1	57	17.1	29	6.6	
Transferred to Medical team	8	3.1	8	2.4	12	2.7	
Transferred to D&A	4	1.6	0	0.0	1	0.2	
Transferred out to other hospital	0	0.0	3	0.9	2	0.5	
Died	1	0.4	1	0.3	0	0.0	

\*Kruskal–Wallis non-parametric analysis of variance.

TABLE 2. Total ED and toxicology presentations and admissions

	February–May 2018	February–May 2019	February–May 2020
ED presentations	63 534	67 498	58 437
Hospital admissions from ED	22 471	22 122	17 695
Hospital admission rate (all specialities)	35%	33%	30%
Toxicology presentations	255	333	441
Toxicology admissions from ED	88	109	108
Toxicology admission rate	35%	33%	24%
Toxicology presentations as a proportion of ED presentations	0.4%	0.49%	0.75%
Toxicology admission rate from all admissions	0.39%	0.49%	0.61%

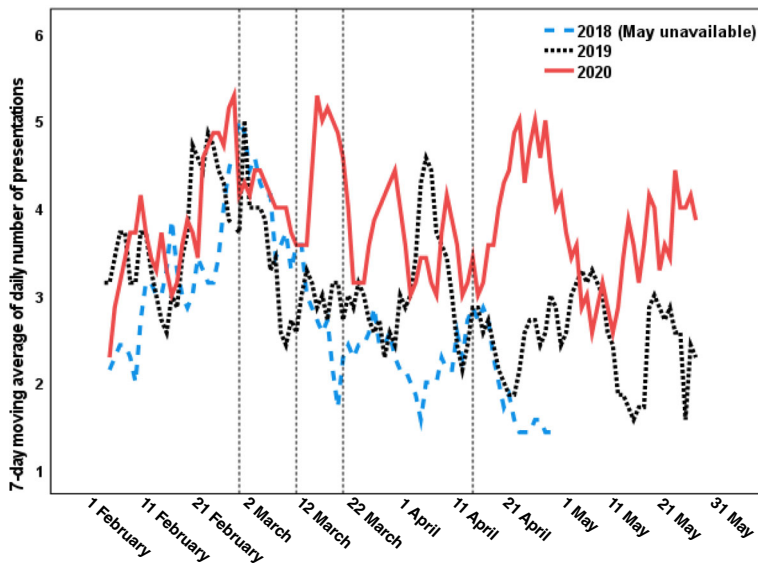


Figure 1. Daily presentation rate 7-day moving average for 2018, 2019, 2020. May 2018 is excluded in this figure. Vertical dotted lines drawn at: 1st March – 1st COVID death in Australia; 12th March – Prime Minister announces first stimulus package; 21st March – non-essential services and many schools close; 15th April – JobKeeper Payment passed.

recreational drugs increased,  $P < 0.001$  (Table 1).

The overall combined figures for all four ED presentations over financial years 2017–2020 demonstrated an initial annual 11.8% increase from 2017–2018 to 2018–2019 (179 162 *vs* 200 324 patients) which then decreased by 9.6% over 2018–2019 to 2019–2020 (200 324 *vs* 181 060 patients).

From February to May 2020, there were 58 437 ED presentations, of which 441 (0.75%) were related to clinical toxicology. This was an

increase compared to 2019 (67 498,  $n = 333$  [0.49%]) and 2018 (63 534,  $n = 255$  [0.40%]). There was a reduction in overall presentation and admission rates from ED for all specialities. Although the toxicology admission rate matched the overall hospital admission rate for 2018 (35%) and 2019 (33%), there was a much lower toxicology admission rate (24%) compared to overall hospital admission rate (30%) in 2020 (Table 2).

The daily rate of presentations in February was comparable in 2020

*versus* 2018 (rate ratio 1.26, 95% CI 0.95–1.69,  $P = 0.109$ ) and 2020 *versus* 2019 periods (rate ratio 1.00, 95% CI 0.73–1.36,  $P = 1$ ). The first COVID death in Australia occurred on 1 March 2020. From this date onwards, Figure 1 shows a clear separation through March–May between the 7-day moving averages of the daily number of presentations in 2020 compared to 2018 and 2019. This is reflected in the elevated rate ratios for 2020 *versus* 2018 and 2019 seen in each of these 3 months. The effect of pre-COVID (2018–2019)–post-COVID (2020) year status on the daily number of referrals was homogeneous across the months March–May (interaction  $P = 0.450$ ), and the overall rate ratio adjusted for month during this 3-month period was 1.42, 95% CI 1.23–1.63,  $P < 0.001$ .

