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Mental Health Presentations to the Paediatric Emergency Department – A Retrospective Study

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Abbreviations
ASD – autism spectrum disorder
ATS – Australasian triage scale
CI – confidence interval
DHHS – department of health and human services
DSH – deliberate self-harm
ED – emergency department
EMR – electronic medical record
ICD-10-AM – International Classification of Diseases, Revision 10, Australian Modification
LOS – length of stay
MH – mental health
OD – odds ratio

Table of contents summary

Paediatric mental health presentations to emergency departments are increasing yet there is a paucity of Australian data assessing patient characteristics and the clinical burden of these presentations.

"KEY MESSAGES BOX"

What is already known

- Mental health presentations to the emergency department (ED) are increasing in children and adolescents, yet the drivers of ED presentation, prolonged length of stay and subsequent admission are poorly understood.
- ED presentations for suicidal ideation, self-harm or intentional poisoning have increased most rapidly in children and adolescents, compared to all other age groups.

What this study adds

- Over a 1 year period at an Australian tertiary paediatric ED, there were 1690 paediatric mental health presentations, representing 7% of all ED presentations for children and adolescents aged 7-17 years. 55% of mental health presentations were for suicidal ideation, self-harm or intentional drug overdose, higher than previously reported in Australian studies.
- The top three reasons for admission were suicidal ideation (42.6%), drug overdose (15.3%) and eating disorder (13.3%). Compared to discharged patients, the highest risk diagnoses associated with admission were eating disorders (OR 9.19, CI 5.48–15.40) and acute psychosis (OR 7.10, CI 3.45–14.63).
- Patients with ED length of stay greater than 8 hours were more likely to be diagnosed with intentional drug overdose (OR 2.39, CI 1.51–3.80) or acute behavioural disturbance (OR 1.61, CI 1.09–2.39) , compared to stays less than or equal to 8 hours.

ABSTRACT

Aims: To describe a cohort of patients aged 7–17 years presenting with mental health (MH) problems to an Australian tertiary paediatric emergency department (ED), in order to identify (i) predictors of admission and (ii) prolonged length of stay (LOS), (iii) reasons for ED presentation based on diagnosis and (iv) differences between major diagnostic groups.

Methods: Data for all presentations from 1-January-2018 to 31-December-2018 were extracted and analysed from the hospital's electronic medical record system. MH presentations were identified though rule-based coding and manual file review.

Results: In this 12-month period, 1071 children had 1690 emergency MH presentations; constituting 6.7% of all ED presentations for children aged 7-17 years. Collectively, the leading cause for presentation was suicidal ideation, self-harm or drug overdose (55%). Compared to discharged patients, admitted patients were more likely to be female (OR1.82, CI 1.41–2.35), aged over 14–years (OR2.50, CI 1.98–3.15), triaged with high acuity (OR2.70, CI 2.00–3.65) and arrive by ambulance or police (OR1.31, CI 1.04–1.64). The highest risk diagnosis associated with admission was eating

disorders (OR9.19, CI 5.48–15.40). Patients with a prolonged LOS (>8hours) were more likely to need admission (OR5.38, CI 3.81–7.61) and be diagnosed with drug overdose (OR2.39, CI 1.51–3.80) or acute behavioural disturbance (OR1.61, CI 1.09–2.39).

Conclusion: MH presentations constitute a large proportion of ED presentations and suicidal behaviour and self-harm accounts for half of them. We have identified patients at increased risk of admission and prolonged ED LOS.

INTRODUCTION

Globally, awareness of the growing burden of mental health (MH) disorders in children and adolescents is increasing.[1] Over a 12-month period, 1 in 7 Australian children aged 4-17-years are affected by a MH disorder[2] and in 2018, suicide was the leading cause of death among young Australians aged 5-17-years.[3]

Australian emergency departments (ED) are seeing an alarming increase in MH presentations across all ages with the most rapid increases in the paediatric population.[4,5] This trend is consistent globally and has been well studied in North America.[6-11] However in Australia, paediatric-specific studies are limited.[12-14]

