

Children and Adolescents with Severe Acute Behavioural Disturbance in the Emergency Department

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Abbreviations

ABD – acute behavioural disturbance

ATS – Australasian triage scale

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ED – emergency department
EMR – electronic medical record
LOS – length of stay
MH – mental health
PED – paediatric emergency department

Table of contents summary

Severe acute behavioural disturbance in children and adolescents in the emergency department, regardless of underlying cause, can be a major management challenge.

What is already known

- Mental health presentations to the emergency department are increasing in children and adolescents.
- Little is known about patients with severe acute behavioural disturbance, the most severe end of these presentations.
- Interventions used in a crisis team response or “Code Grey” are currently not evidence based.

What this study adds

- Children and adolescents with severe acute behavioural disturbance have increased acuity, length of stay and hospital admissions compared with those presenting with other mental health problems, and often require physical or chemical restraint.
- This cohort are often repeat presenters for whom development of anticipatory management plans may be suitable.

Contributors statement page

AC, SMOD and AH conceived the study, obtained ethics approval, extracted and analysed the data and wrote the first draft of the paper.

FEB assisted with the design of the study protocol, obtained ethics approval and revised the draft.

All authors approved the final draft for submission.

ABSTRACT

OBJECTIVE

Mental health (MH) presentations to emergency departments (EDs) are increasing in children and adolescents. Little is known about patients with severe acute behavioural disturbance (ABD). We set out to describe patients with ABD severe enough to trigger an acute crisis team response in ED (termed “Code Grey”) and how they differ from other MH patients.

METHODS

Retrospective electronic medical record review (EMR) of all ED patients with MH discharge codes at a tertiary children’s hospital. We assessed the epidemiology and management of patients who triggered acute crisis team interventions (Code Grey) as proxy for severe ABD. We calculated the odds ratios (ORs with 95% confidence intervals (CI)) of key demographic factors compared to other MH patients.

RESULTS

During 2018 there were 85,347 ED presentations of which 1695 (2.0%) were related to MH diagnoses; 84 MH patients had 141 MH presentations triggering 204 Code Greys (26 patients triggered 59% of Code Greys). These patients had higher triage acuity (OR 12.6 (8.3 to 19.0)), stayed longer in ED (> 12 hrs OR 8.2 (5.1 to 13.1)) and were more likely to be admitted (OR 2.0 (1.4 to 3.0)) compared with non-Code Grey MH presentations. Patients were physically (19.2%), mechanically (31.9%) or chemically restrained (37.6%). Eight different medication approaches were used as either a single agent or a combination of oral and/or intramuscular agents.

CONCLUSIONS

Children and adolescents with severe ABD differ from other MH presentations and often require physical or chemical restraint. Anticipatory management plans may be suitable for repeat presenters.

KEY WORDS

Acute behavioural disturbance

Mental health presentations

Paediatrics

Emergency

Restraint

INTRODUCTION

Mental health (MH) presentations to paediatric emergency departments (PEDs) in Australia have significantly increased in recent years, in comparison to both paediatric physical health presentations¹ and adult MH presentations². MH presentations are more likely to arrive out of business hours, be triaged as urgent, stay longer in ED and be admitted to hospital^{1,2}. Similar increases in presentations and length of stay (LOS) are reported in the USA³.

In adult EDs there has been considerable focus on the increasing number of patients with severe ABD in particular; they often remain in ED for long durations and require considerable resources to safely manage⁴. Aggressive and agitated patients often require a coordinated staff response to safely manage these behaviours and minimise risk to the patient, other patients and staff. In Victoria, this response is known as “Code Grey”. In adult EDs, patients with ABD requiring a Code grey are more likely to be male, drug and/or alcohol affected, have an underlying mental health illness⁴⁻⁵, arrive with the police⁴, be triaged as urgent and be admitted to hospital, compared with non-MH presentations⁵.

Severe ABD, Code Grey response and the use of restrictive intervention has not been well studied in children and adolescents in ED⁶. Considering the reports of increasing paediatric MH presentations^{1,2} and particular concerns about the severe end of the spectrum of these presentations we set out to assess children and adolescents presenting to a tertiary children’s hospital ED with ABD. We aim to describe a cohort of patients with ABD

severe enough to trigger an acute crisis team response in ED (Code Grey) and how they differ from other MH patients.

METHODS

Design and Setting

We conducted a retrospective EMR review of all ED patients with MH discharge codes at the Royal Children's Hospital (RCH) in Melbourne, Australia. We then assessed the epidemiology and management of patients who triggered acute crisis team interventions (Code Grey) as a proxy indicator for severe ABD.