### Types of exposure and ingestion

The daily rate of presentations for DSP was comparable between 2020 and 2019 with no significant differences in mean rate ratio from February to May. There was a significant increase in presentations in April 2020 compared to 2018 (rate ratio 1.51, 95% CI 1.10–2.07,  $P = 0.011$ ) (Table 3). The overall rate ratio adjusted for month from March to May of pre-COVID (2018–2019) *versus* post-COVID (2020) was 1.22, 95% CI 1.01–1.48,  $P = 0.04$ .

TABLE 3. Mean daily rates and SD of DSP and recreational drug use presentations by month and year

Type of presentation	Month	Daily number of presentations						2020–2019					
		2018		2019		2020		Mean rate ratio	95% CI for mean rate ratio	Log linear model P-value	Mean rate ratio	95% CI for mean rate ratio	Log linear model P-value
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)						
DSP	February	1.79 (0.83)	2.00 (1.18)	1.96 (1.08)	1.09	0.82–1.45	0.538	0.98	0.71–1.34	0.896			
	March	1.74 (1.10)	1.56 (1.61)	2.14 (1.33)	1.23	0.89–1.70	0.208	1.37	0.87–2.16	0.172			
	April	1.28 (0.74)	1.50 (0.81)	1.93 (1.22)	1.51	1.10–2.07	0.011	1.29	0.95–1.75	0.104			
	May	NA	1.42 (1.10)	1.43 (1.45)	NA	NA	NA	1.01	0.63–1.60	0.976			
Recreational	February	0.71 (1.04)	1.29 (1.73)	1.04 (0.95)	1.47	0.75–2.90	0.265	0.81	0.43–1.52	0.507			
	March	0.59 (0.69)	1.12 (1.01)	1.50 (1.07)	2.53	1.53–4.20	<0.001	1.34	0.87–2.07	0.187			
	April	0.48 (0.71)	0.88 (1.18)	1.45 (1.27)	3.02	1.57–5.78	<0.001	1.64	0.91–2.96	0.102			
	May	NA	0.96 (1.43)	1.57 (1.01)	NA	NA	NA	1.63	0.89–2.98	0.113			

CI, confidence interval; DSP, deliberate self-poisoning; NA, not available; SD, standard deviation.

The daily presentation rate of recreational drug use was comparable between 2020 and 2019 with no significant differences in mean rate ratio from February to May. There was a significant increase in presentations between March 2020 (rate ratio 2.53, 95% CI 1.53–4.20,  $P < 0.001$ ) and April 2020 (rate ratio 3.02, 95% CI 1.57–5.78,  $P < 0.001$ ) compared to 2018 (Table 3). The overall rate ratio adjusted for March to May of pre-COVID (2018–2019) versus post-COVID (2020) was 2.01, 95% CI 1.53–2.64,  $P < 0.001$ .

There was no significant difference in type of ingestion ( $P = 0.094$ ).

### Specific drugs ingested

There was an overall increase in number of presentations across all major drug classes. There was a significant increase in proportion of presentations for opiates use in 2020 (18.8%) and 2019 (18.0%) compared to 2018 (10.2%) ( $P = 0.008$ ). There was a significant difference in proportion of stimulant use presentations with an increase from 2018 (10.2%) to 2019 (18.6%) and subsequent decrease in 2020 (15.2%) ( $P = 0.018$ ). There was no significant difference in proportion of presentations for antidepressants, paracetamol, benzodiazepines, antipsychotics and ethanol (Table 4).

### Discussion

This study demonstrated an overall increase in number of toxicology-related presentations during the first wave of the COVID-19 pandemic from March to May 2020 compared to the same time periods in 2018 and 2019. This was in contrast to the decrease in overall presentations to ED seen across all specialties. Our results are most consistent with a US-based study examining surveillance data showing an increase in overdoses despite a decrease in total ED visit counts.<sup>17</sup> However, other Australian and overseas studies have shown an overall decline in drug-related emergency presentations and reduction in illicit drug consumption.<sup>18,19</sup> In particular, our centre saw an increase in presentations, with a notable spike in presentations

TABLE 4. Presentations by drug class 2018–2020

Drug	2018 (n = 255)		2019 (n = 333)		2020 (n = 441)		$\chi^2$ P-value
	n	%	n	%	n	%	
Antidepressants	45	16.1	35	9.6	58	12.7	0.063
Paracetamol	34	13.3	61	18.3	57	12.9	0.085
Benzodiazepine	44	17.3	70	21.0	83	18.8	0.503
Opiates	27	10.2	61	18.0	84	18.8	0.008
Antipsychotics	43	15.3	47	13.5	49	10.7	0.183
Stimulants	32	10.2	72	18.6	83	15.2	0.018
Ethanol	24	9.4	44	13.2	54	12.2	0.348

immediately after the announcement of the JobKeeper Payment by the Australian Government.