MH presentations can strain already limited ED resources, this cohort is more likely to have recurrent ED presentations[15,16], require an extended length of stay (LOS) and are more likely to need admission than children who present with a physical diagnosis.[6,8,10,11] Results from a recent Australian study had

similar findings and also found that 22.5% of all paediatric MH presentations were for self-harm.[12] Prior to this, there were only two Australian studies of paediatric MH emergency presentations conducted almost two decades ago.[13,14]

Despite this growing demand, the drivers of ED presentation, prolonged LOS and subsequent admission are poorly understood. As Victoria, Australia's second most populous state, is working towards reforming their public MH system[17], current and detailed local data are vital to inform future policy, practice and support for children and adolescents with MH crises. This study sought to identify patient characteristics and service utilisation patterns which were (i) predictors of admission and (ii) prolonged LOS, and to identify (iii) the most common reasons for ED presentation and (iv) differences between major diagnostic groups.

METHODS

Design and Setting

We conducted a retrospective observational study of all ED MH presentations in children aged 7-17-years presenting over a 12-month period, 1-January-2018 to 31-December-2018, inclusive, to the Royal Children's Hospital (RCH) in Melbourne, Australia. Data were extracted from the hospital's electronic medical record (EMR) system, Epic.

RCH is a 385-bed tertiary paediatric hospital with an annual ED census of 85,347 children (2018) and is a designated mental health facility under Victorian Mental Health Act regulation. The MH service consists of the ED, a 16-bed adolescent (13-18-years) psychiatric inpatient unit and outpatient services. This study was approved by the RCH Human Research and Ethics Committee (HREC QA/51710/RCHM-2019).

Study procedure

A list of 66 MH-related International Classification of Diseases, Revision 10, Australian Modification (ICD-10-AM) diagnostic codes were used to identify ED MH presentations for study inclusion. (**Supplemental Table 1**) This list included all MH-specific diagnoses and relevant associated diagnoses (ingested foreign body and lacerations). EMRs of all identified presentations were manually reviewed to confirm inclusion or exclusion. (**Figure 1**) For each presentation, we extracted demographic, diagnostic, management and follow-up data, using an a priori developed coding dictionary. To ensure consistent coding, 4 data extractors were trained and any presentations with ambiguous coding were flagged for the lead researcher to review.

For comparison, routine data for all RCH ED presentations in children aged 7-17-years, over the same 12-month period, were also extracted from the EMR. Due to the large number of presentations manual file review was not possible and data collected were limited to basic demographic and presentation data.

Diagnostic categorisation

Within the MH group, emergency and MH clinician primary diagnoses were identified through manual file review and aimed to capture the most accurate reason for ED presentation, compared to reliance on ICD-10-AM diagnostic codes alone. The emergency clinician diagnosis was chosen for further analysis as this represented the most comprehensive list of reasons for ED presentation. In some, but not all ED encounters, relevant background and underlying MH diagnoses such as depression or Autism Spectrum Disorder (ASD) were documented. When documented, these were listed as underlying MH diagnoses. (**Supplemental Table 2**)

Suicidal ideation and attempt, self-harm and intentional drug overdose are diagnostic categories with significant overlap. In keeping with current literature, we attempted to separate them in order to provide a more detailed analysis of presenting diagnoses.[5,18,19] Specifically, intentional drug overdose

was recorded separately from deliberate self-harm (DSH) and suicide attempt. Overdose is the most common mechanism of injury among hospital-treated cases of DSH in Australia[20] and hence warranted separate analysis. DSH is defined as episodes of bodily harm without suicidal intent, and excluded drug overdose and methods of high lethality. Acute behavioural disturbance was a broad category used to describe a range of externalising behaviours such as physical aggression and destructive behaviour.

In cases with concurrent diagnoses, the primary diagnosis was recorded based on documentation by the emergency and MH clinician and concurrent diagnoses were listed as underlying MH diagnoses.

Definitions

- High acuity was determined by the Australasian triage scale (ATS)[21] categories 1-3; deemed immediately to potentially life-threatening.
- Code Grey is an emergency alert at RCH in response to a situation of unarmed aggression.
- Section 351 of the Victorian Mental Health Act[22] indicates the apprehension by police of a person who appears to have a mental illness and needs to be apprehended to prevent serious and imminent harm to the person or other persons.