RCH is a large tertiary children's hospital with an annual census of 85,347 children (2018) and is a designated MH facility under Victorian Mental Health Act regulation^{7,8}, servicing a population of over 6 million people⁹. The MH service consists of the ED, a 16-bed adolescent inpatient unit and accessible outpatient services for children up to the age of 18⁷. The study was approved by the Human Research and Ethics Committee (HREC) at RCH (HREC QA/51710/RCHM-2019).

Code Grey

"Code grey" is an emergency alert used at RCH to elicit a rapid response to a situation of anticipated danger or risk by a person towards themselves, other patients, staff members, visitors or property. This type of response may involve verbal de-escalation or restraint of a potentially aggressive person by an emergency response team trained in the management of aggression^{10,11}. Management of ABD often involves chemical sedation,

which is guided by a stepwise approach to pharmacological management described in the RCH clinical practice guideline on ABD: Code Grey¹¹. In ED, the Code Grey team consists of a senior emergency physician, the ED nurse and/or associate unit manager, three ward nurses from outside the ED, two security staff and a member of the hospital administrative executive¹¹. Code grey events are electronically logged on the EMR and separate Code Grey specific records are held by the hospital Code Grey co-ordinator; both allow case identification.

Study procedure

A list of 66 MH related ICD 10 diagnostic codes were used to identify MH presentations to ED. This list included all psychiatric diagnoses available to treating staff and other diagnoses not specifically psychiatric but often associated with a MH presentation (ingested foreign body, forearm laceration and hallucination). The ICD 10 diagnostic codes were used to identify patients for inclusion; EMRs of all identified MH presentations were manually assessed to confirm MH related presentations, exclude non-MH presentations, assess the ED and MH clinician diagnosis and any underlying MH or medical diagnosis reported in the medical record. The total MH population elicited by the ICD 10 code search was cross-referenced with the mandatory “Code Grey” records to identify a subset of presentations who required at least one Code Grey response while in ED. For identified patients we extracted relevant demographic, diagnostic, management and follow up data, using an a priori developed coding dictionary. Data extractors were trained and intermittently audited¹².

Inclusion criteria:

- All MH presentations aged 7 to <18 years presenting to ED, who had a MH diagnosis assigned by the ED and / or MH clinician

Exclusion criteria:

- Children under 7 and ≥ 18 years of age
- Presentations with a diagnosis of ingested foreign body or forearm laceration where there was no MH issue

Definitions

- **ED triage urgency** was defined using the national Australian triage scale (ATS)¹³.
- **Restrictive interventions** were assessed as regulated under the Victorian Mental Health Act 2014⁸ and involved use of bodily restraint and seclusion. A restrictive intervention under the Act may only be used after all reasonable and less restrictive options and have been attempted or considered or are unsuitable in the circumstances. They included:
 - Bodily restraint
 - Physical restraint
 - Mechanical restraint
 - Chemical restraint
 - Sedation
 - Seclusion

- **Section 351** of the Victorian Mental Health Act⁸ is the apprehension of a person by police if the person appears to have a mental illness and needs to be apprehended to prevent serious and imminent harm to the person or another person, and subsequent transport to a medical or mental health practitioner or a public hospital for examination.

Analysis

Data were entered into an Excel database (Microsoft, Seattle, WA, USA) and analysed using Stata 14 (Stata Corp, College Station, Tx, USA). We reported LOS related variables for all MH presentations and Code Grey related presentations. We reported demographic data for all MH and Code Grey presentations using frequencies and percentages with 95% confidence intervals (CIs), and additional presentation related variables for the subset of Code Grey presentations. Our primary analysis was focused on identifying the differences between Code Grey and non-Code Grey MH presentations using odds ratios (ORs) of key demographic factors.

RESULTS

During 2018 there were 85,347 ED presentations of which 1695 (2.0% of total ED presentations, median age 14, IQR 13-16) were related to MH diagnoses (Figure 1). In the corresponding period, there were 292 Code Grey events of which 204 (69.8%) were associated with 141 ED MH presentations. The 88 (30.1%) Code Grey events excluded from

analysis were associated with accompanying adults (parents or visitors), children under 7 years of age and adolescents presenting with acute behavioural disturbance due to drug or alcohol intoxication (n = 12, 4.1% of total Code Grey group) with no MH diagnosis. A total of 84 patients accounted for the 141 MH presentations requiring at least one Code Grey response. Of these 84 patients, 26 patients had multiple presentations and accounted for more than half of the total MH presentations (n = 83, 58.9%) (Figure 1). There was more suicidality in this smaller cohort of 26 patients (46% presenting with suicidal ideation) compared with the total re-presenting group (n = 84, 26% presenting with suicidal ideation).