Some studies have demonstrated altered consumption patterns and potentially elevated risk of fatal overdose without opportunity for rescue because of COVID-related social distancing and isolation.<sup>15,20,21</sup> There was no significant difference during the study period in acuity as defined by triage category and PSS for our population, despite other studies demonstrating a reduction in higher acuity presentations.<sup>3</sup> Despite there being no difference in triage category or PSS, there was a decrease in toxicology admissions as a proportion of overall presentations. This decrease was greater than the decrease in overall ED admission rates, which has also been demonstrated in other studies.<sup>3</sup> The reasons for this are likely complex. Given that all DSP presentations are triaged as category 2, it is likely that the patients who presented had less potentially lethal exposures, exposures that required less medical intervention or exposures that required less time for observation. There may also have been a reluctance by patients to be admitted to hospital with other forms of exposure that were not DSP related.

Despite the initial concerns regarding the increase in mental health presentations, our study demonstrated similar presentation rates for DSP over 3 of the 4 months in the first wave of the COVID pandemic in Australia. The only spike in the daily

number of DSP presentations occurred in April 2020 when compared with 2018 presentations, which corresponded to the time period immediately after the peak number of COVID case numbers recorded on 28 March. Other Australian studies showed no net difference in number of drug overdose presentations to ED.<sup>11</sup> The increase in community mental health services during the COVID-19 period may have diverted patients away from the ED.<sup>22</sup> Furthermore, public anxiety about presenting to ED during the first wave of the COVID-19 pandemic that deterred the general public away from hospital would have also applied to mental health patients.<sup>10,23</sup>

Our study demonstrated a decrease in the proportion of stimulant-related presentations, consistent with other studies conducted both overseas and in Australia.<sup>19,24,25</sup> This is likely because of restrictions on social gatherings during lockdown period. A survey conducted by the Ecstasy and Related Drugs Reporting System demonstrated that 71% of participants reported a change in frequency of use of ecstasy/methylenedioxymethamphetamine (MDMA) and related drugs, with 82% of those participants reducing or ceasing use during COVID-19. This was mainly because of fewer opportunities to socialise with other people or they 'didn't feel like it'.<sup>24</sup> Similarly, the Australians' Drug Use: Adapting to Pandemic Threats (ADAPT) study found a decrease in MDMA, cocaine and ketamine use but an increase in cannabis use.<sup>25</sup>

### Limitations

Our data do not include toxicology presentations for a period of 10 days in May 2018 because of an administrative error in our toxicology database. However, the admission number in May 2018 is correct as it was taken from hospital data set.

Our study may have missed some patients who were directly referred by ED to psychiatry, drug health services or discharged. Given the changes noted for recreational drug use behaviour and alcohol consumption, our numbers may not truly reflect all patients with substance use who presented to ED during the study period related to the first wave of the COVID-19 pandemic in NSW. Even so, this study demonstrated a significantly increased rate of referrals to our unit for toxicity from recreational drugs.

In addition, we only used three comparable years for the analysis of trend. Although this may be too short a period to delineate the underlying trends on presentation numbers for toxicology-related conditions, the marked difference in our results when compared to other studies suggests an association to the COVID-19 first wave and the instigation of lockdowns. Another supporting factor for this is the underlying reduction in ED presentations, in line with other existing studies.

### Conclusion

There was a relative increase in toxicology presentations during the

COVID-19 pandemic compared to an overall decrease in presentations to ED. Recreational drug use increased significantly during the pandemic compared to 2018. Further research including qualitative analysis is required to evaluate the reasons for increase substance use and presentations to the ED for DSP and recreational drug use during pandemics.

### Competing interests

None declared.