Statistical analysis

Data were analysed using Stata 14 (Stata Corp, College Station, Tx, USA). We reported demographic and ED presentation variables for all presentations using frequencies and percentages. We calculated the odds ratios (OR) and 95% confidence intervals (CI) of key presentation variables and common emergency clinician diagnoses in three comparisons, (i) MH compared to non-MH presentations, (ii) admitted compared to discharged MH patients and (iii) LOS>4-hours and >8-hours compared to LOS≤4-hours and ≤8-hours respectively amongst MH presentations.

RESULTS

Amongst presentations in children aged 7-17-years, 6.7% of all ED presentations were for MH (1690/25,095 presentations). A total of 1071 patients accounted for these 1690 presentations, representing 1.6 presentations per patient and 4.6 presentations per day.

Patient and presentation characteristics (Table 1)

Compared to non-MH emergency presentations, MH patients were more likely to be female (OR 2.56, CI 2.31–2.84), older than 14-years (OR 6.04, CI 5.45–6.69), present with high acuity (OR 8.52, CI 7.62–9.53) and arrive by ambulance or police (OR 5.77, CI 5.19–6.42). They were more likely to present after-hours (OR 1.31, CI 1.19–1.45), be admitted (OR 2.13, CI 1.90–2.40) and have a prolonged LOS >8-hours (OR 1.36, CI 1.14–1.62).

The guardianship for most patients (87.0%) was with parents. A small but notable proportion of patients were under a child protection order or in out-of-home care (9.5%).

The majority of MH presentations (78.7%) had prior contact with MH services (psychiatrist or psychologist) and most were discharged with follow-up from community MH services (66.8%). Of note, 20.5% of presentations had no previous contact with MH services.

Predictors of admission (Table 2)

Compared to discharged MH patients, admitted patients were more likely to be female (OR 1.82, CI 1.41–2.35), older than 14-years (OR 2.50, CI 1.98–3.15), present with high acuity (OR 2.70, CI 2.00–3.65) and ambulance or police (OR 1.31, CI 1.04–1.64). Presentations requiring admission were more likely to have a LOS >4-hours (OR 4.0, CI 3.17–5.05), and require a Code Grey (OR 1.99, CI 1.39–2.85) or intramuscular medication (OR 2.39, CI 1.05–5.43) for acute behaviour management.

The top three reasons for MH admission were suicidal ideation (42.6%), drug overdose (15.3%) and eating disorder (13.3%). Compared to discharged patients, the highest risk diagnoses associated with admission were eating disorders (OR 9.19, CI 5.48–15.40), acute psychosis (OR 7.10, CI 3.45–14.63), intentional drug overdose (OR 2.49, CI 1.76–3.52) and suicidal ideation (OR 1.33, CI 1.06–1.66).

Predictors of prolonged length of stay

A notable portion of presentations (151, 8.9%) required a prolonged LOS (>8-hours). (**Table 1**) The unadjusted odd ratios for prolonged LOS, compared to LOS ≤8-hours are shown in Table 3. Factors associated with prolonged LOS were high triage acuity and presentation after-hours, with ambulance or police and under Section 351. These patients were 5.4-times more likely to require a Code Grey (OR 5.36, CI 3.55–8.10) and 3.1-times more likely to need medications (OR 3.13, CI 2.17–4.49) for acute behavioural management. They were more likely to be diagnosed with drug overdose (OR 2.39, CI 1.51–3.80) or acute behavioural disturbance (OR 1.61, CI 1.09–2.39). Findings for LOS >4-hours were similar. (**Supplemental Table 3**)

Mental health diagnoses

Overall, self-harm and suicidal ideation (including drug overdose and suicide attempt) were the most common reasons for presentation, accounting for 55.0% (930) of MH presentations. Based on emergency clinician diagnosis, the most common single diagnosis was suicidal ideation (634, 37.5%), followed by acute behavioural disturbance (295, 17.5%). There were 309 (18.3%) patients without a diagnosis from a MH clinician; usually due to the ED clinician determining that an ED MH review was not necessary or because a MH clinician was not available. (**Table 4**) Depression (24.1%) and anxiety (20.1%) were the most common underlying MH diagnoses, followed by ASD (12.3%). (**Supplemental Table 2**)