MH presentations requiring a Code Grey response were more likely to be female (74.5%, OR 1.5 (1.0 to 2.2), median age 15, IQR 12-16) compared with non-Code Grey MH presentations (66.1%, median age 15, IQR 13-16) (Table 1). The Code Grey group were of higher acuity (37.6% triage category 1 & 2 OR 12.6 (8.3 to 19.0)), stayed longer in ED (24.1% > 12 hrs OR 8.2 (5.1 to 13.1)) and were more likely to be admitted (29.1% OR 2.0 (1.4 to 3.0)) compared with the non-Code Grey MH presentations (acuity 4.6% triage category 1 & 2; LOS 3.7% > 12 hrs; admission rate 16.9%) (Table 1).

Over half of the Code Grey group were brought to ED with police (51.1%) and over a third (38.3%) were under section 351 of the Victorian mental health act (Table 2). The Code Grey group predominantly arrived outside of business hours (60.3%), were discharged home with a parent(s) (58.9%) who was also their legal guardian (68.8%), and with community psychiatric follow up organised (73.8%) (Table 1 and 2). The majority (92.2%) had a previous MH presentation to ED or community psychiatric involvement, and a psychiatric diagnosis

which was made either prior to ED presentation or subsequently in follow up (95.7% of presentations) (Table 2).

The majority of Code Grey events were called outside of business hours (62.4%) and within 2 hours of arrival to ED (73.8%) (Table 3). Typically, one Code Grey event was required per presentation (69.5%), hands on restraint (either physical or mechanical) was used in 51.1% of cases, chemical restraint in 36.9% and seclusion in 30.5% (Table 3). There was one documented incident of a staff member being injured during a Code Grey event in ED.

For a total of 53 presentations psychotropic medications were administered during the Code Grey (37.6%); IM medication was given in 22 presentations and oral medication given in 31. A total of 79 medication doses were dispensed during the 53 Code Greys; 30.2% received two and 18.9% received three or more medications, with up to 4 oral and 5 IM injections administered. Of the IM medications given, the most frequently administered was droperidol IM, followed by olanzapine IM and midazolam IM (Table 3). The most common orally administered medication was olanzapine PO followed by diazepam PO (Table 3). There were no adverse effects documented for any medications administered in ED.

Of the Code Grey cohort, the most common diagnosis made by an ED or MH clinician was acute behavioural disturbance (41.1%), followed by suicidal ideation (27.7%) (Table 4). Where there was a pre-existing MH diagnosis, the most frequent was autism spectrum disorder (ASD) (17.0%), chronic suicidality (14.2%) or depression (11.4%) (Table 5, supplementary data). Those with no pre-existing MH diagnosis were either not seen by a

MH clinician during that presentation, or were yet to receive a formal MH diagnosis. For the subset of 26 patients with repeat presentations who accounted for over half of the total MH presentations, the predominant pre-existing MH diagnoses were chronic suicidality (23.1%), ASD (15.4%), borderline personality disorder (11.5%) and depression (11.5%).

There was a proportionately higher rate (11.5%) of Code Grey activation in the younger age group (7-12 years) compared with the older group (13-17 years, 7.3%, OR 1.6 (1.1 to 2.4)) and the younger group were significantly more likely to be diagnosed with acute behavioural disturbance (72.3% in younger group, 23.4% in older group, OR 8.6 (3.9 to 19.0)).

DISCUSSION

Our study has identified children and adolescents presenting to ED with MH issues who triggered a Code Grey response due to severe acute behavioural disturbance. These patients differ from other MH presentations by having a higher triage acuity, staying longer in ED and having a higher admission rate. A high proportion of children were physically, mechanically and/or chemically restrained. Our data identify a particularly vulnerable group of patients with repeat Code Grey presentations, where just 26 patients account for the majority of Code Grey responses; typically these patients are 15-year-old girls expressing suicidality with a psychiatric history and are brought restrained by Police under section 351 of the Victorian Mental Health Act. Although the average age of patients requiring a Code Grey response was 15 years, we found that the younger age group (7-12 year olds) had

relatively more frequent acute severe behavioural disturbance presentations requiring Code Grey activation during their ED presentations than the older group (13-17 year olds).

Our finding of a smaller, high intensity cohort of frequent presenters provides a unique opportunity to better understand and prepare for this patient group, with a focus on improving pre-hospital and ED care. Reasons for frequent mechanical restraint in children and adolescents likely differ from adults but are not well researched¹⁴. The RCH utilises the statewide clinical practice guideline on acute behavioural disturbance¹¹ and the local restrictive interventions policy and procedure guideline¹⁵. It is recommended that mechanical restraints are only used as a last resort, with a coordinated, trained, swift five-person Code Grey team approach and with accompanying sedation. There are specific indications for restraint and the need for restraint is reviewed on an ongoing basis by the Code Grey team leader. The mechanical restraint is removed once control is gained and in a stepwise fashion (one limb at a time). Focused interventions to prevent and reduce the use of restrictive intervention should take into account specific patient characteristics and may be achievable through tailored management plans. Joint crisis plans (JCP) used in adult MH settings are advanced agreements between patients and clinicians to document treatment preferences for future crisis presentations and have been shown to reduce admission and treatment in MH services¹⁶. Anticipatory crisis plans could be developed in the paediatric ED setting for all frequent presenters that are easily accessible in ED and prior to arrival by prehospital services and may similarly reduce restrictive interventions and admission.