### Data availability statement

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

### References

- Kam AW, Chaudhry SG, Gunasekaran N, White AJ, Vukasovic M, Fung AT. Fewer presentations to metropolitan emergency departments during the COVID-19 pandemic. *Med. J. Aust.* 2020; **213**: 370–1.
- Hartnett KP, Kite-Powell A, DeVies J *et al.* Impact of the COVID-19 pandemic on emergency department visits – United States, January 1, 2019–May 30, 2020. *MMWR Morb. Mortal. Wkly. Rep.* 2020; **69**: 699–704.
- Allen MT, Thompson BC, Atkinson B *et al.* Emergency department presentations in the Southern District of New Zealand during the 2020 COVID-19 pandemic lockdown. *Emerg. Med. Australas.* 2021; **33**: 534–40.
- Harris D, Ellis DY, Gorman D, Foo N, Haustead D. Impact of COVID-19 social restrictions on trauma presentations in South Australia. *Emerg. Med. Australas.* 2021; **33**: 152–4.
- Thornton J. Covid-19: A&E visits in England fall by 25% in week after lockdown. *BMJ* 2020; **369**: m1401.
- Morelli N, Rota E, Terracciano C *et al.* The baffling case of ischemic stroke disappearance from the casualty department in the COVID-19 era. *Eur. Neurol.* 2020; **83**: 213–5.
- Tam C-CF, Cheung K-S, Lam S *et al.* Impact of coronavirus disease 2019 (COVID-19) outbreak on ST-segment-elevation myocardial infarction care in Hong Kong, China. *Circ. Cardiovasc. Qual. Outcomes* 2020; **13**: e006631.
- Metzler B, Siostrzonek P, Binder RK, Bauer A, Reinstadler SJ. Decline of acute coronary syndrome admissions in Austria since the outbreak of COVID-19: the pandemic response causes cardiac collateral damage. *Eur. Heart J.* 2020; **41**: 1852–3.
- Solomon MD, McNulty EJ, Rana JS *et al.* The Covid-19 pandemic and the incidence of acute myocardial infarction. *N. Engl. J. Med.* 2020; **383**: 691–3.
- Mitchell RD, O'Reilly GM, Mitra B, Smit V, Miller JP, Cameron PA. Impact of COVID-19 state of emergency restrictions on presentations to two Victorian emergency departments. *Emerg. Med. Australas.* 2020; **32**: 1027–33.
- Dragovic M, Pascu V, Hall T, Ingram J, Waters F. Emergency department mental health presentations before and during the COVID-19 outbreak in Western Australia. *Australas. Psychiatry* 2020; **28**: 627–31.
- Blair G. Japan suicides decline as Covid-19 lockdown causes shift in stress factors. *The Guardian* 2020.
- Smalley CM, Malone DA Jr, Meldon SW *et al.* The impact of COVID-19 on suicidal ideation and alcohol presentations to emergency departments in a large healthcare system. *Am. J. Emerg. Med.* 2021; **41**: 237–8.
- Hoyer C, Ebert A, Szabo K, Platten M, Meyer-Lindenberg A, Kranaster L. Decreased utilization of mental health emergency service during the COVID-19 pandemic. *Eur. Arch. Psychiatry Clin. Neurosci.* 2020; **271**: 1–3.
- Dietze PM, Peacock A. Illicit drug use and harms in Australia in the context of COVID-19 and associated restrictions: anticipated consequences and initial responses. *Drug Alcohol Rev.* 2020; **39**: 297–300.
- Czeisler M, Lane R, Petrosky E *et al.* Mental health, substance use, and suicidal ideation during the COVID-10 pandemic – United States, June 24–30, 2020. *MMWR Mob. Mortal Wkly.* 2020; **69**: 1049–57.
- Holland KM, Jones C, Vivolo-Kantor AM *et al.* Trends in US Emergency Department visits for mental health, overdose, and violence outcomes before and during the COVID-19 pandemic. *JAMA Psychiatry* 2021; **78**: 372–9.
- Fry M, Harris K, Isoardi KZ. Falling methamphetamine-related presentations to a clinical toxicology unit during the COVID-19 pandemic. *Emerg. Med. Australas.* 2021; **33**: 179–80.
- European Monitoring Centre for Drugs and Drug Addiction. *Impact of COVID-19 on Patterns of Drug Use and Drug-Related Harms in Europe*. Lisbon: European Monitoring Centre for Drugs and Drug Addiction, 2020.
- Khatrri UG, Perrone J. Opioid use disorder and COVID-19: crashing of the crises. *J. Addict. Med.* 2020; **14**: e6–7.
- Volkow ND. Collision of the COVID-19 and addiction epidemics. *Ann. Intern. Med.* 2020; **173**: 61–2.
- Covid-19 impact activates first national emergency appeal in lifeline's 57 year history [press release]. *Lifeline* 2020.
- Wong L, Hawkins J, Langness S, Murrell K, Iris P, Sammann A. Where are all the patients? Addressing Covid-19 fear to encourage sick patients to seek emergency care. *NEJM Catalyst* 2020; doi: [10.1056/CAT.20.0193](https://doi.org/10.1056/CAT.20.0193).
- Peacock A, Price O, Dietze P *et al.* *Impacts of COVID-19 and Associated Restrictions on People Who Use Illicit Stimulants in Australia: Preliminary Findings from the Ecstasy and Related Drugs Reporting System 2020*. Sydney: National Drug and Alcohol Research Centre, UNSW Sydney, 2020.
- Sutherland R, Baillie G, Memedovic S *et al.* *Key Findings from the 'Australians' Drug Use: Adapting to Pandemic Threats' (ADAPT) Study*. Sydney: National Drug and Alcohol Research Centre, UNSW Sydney, 2020.