Amongst the top 5 diagnostic groups, acute behavioural disturbance was the most heterogeneous. This was the only group with a male predominance (65.4%) and had the highest proportion of children 14-years or younger (83.1%), presentations with police (32.5%) or under Section 351 (21.7%). Patients with acute behavioural disturbance were the most likely to require a Code Grey (18.3%) or medication (29.8%), including intramuscular medication (15.9%, 14/88 patients who required medication), for acute behavioural de-escalation. (**Table 5**)

Patients with drug overdose presented with the highest acuity (triage category 1-2, 20.1%) and highest rate of ambulance arrival (49.7%) and admission (42.3%). Patients with self-harm were the most likely to be in out-of-home care; 21.1% were under a child protection order and most often presented after-hours (64.8%). (**Table 5**)

DISCUSSION

This is the largest cross-sectional analysis of paediatric emergency MH presentations at a single Australian centre. In this cohort, MH presentations made up a large proportion (7%) of ED presentations in children and adolescents aged 7-17-years. Half of all MH presentations were due to suicidal behaviour, self-harm or drug overdose; collectively the leading cause for MH presentation and much higher than previously reported in Australian studies. Hiscock *et al*. found 22.5% of emergency MH presentations in children under 19-years to be due to self-harm; this study did not distinguish suicidal from non-suicidal self-harm.[12] Perera *et al*. found 17.4% of ED MH presentations across all ages were due to suicidal behaviour, self-harm, and intentional poisoning and that the greatest increase was for the 10-19-year-old age group, rising 27% per year; age-specific proportions were not reported.[5]

The most likely reason for this probable under-reporting in previous studies is the reliance on ICD-10-AM diagnostic codes, which may be entered inaccurately by busy clinicians. The limitations of

diagnostic codes are known[23] and this was evidenced in this study by the 178 (10.5%) presentations with non-specific ICD-10-AM codes of “Mental health disorder” or “Psychiatric disorder”. Although labour intensive, this study was strengthened by manual file review to identify the most accurate reasons for presentation as well as underlying diagnoses that are often not coded.

The second most common reason for MH presentation was acute behavioural disturbance. This group encompassed a wide range of presentations and underlying diagnoses, such as aggressive behaviour due to severe ASD or anti-social behaviour due to oppositional defiant disorder. In contrast to other major diagnostic groups, these children were mostly male, younger than 14-years and required the most resource-intensive support for behaviour management with high use of ambulance or police, Code Greys and medications. There is currently limited Australian data[24] describing this challenging group and further research is required to better understand and manage these children.

Reasons for delay in admission and discharge need to be assessed and rectified. EDs are high-stimulus environments that are not conducive to calming distressed or agitated patients.[9] It is not appropriate for MH patients to spend hours waiting for a bed in ED and these issues make caring for a challenging population even more difficult. MH patients are also more likely to present after-hours, which further exacerbates these challenges and highlights the need for continuous MH clinician staffing in the ED. Almost 20% of children with MH presentations in this study did not have a MH clinician review in the ED. Further research is required to assess the reasons behind this and their subsequent outcomes. This study highlights the resource-intensive nature of MH presentations which often impacts ED patient flow and access to care for other patients.

In Victoria, 1.2% of children are under a child protection order.[25] Our study identified a disproportionately high rate (9.5%) of children with MH presentations who were under child protection orders. This proportion was highest (21.1%) for patients presenting with self-harm. The

high prevalence of MH disorders and high utilisation of MH services amongst children known to child protection services, particularly those in out-of-home-care, has been previously described.[26,27] However, local data regarding ED utilisation are limited. Future research and policy priorities should focus on optimising and providing adequate community MH and crisis supports for this vulnerable group.

Limitations

As a retrospective study there were limitations to data collection. While administrative data and medication use was recorded with high accuracy within the EMR, other data depended on the accuracy and completeness of clinician documentation. To optimise data quality, we used trained abstractors (all with medical and nursing backgrounds), a detailed protocol and data coding dictionary.[28]

This study was undertaken at a single centre in a metropolitan tertiary paediatric ED, which may limit the generalisability of results. ED patterns are affected by local factors such as inpatient bed numbers and availability of specialised MH services.

This study excluded patients 6-years-of-age or younger in order to focus on the group of children most likely to present with psychiatric illness; it is possible some MH presentations for younger children were missed.