The Victorian Police, Ambulance and Clinical Early Response (PACER) service is a mobile adult emergency MH response that aims to resolve MH crisis in the community; since its introduction in 2007, this model has demonstrated quicker access to MH assessment, improved information sharing between agencies and decreased referrals and transport to EDs¹⁷. If transport is required, several Victorian adult EDs incorporate an on-site MH and AOD (alcohol and other drugs) hub¹⁸, which has been shown to decrease use of restrictive interventions and LOS in ED¹⁹.

There is currently no paediatric equivalent mobile or on-site service. Our data allow only a limited comparison with adult Code Grey data due to different populations and exclusions. Whereas adults requiring Code Grey response tend to be male and present drug or alcohol affected, often with a MH background^{4,5}, children and adolescents were predominantly female teenagers with a primary MH complaint. The broad similarity across all age groups is a pre-existing MH diagnosis. The success of alternative models of care in adult populations¹⁸ calls for an equivalent paediatric focus to both decrease the demand on paediatric EDs and optimise the care provided to a vulnerable patient cohort.

Our data show a range of different medication approaches, where either a single agent, or a combination of oral and/or intramuscular agents were used to chemically restrain children and adolescents. To date, there are no randomised controlled trials (RCTs) studying the best psychotropic management of ABD in the PED environment²⁰. In adults, there are multiple high-quality studies identifying and comparing different agents used to manage ABD in the ED setting²¹. The most frequently administered medication (oral

olanzapine) in our setting has been reported as safe for acute agitation in the PED²² and has been shown to be efficacious in adult RCTs²¹. Paediatric RCTs will need to be adequately powered and multicenter to ensure generalisability in the Australian ED setting.

LIMITATIONS

As a retrospective single centre study there are limitations to the data; however, we tried to optimise data collection by following recommended guidance including the use of trained abstractors, the use of a detailed protocol and data dictionary and intermittent audits¹². While administrative data and medication use was recorded with high accuracy within the EMR, other data depended on the accuracy and completeness of the recording by the clinicians concerned. The use of ICD 10 diagnostic coding, with its inherent issues of coding accuracy and variability of use among clinicians, to identify participants, may have missed eligible participants with a MH diagnosis. We excluded patients < 7 years of age as they likely did not present with typical MH related presentations and often did not have a psychiatric diagnosis. We also excluded drug and/or alcohol affected adolescents if they presented after risk taking behaviours with no MH diagnosis.

CONCLUSIONS

Children and adolescents with severe ABD differ from other MH presentations and often require physical and/or chemical restraint. While the focus should be on non-pharmacological approaches to de-escalation that are appropriate for the patient's age and

diagnosis, the multiple medication approaches used in MH crisis situations calls for adequately powered medication trials to be conducted to provide evidence for their optimal use in the PED. Efforts are required to better understand reasons for repeat presentations where restrictive intervention are required; this group of patients may be amenable to anticipatory management plans and would benefit from a collaborative approach with pre-hospital services.

REFERENCES

1. Hiscock H, Neely RJ, Lei S, Freed G. Paediatric mental health presentations to emergency departments, Victoria, 2008-15. *Med J Aust.* 2018; **208**: 343-348.
2. Tran QN, Lambeth LG, Sanderson K et al. Trends of emergency department presentations with a mental health diagnosis by age, Australia, 2004-05 to 2016-17: A secondary data analysis. *Emerg Med Australas.* 2019; DOI: 10.1111/1742-6723.13323.
3. Hoffman JA, Stack AM, Monuteaux MC, Levin R, Lee LK. Factors associated with boarding and length of stay for pediatric mental health emergency visits. *Am J Emerg Med.* 2018; [Cited 17 Oct 2019]. Available from URL: <http://doi.org/10.1016/j.ajem.2018.12.041>
4. Oliver M, Adonopulos AA Haber PS et al. Impact of acutely behavioural disturbed patients in the emergency department: A prospective observational study. *Emerg Med Australas.* 2018; DOI: 10.1111/1742-6723.13173.
5. Knott J, Gerdtz M, Dobson S et al. *Restrictive Interventions in Victorian Emergency Departments: A Review of Current Clinical Practice.* Victoria State Government. 2019. Available from URL: <https://www2.health.vic.gov.au/about/publications/researchandreports/restrictive-interventions-emergency-departments-review>
6. Hopper SM, Babl FE, Stewart CE, Woo JW. Aggression management in a children's hospital setting. *Med J Aust.* 2012; **196**: 198-201.
7. The Royal Children's Hospital, Melbourne. *Division of Medicine: Mental Health.* [Cited 17 Oct 2019]. Available from URL: <https://www.rch.org.au/mental-health/>
8. Victoria State Government. *Mental Health Act, Stat. 14-026.* Victorian Legislation and Parliamentary Documents. 2014; [Cited 17 Oct 2019]. Available from URL: <http://legislation.vic.gov.au>
9. Australian Bureau of Statistics. *Victoria: Region Data Summary.* [Updated July 2019; Cited 25 Oct 2019]. Available from URL: https://itt.abs.gov.au/itt/r.jsp?RegionSummary®ion=2&dataset=ABS_REGIONAL_ASGS2016&geoconcept=ASGS_2016&measure=MEASURE&datasetASGS=ABS_REGIO

10. The Royal Children's Hospital, Melbourne. *The Royal Children's Hospital Emergency Management Manual (Part 8)*. [Updated Mar 2015; cited 21 Oct 2019] Available from URL: <https://www.rch.org.au/uploadedFiles/Main/Content/emergencyprocedures/code-grey.pdf>
11. The Royal Children's Hospital, Melbourne. Acute behavioural disturbance: code grey. *Clinical Practice Guidelines*. [Updated Jul 2017; cited 17 Oct 2019]. Available from URL: https://www.rch.org.au/clinicalguide/guideline_index/acute_behavioural_disturbance_code_grey/
12. Kaji A, Schriger D, Green S. Looking Through the Retrospectoscope: Reducing Bias in Emergency Medicine Chart Review Studies. *Ann Emerg Med*. 2014; 64: 292-298.
13. Australasian College for Emergency Medicine. *Guidelines on the implementation of the Australasian Triage Scale in emergency departments*. [Updated Jul 2016; cited 17 Oct 2019]. Available from URL: https://acem.org.au/getmedia/51dc74f7-9ff0-42ce-872a-0437f3db640a/G24_04_Guidelines_on_Implementation_of_ATS_Jul-16.aspx
14. National Institute for Health and Care Excellence. *Violence and aggression: short-term management in mental health, health and community settings*. National Institute for Health and Care Excellence guidelines, 2015. [Updated May 2015; cited 17 Oct 2019]. Available from URL: <https://www.nice.org.uk/guidance/ng10>
15. The Royal Children's Hospital, Melbourne. Restrictive Interventions – Physical and Mechanical restraint. *Policies and Procedures*. [Updated Jun 2018; cited 14 Feb 2020]. Available from URL: https://www.rch.org.au/policy/policies/restrictive_interventions_physical_mechanical_restraint/
16. Henderson C, Flood C, Leese M et al. Effect of joint crisis plans on use of compulsory treatment in psychiatry: single blind randomised controlled trial. *BMJ*; 2004 doi:10.1136/bmj.38155.585046.63.
17. Department of Health and Human Services. *Police, Ambulance and Clinical Early Response (PACER) Evaluation, Final Report*. The Allen Consulting Group, 2012. [Cited 17 Oct 2019]. Available from URL:

<https://www2.health.vic.gov.au/about/publications/researchandreports/Police-Ambulance-and-Clinical-Early-Response-PACER-Evaluation-Report>

18. Department of Health and Human Services. *Victoria's Mental Health Services Annual Report 2017-18*. Victoria: Department of Health and Human Services, 2018. [Cited 17 Oct 2019]. Available from URL: www.mentalhealthplan.vic.gov.au
19. Braitberg G, Gerdtz M, Harding S, Pincus S, Thompson M, Knott J. Behavioural assessment unit improves outcomes for patients with complex psychosocial needs. *Emerg Med Australas*. 2018; **30**: 353-358.
20. Gerson R, Malas N, Mroczkowski MM. Crisis in the Emergency Department: The Evaluation and Management of Acute Agitation in Children and Adolescents. *Child Adolesc Psychiatr Clin N Am*. 2018; **27**: 367-368.
21. Taylor DM, Yap CYL, Knott JC et al. Midazolam-Droperidol, Droperidol, or Olanzapine for Acute Agitation: A Randomized Clinical Trial. *Ann Emerg Med*. 2017; 69: 318-326.e1
22. Cole JB, Strobel AM, Klein LR, Blanchard SR, Nahum RH, Martel ML. The use, safety, and efficacy of olanzapine in a pediatric emergency department over a 10-year period. *Acad Emerg Med*. 2017; **24**: S210-S211.