Future practice and policy

An ongoing state inquiry into Victoria's mental health system has already highlighted that the public MH system requires significant overhaul[17], with the current system crisis driven. Improving overall access to community MH services may have addressed many patients seen in the ED, including the 21% of patients in this cohort who presented to ED without prior MH contact.

Future interventions including specialised psychiatric support and re-designing the physical ED environment to assess MH patients may reduce LOS and reduce security and restraint use.[29] In line with state inquiry recommendations for suicide prevention, newer models of care, which move beyond crisis stabilisation, must also be considered. For example, programs similar to the adult Hospital Outreach Post-suicidal after Engagement (HOPE) program, can be developed and tailored to the paediatric population.[17] In Canada, use of a rapid response model and an ED follow-up team has been found to reduce admission rates for adolescents presenting with suicidal behaviour.[30] These models have shown positive outcomes in adult and overseas settings.[17,30]

Conclusion

MH presentations constitute a large proportion of ED presentations in children and suicidal behaviour and self-harm accounts for half of them. We have identified patients at increased risk of admission and prolonged ED LOS.

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Table 1. Demographics and presentation variables of mental health and non-mental health presentations aged 7 to 17 years.

	Mental Health Presentations n = 1690		Non-Mental Health Presentations n = 23,405		Comparison
Sex	**n**	**%**	**n**	**%**	**Odds Ratio (95% CI)†**
Female	1130	66.86	10314	44.07	Female: Male 2.56 (2.31 – 2.84)
Male	560	33.14	13091	55.93	
Age (years)					
7–10	180	10.65	11847	50.62	>14: ≤14 years 6.04 (5.45 – 6.69)
11–14	673	39.82	8287	35.41	
15–17	837	49.53	3271	13.98	
Guardianship					
Parent	1470	86.98	Data unavailable ‡		
Child protection order	160	9.47			
Other family/appointed guardian	45	2.66			
Police custody	4	0.24			
Unknown	11	0.65			
Triage category					
1	24	1.42	90	0.38	Cat 1-2: Cat 3-5 2.07 (1.70 – 2.53)
2	98	5.80	756	3.23	
3	1119	66.21	4885	20.87	Cat 1-3: Cat 4-5 8.52 (7.62 – 9.53)
4	421	24.91	13088	55.92	
5	28	1.66	4586	19.59	
Length of stay (hours)					
≤ 4	1038	61.42	17096	73.04	> 4: ≤ 4 hours 1.70 (1.54 – 1.89)
> 4 – ≤ 8	501	29.64	4730	20.21	
> 8 – ≤ 12	67	3.96	975	4.17	> 8: ≤ 8 hours 1.36 (1.14 – 1.62)
> 12 – ≤ 18	51	3.02	478	2.04	
> 18	33	1.95	126	0.54	
Arrival day					
Weekday	1312	77.63	16454	70.30	Weekend: Weekday

Weekend	378	22.37	6951	29.70	0.68 (0.61 – 0.77)
Arrival time					
0000 – 0759	159	9.41	1919	8.20	After-hours: In-hours 1.31 (1.19 – 1.45)
0800 – 1559	646	38.22	10694	45.69	
1600 – 2359	885	52.37	10792	46.11	
Arrival after-hours (1700– 0759)	928	54.91	11269	48.15	
Arrival in-hours (0800 – 1659)	762	45.09	12136	51.85	
Means of arrival					
Private car / self / public transport	1033	61.12	21098	90.14	Ambulance/Police: Private transport 5.77 (5.19 – 6.42)
Ambulance	362	21.42	2307 §	9.86	
Police (includes all police escorts)	292	17.28			
Unknown	3	0.18	0		
Sectioned					
No	1455	86.09	Data unavailable ‡		
Yes	231	13.67			
Unknown	4	0.24			
Attended with					
Parent	1331	78.76	Data unavailable ‡		
DHHS¶ /residential /social worker	125	7.40			
Alone	107	6.33			
Other family/appointed guardian	71	4.20			
Friend	27	1.60			
Unknown	21	1.24			
Teacher	8	0.47			
Prior psychiatric community care					
Yes	1330	78.70	Data unavailable ‡		
No	347	20.53			
Unknown	13	0.77			
Prior psychiatric diagnosis					
Yes	1257	74.38	Data unavailable ‡		
No	408	24.14			
Unknown	25	1.48			