Figure 1: Flowchart identifying mental health presentations associated with Code Grey event

Table 1: Demographics and length of stay variables of total mental health presentations and Code Grey group

† - length of stay

‡ - hours

§ - against medical advice

¶ - emergency department short stay unit

Table 2: Presentation related variables of Code Grey group (n=141)

† - department of human services

‡ - outpatient department

§ - general practitioner

Table 3: Code Grey group outcomes (n=141)

† - mins

‡ - hours

§ - per oral

¶ - intramuscular

Table 4: Emergency clinician and mental health clinician diagnoses of Code Grey group (n=141)

Table 5: Pre-existing mental health diagnosis in Code Grey group (n=141)

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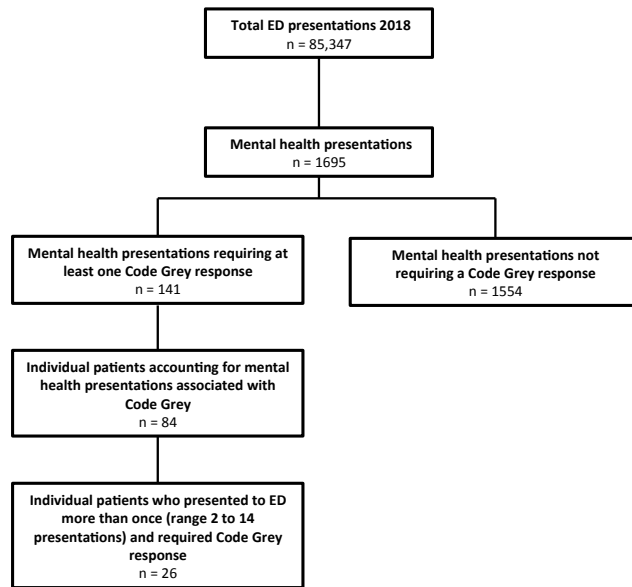
Demographics	Total mental health presentations (1695)		Code Grey group (n = 141)		Non Code Grey group (n = 1554)		Comparison of Code Grey group to non-Code Grey group	
	n	% total	n	% total	n	% total	Variable compared	OR (95% CI)
Sex								
Female	1132	66.8	105	74.5	1027	66.1	F:M	1.5 (1.0 - 2.2)
Male	563	33.1	36	25.5	527	33.8		
Age								
7-12	409	24.1	47	33.3	362	23.3	7-12:13-17	1.6 (1.1 - 2.4)
13-17	1286	75.9	94	66.7	1192	76.7		
Category								
1	24	1.4	20	14.2	4	0.3	Cat1&2: Cat3-5	12.6 (8.3 - 19.0)
2	100	5.9	33	23.4	67	4.3		
3	1120	66.1	82	58.2	1038	66.8		
4	423	25.0	5	3.6	418	0.3		
5	28	1.7	1	0.7	27	1.7		
LOS†								
< 4 hrs‡	706	41.7	43	30.5	663	42.7	> 12 hours: < 12 hours	8.2 (5.1 - 13.1)
> 4 - 6 hrs	563	33.2	29	20.6	534	34.4		
> 6 - 8 hrs	229	13.5	19	13.5	210	13.5		
> 8 - 10 hrs	70	4.1	12	8.5	58	3.7		
> 10 - 12 hrs	35	2.1	4	2.8	31	2.0		
> 12 hrs	92	5.4	34	24.1	58	3.7		
Disposition								
Discharged	1355	79.9	99	70.2	1256	80.8	Admitted: Discharged	2.0 (1.4 - 3.0)
Admitted	304	17.9	41	29.1	263	16.9		
Left AMA§	13	0.8	1	0.7	12	0.8		
ED SSU¶	21	1.2	0	0	21	1.6		
Left without treatment	2	0.1	0	0	2	0.1		
Arrival day								
Weekday	1314	77.5	104	73.8	1210	77.8	Weekday: Weekend	1.3 (0.8 - 1.9)
Weekend	381	22.5	37	26.3	344	22.1		
Arrival time								
0000-0759	160	9.5	20	14.2	140	9.1		
0800-1559	647	38.2	49	34.7	598	38.4		
1600-2359	888	52.4	72	51	816	52.5		
After hours (1700-0759)								
	931	54.9	85	60.3	846	54.4	After hours: Business hours	1.3 (0.9 - 1.8)
In hours (0800-1659)								
	764	45.1	56	39.7	708	45.6		

	n	%
Means of arrival		
Police	72	51.1
Ambulance	36	25.5
Private car / self / public transport	33	23.4
Sectioned		
No	84	59.6
Yes	54	38.3
Unknown	3	2.1
Guardianship		
Parent	97	68.8
DHS†	36	25.5
Other family	4	2.8
Police / Juvenile system	3	2.1
Friend	1	0.7
Attended with		
Parent	83	58.9
Residential care / social worker	24	17.0
Alone	19	13.5
Friend	7	5.0
DHS worker	4	2.8
Other	2	1.4
Community psychiatric liaison	1	0.7
Teacher	1	0.7
Prior psychiatric / community care		
Yes	130	92.2
No	11	7.8
Past psychiatric diagnosis		
Yes	135	95.7
No	6	4.3
Disposition from ED		
Home	72	51.1
Admitted RCH	38	27.0
Admitted to another facility	11	7.8
Residential care	13	9.2
Police custody	3	2.1
DHS	3	2.1
Absconded	1	0.7
Discharged with		
Parent	81	57.5
Residential carer / social worker	33	23.4
DHS worker	7	5.0
Other	7	5.0
Police	6	4.3
Unknown	5	3.6
Alone	1	0.7
Friend	1	0.7

Outcomes	Code Grey group	
	n	% total
Timing of first Code Grey post arrival to ED		
0 – 30 mins†	73	51.8
31 mins – 2 hrs‡	31	22.0
> 2 hrs – 4 hrs	18	12.8
> 4 hrs – 6 hrs	7	5.0
> 6 hrs	12	8.5
Code Grey time of day		
00:00-07:59	20	14.2
08:00-15:59	47	33.3
16:00-23:59	74	52.5
Number of Code Greys during ED presentation		
1	98	69.5
2	30	21.3
3	8	5.7
4	3	2.1
5	2	1.4
Restraint		
Mechanical	45	31.9
Physical	27	19.2
Shepherding	27	19.2
Presence	20	14.2
None	22	15.6
Medication		
No	88	62.4
Yes	53	37.6
Medication type		
PO§	31	58.5
IM¶	22	41.5
Seclusion		
No	98	69.5
Yes	43	30.5
Medications	n (times administered)	% (of total medications given)
Olanzapine PO	22	27.9
Droperidol IM	14	17.7
Olanzapine IM	12	15.2
Diazepam PO	11	13.9
Midazolam IM	9	11.4
Lorazepam PO	7	8.9
Diazepam IM	2	2.5
Midazolam PO	2	2.5

Diagnosis	Emergency clinician diagnosis		Mental health clinician diagnosis	
	n	% total	n	% total
Acute behavioural disturbance	58	41.1	47	33.3
Suicidal ideation	39	27.7	38	27.0
Self-harm	14	9.9	11	7.8
Drug overdose	13	9.2	4	3.6
Anxiety	4	2.8	6	4.3
Acute psychosis	3	2.1	2	1.4
Anorexia nervosa	3	2.1	3	2.1
Affective bipolar disorder	2	1.4	2	1.4
Depression	2	1.4	2	1.4
Drug withdrawal	1	0.7	1	0.0
Suicide attempt	1	0.7	1	0.7
Adjustment disorder	0	0.0	1	0.7
Borderline personality disorder	0	0.0	1	0.7
Crisis presentation	0	0.0	6	4.3
Emotional dysregulation	0	0.0	5	3.6
Homicidal and suicidal ideation	0	0.0	1	0.7
Nil	0	0.0	9	6.4
Relational disorder	0	0.0	1	0.7
Physical injury	1	0.7	0	0.0

Diagnosis	Pre-existing mental health diagnosis	
	n	% total
Nil	35	24.8
Autism spectrum disorder	24	17.0
Suicidal ideation	20	14.2
Depression	16	11.4
Anxiety	9	6.4
Self-harm	7	5.0
Emotional dysregulation	7	5.0
Borderline personality disorder	5	3.6
Drug overdose	3	2.1
Anorexia nervosa	3	2.1
Oppositional defiance disorder	3	2.1
Attention deficit hyperactivity disorder	3	2.1
Intellectual disability	3	2.1
Schizophrenia / schizoaffective disorder	2	1.4
Obsessive compulsive disorder	1	0.7