Disposition from emergency department					
Home	1130	66.86	Data unavailable ‖		Admitted: Discharged 2.13 (1.90 – 2.40)
Admitted RCH #	329	19.47			
Admitted to another facility/hospital	84	4.97			
Residential care unit	74	4.38			
Other DHHS care	29	1.72			
Other family/appointed guardian	19	1.12			
Police custody	10	0.59			
Absconded	15	0.89			
Total discharged (any location)	1277	75.56	20322	86.83	
Total admitted (any location)	413	24.44	3083	13.17	
Discharged with					
Parent	1364	80.71	Data unavailable ‡		
DHHS/residential care/social worker	163	9.64			
Other family/appointed guardian	72	4.26			
Friend	27	1.60			
Alone	23	1.36			
Police	15	0.89			
Unknown	26	1.54			
Primary follow-up arrangement for mental health issue					
Community psychiatric services	1129	66.80	Data unavailable ‡		
Private psychiatrist / counsellor	188	11.12			
Paediatrician	117	6.92			
General Practitioner	92	5.44			
Transferred to another hospital	65	3.85			
None arranged	41	2.43			
Return to emergency department	25	1.48			
Unknown	33	1.95			
Code grey					
No	1549	91.66	Data unavailable ‡		
Yes	141	8.34			
Medication received					

No	1410	83.43	Data unavailable ‡
Yes	280	16.57	
Intramuscular medication used (of those receiving medications)			
No	254/280	90.71	Data unavailable ‡
Yes	26/280	9.29	

† Odd Ratios (OR) and 95% confidence intervals (CI) calculating the likelihood of presentation variables in mental health presentations, compared to non-mental health presentations.

‡ Data for non-mental health presentations was extracted from routine data collected through the electronic medical record; these variables were not recorded in routine data.

§ Routine data collection did not accurately reflect means of arrival; in particular, police escort was under-recorded. Hence, both ambulance and police arrivals were combined.

¶ Department of Health and Human Services (DHHS)

Royal Children's Hospital (RCH)

|| Routine data collection did not provide detailed descriptions of disposition from emergency; hence only admission and discharge numbers were reported.

Table 2. Comparison by admission in paediatric mental health presentations to the emergency department (n=1690)

	Admitted (n=413)		Discharged (n=1277)		Comparison
Sex	**n**	**%**	**n**	**%**	**Odds Ratio (95% CI)†**
Female	315	76.27	815	63.82	Female: Male
Male	98	23.73	462	36.18	1.82 (1.41 – 2.35)
Age (years)					
7–10	13	3.15	167	13.08	>14: ≤14 years
11 –14	126	30.51	547	42.83	2.50 (1.98 – 3.15)
15 –17	274	66.34	563	44.09	
Triage category					
1	8	1.94	16	1.25	Cat 1-2: Cat 3-5
2	42	10.17	56	4.39	2.31 (1.58 – 3.37)
3	305	73.85	814	63.74	Cat 1-3: Cat 4-5
4	57	13.80	364	28.50	2.70 (2.00 – 3.65)
5	1	0.24	27	2.11	
Length of stay (hours)					
≤ 4hrs	150	36.32	888	69.54	> 4: ≤ 4 hours
> 4 – ≤ 8	174	42.13	327	25.61	4.00 (3.17 – 5.05)
> 8 – ≤ 12	31	7.51	36	2.82	> 8: ≤ 8 hours
> 12 – ≤ 18	30	7.26	21	1.64	5.38 (3.81 – 7.61)
> 18	28	6.78	5	0.39	
Arrival day					
Weekend	83	20.10	295	23.10	Weekend: Weekday
Weekday	330	79.90	982	76.90	0.84 (0.64 – 1.10)
Arrival time					
0000 – 0759	37	8.96	122	9.55	After-hours: In-hours
0800 – 1559	171	41.40	475	37.20	0.75 (0.60 – 0.93)
1600 – 2359	205	49.64	680	53.25	
Afterhours (1700-0759)	204	49.39	724	56.70	
In-hours (0800-1659)	209	50.61	553	43.30	
Sectioned					