Demographics	Total mental health presentations (1695)		Code Grey group (n = 141)		Non Code Grey group (n = 1554)		Comparison of Code Grey group to non-Code Grey group	
	n	% total	n	% total	n	% total	Variable compared	OR (95% CI)
Sex								
Female	1132	66.8	105	74.5	1027	66.1	F:M	1.5 (1.0 - 2.2)
Male	563	33.1	36	25.5	527	33.8		
Age								
7-12	409	24.1	47	33.3	362	23.3	7-12:13-17	1.6 (1.1 - 2.4)
13-17	1286	75.9	94	66.7	1192	76.7		
Category								
1	24	1.4	20	14.2	4	0.3	Cat1&2: Cat3-5	12.6 (8.3 - 19.0)
2	100	5.9	33	23.4	67	4.3		
3	1120	66.1	82	58.2	1038	66.8		
4	423	25.0	5	3.6	418	0.3		
5	28	1.7	1	0.7	27	1.7		
LOS†								
< 4 hrs‡	706	41.7	43	30.5	663	42.7	> 12 hours: < 12 hours	8.2 (5.1 - 13.1)
> 4 - 6 hrs	563	33.2	29	20.6	534	34.4		
> 6 - 8 hrs	229	13.5	19	13.5	210	13.5		
> 8 - 10 hrs	70	4.1	12	8.5	58	3.7		
> 10 - 12 hrs	35	2.1	4	2.8	31	2.0		
> 12 hrs	92	5.4	34	24.1	58	3.7		
Disposition								
Discharged	1355	79.9	99	70.2	1256	80.8	Admitted: Discharged	2.0 (1.4 - 3.0)
Admitted	304	17.9	41	29.1	263	16.9		
Left AMA§	13	0.8	1	0.7	12	0.8		
ED SSU¶	21	1.2	0	0	21	1.6		
Left without treatment	2	0.1	0	0	2	0.1		
Arrival day								
Weekday	1314	77.5	104	73.8	1210	77.8	Weekday: Weekend	1.3 (0.8 - 1.9)
Weekend	381	22.5	37	26.3	344	22.1		
Arrival time								
0000-0759	160	9.5	20	14.2	140	9.1		
0800-1559	647	38.2	49	34.7	598	38.4		
1600-2359	888	52.4	72	51	816	52.5		
After hours (1700-0759)	931	54.9	85	60.3	846	54.4	After hours: Business hours	1.3 (0.9 - 1.8)
In hours (0800-1659)	764	45.1	56	39.7	708	45.6		

	n	%
Means of arrival		
Police	72	51.1
Ambulance	36	25.5
Private car / self / public transport	33	23.4
Sectioned		
No	84	59.6
Yes	54	38.3
Unknown	3	2.1
Guardianship		
Parent	97	68.8
DHS†	36	25.5
Other family	4	2.8
Police / Juvenile system	3	2.1
Friend	1	0.7
Attended with		
Parent	83	58.9
Residential care / social worker	24	17.0
Alone	19	13.5
Friend	7	5.0
DHS worker	4	2.8
Other	2	1.4
Community psychiatric liaison	1	0.7
Teacher	1	0.7
Prior psychiatric / community care		
Yes	130	92.2
No	11	7.8
Past psychiatric diagnosis		
Yes	135	95.7
No	6	4.3
Disposition from ED		
Home	72	51.1
Admitted RCH	38	27.0
Admitted to another facility	11	7.8
Residential care	13	9.2
Police custody	3	2.1
DHS	3	2.1
Absconded	1	0.7
Discharged with		
Parent	81	57.5
Residential carer / social worker	33	23.4
DHS worker	7	5.0
Other	7	5.0
Police	6	4.3
Unknown	5	3.6
Alone	1	0.7
Friend	1	0.7

Follow up arrangements		
Community psychiatric services	104	73.8
Hospital Psychiatry OPD‡	13	9.28
Transfer to another unit	8	5.7
Paediatrician	8	5.7
Private Psychiatrist / Counselor	3	2.1
None	2	1.4
Unknown	2	1.4
GP§	1	0.7

Outcomes	Code Grey group	
	n	% total
Timing of first Code Grey post arrival to ED		
0 – 30 mins†	73	51.8
31 mins – 2 hrs‡	31	22.0
> 2 hrs – 4 hrs	18	12.8
> 4 hrs – 6 hrs	7	5.0
> 6 hrs	12	8.5
Code Grey time of day		
00:00-07:59	20	14.2
08:00-15:59	47	33.3
16:00-23:59	74	52.5
Number of Code Greys during ED presentation		
1	98	69.5
2	30	21.3
3	8	5.7
4	3	2.1
5	2	1.4
Restraint		
Mechanical	45	31.9
Physical	27	19.2
Shepherding	27	19.2
Presence	20	14.2
None	22	15.6
Medication		
No	88	62.4
Yes	53	37.6
Medication type		
PO§	31	58.5
IM¶	22	41.5
Seclusion		
No	98	69.5
Yes	43	30.5
Medications	n (times administered)	% (of total medications given)
Olanzapine PO	22	27.9
Droperidol IM	14	17.7
Olanzapine IM	12	15.2
Diazepam PO	11	13.9
Midazolam IM	9	11.4
Lorazepam PO	7	8.9
Diazepam IM	2	2.5
Midazolam PO	2	2.5

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