No	349	84.50	1106	86.61	Sectioned: Not 1.19 (0.87 – 1.63)
Yes	63	15.25	168	13.16	
Unknown	1	0.24	3	0.23	
Guardianship					
Parent	361	87.41	1109	86.84	DHHS: Parent 0.93 (0.63 – 1.36)
Child protection order	36	8.72	124	9.71	
Other family/guardian	10	2.42	35	2.74	
Police custody	2	0.48	2	0.16	
Unknown	4	0.97	7	0.55	
Means of arrival					
Private transport	230	55.69	803	62.88	Ambulance/Police: Private transport 1.31 (1.04 – 1.64)
Ambulance	104	25.18	258	20.20	
Police	76	18.40	216	16.91	
Unknown	3	0.73	0		
Code grey					
No	360	87.17	1189	93.11	1.99 (1.39 – 2.85)
Yes	53	12.83	88	6.89	
Medication received					
No	334	80.87	1076	84.26	1.27 (0.95 – 1.69)
Yes	79	19.13	201	15.74	
Intramuscular medication used (of those receiving medications)					
No	67/79	84.81	187/201	93.03	2.39 (1.05 – 5.43)
Yes	12/79	15.19	14/201	6.97	
Most common emergency clinician diagnoses in admitted patients §					
Suicidal ideation	176	42.62	458	35.87	1.33 (1.06 – 1.66)
Drug overdose	63	15.25	86	6.73	2.49 (1.76 – 3.52)
Eating disorder	55	13.32	21	1.64	9.19 (5.48 – 15.40)
ABD ‡	33	7.99	262	20.52	0.34 (0.23 – 0.49)
Acute psychosis	24	5.81	11	0.86	7.10 (3.45 – 14.63)
Deliberate self-harm	19	4.60	109	8.54	0.52 (0.31 – 0.85)
Anxiety	10	2.42	194	15.19	0.14 (0.07 – 0.26)

† Odd Ratios (OR) and 95% confidence intervals (CI) calculating the likelihood of presentation variables in patients who were admitted, compared to discharged mental health patients.

‡ Acute behavioural disturbance (ABD)

§ The top seven most common diagnoses in admitted MH patients; when combined, these represents 92.01% (380/413) of admitted MH patients and 89.35% (1141/1277) of discharged MH patients.

Table 3. Comparison by length of stay in paediatric mental health presentations to the emergency department (≤8hours compared to >8hours) (n=1690)

	≤ 8 hours length of stay (n=1539)		>8 hours length of stay (n=151)		Comparison
Sex	**n**	**%**	**n**	**%**	**Odds Ratio (95% CI)†**
Female	1022	66.41	108	71.52	Female: Male
Male	517	33.59	43	28.48	1.27 (0.88 – 1.84)
Age (years)					
7–10	163	10.59	17	11.26	
11–14	621	40.35	52	34.44	> 14: ≤14 years
15 –17	755	49.06	82	54.30	1.23 (0.88 – 1.73)
Guardianship					
Parent	1350	87.72	120	79.47	
Child protection order	139	9.03	21	13.91	
Other family/guardian	38	2.47	7	4.64	DHHS: Parent
Police custody	3	0.19	1	0.66	1.68 (1.03 – 2.72)
Unknown	9	0.58	2	1.32	
Triage category					
1	15	0.97	9	5.96	Cat 1-2: Cat 3-5
2	81	5.26	17	11.26	3.13 (1.95 – 5.00)
3	1023	66.47	96	63.58	
4	395	25.67	26	17.22	Cat 1-3: Cat 4-5
5	25	1.62	3	1.99	1.58(1.04 – 2.40)
Arrival day					
Weekday	1198	77.84	114	75.50	Weekend: Weekday
Weekend	341	22.16	37	24.50	1.14 (0.77 – 1.68)
Arrival time					
0000 – 0759	125	8.12	34	22.52	
0800 – 1559	607	39.44	39	25.83	
1600 – 2359	807	52.44	78	51.66	After-hours: In-hours
Afterhours (1700-0759)	825	53.61	103	68.21	1.86 (1.30 – 2.65)
In-hours (0800 – 1659)	714	46.39	48	31.79	
Means of arrival					

Private	974	63.29	59	39.07	AV/Police: Private 2.71 (1.92 – 3.82)
Ambulance	317	20.60	45	29.80	
Police	245	15.92	47	31.13	
Unknown	3	0.19	0		
Sectioned					
No	1346	87.46	109	72.19	Sectioned: Not 2.65 (1.79 – 3.91)
Yes	190	12.35	41	27.15	
Unknown	3	0.19	1	0.66	
Disposition from emergency department					
Home	1088	70.70	42	27.81	Admitted: Discharged 5.38 (3.81 – 7.61)
Admitted RCH ‡	264	17.15	65	43.05	
Admitted other	60	3.90	24	15.89	
Residential care	67	4.35	7	4.64	
Other DHHS § care	23	1.49	6	3.97	
Other family/guardian	17	1.10	2	1.32	DHHS/Police: Home 4.01 (2.19 – 7.35)
Police custody	7	0.45	3	1.99	
Absconded	13	0.84	2	1.32	
Total discharged	1215	78.95	62	41.06	
Total admitted	324	21.05	89	58.94	
Code grey					
No	1439	93.50	110	72.85	5.36 (3.55 – 8.10)
Yes	100	6.50	41	27.15	
Medication received					
No	1312	85.25	98	64.90	3.13 (2.17 – 4.49)
Yes	227	14.75	53	35.10	
Intramuscular medication used (of those receiving medications)					
No	215/227	94.71	39/53	73.58	6.43 (2.77 – 14.95)
Yes	12/227	5.29	14/53	26.42	
Most common emergency clinician diagnoses					
Suicidal ideation	585	38.01	49	32.45	0.78 (0.55 – 1.12)
ABD ¶	258	16.76	37	24.50	1.61 (1.09 – 2.39)
Anxiety	202	13.13	2	1.32	0.09 (0.02 – 0.36)

Drug overdose	123	7.99	26	17.22	2.39 (1.51 – 3.80)
Deliberate self-harm	119	7.73	9	5.96	0.76 (0.38 – 1.52)

† Odd Ratios (OR) and 95% confidence intervals (CI) calculating the likelihood of presentation variables in patients with a prolonged length of stay of more than 8 hours, compared to patients staying equal to or less than 8 hours, amongst mental health presentations.

‡ Royal Children's Hospital (RCH)

§ Department of Health and Human Services (DHHS)

¶ Acute behavioural disturbance (ABD)

Table 4. Diagnoses in paediatric mental health presentations to the emergency department (n = 1690)

Diagnosis	Emergency Doctor Diagnosis		Mental Health Diagnosis		ICD-10-AM Diagnosis †	
	n	%	n	%	n	%
Suicidal ideation	634	37.51	558	33.02	623	36.86
Acute behavioural disturbance	295	17.46	211	12.49	270	15.98
Anxiety	204	12.07	94	5.56	202	11.95
Intentional drug overdose, drug ingestion and drug intoxication	149	8.82	117	6.92	131	7.75
Deliberate self-harm	128	7.57	108	6.39	57	3.37
Anorexia nervosa and other eating disorders	76	4.50	49	2.90	72	4.26
Depression	45	2.66	40	2.37	23	1.36
Acute psychosis and drug-induced psychosis	35	2.07	40	2.37	8	0.47
Hallucinations	28	1.66	19	1.12	17	1.01
Suicide attempt	19	1.12	18	1.07	0	
Somatoform or functional disorder and somatic symptoms	12	0.71	9	0.53	9	0.53
Acute behavioural disturbance due to drug ingestion	12	0.71	11	0.65	2	0.12
Anxiety and depression	11	0.65	18	1.07	15	0.89
Homicidal ideation (including suicidal and homicidal ideation)	10	0.59	12	0.71	1	0.06
Stress and adjustment reaction or adjustment disorder	10	0.59	6	0.36	14	0.83
Bipolar disorder (including manic episode and manic psychosis)	9	0.53	6	0.36	9	0.53
Emotional dysregulation	7	0.41	39	2.31	9	0.53
Autism spectrum disorder and intellectual disability	2	0.12	9	0.53	0	
Other mental health disorders (eg. OCD, ODD ‡)	2	0.12	1	0.06	0	
Schizophrenia and schizoaffective disorder	1	0.06	4	0.24	1	0.06
Mental health and psychiatric disorder	1	0.06	0		178	10.53
No mental health clinician diagnosis or review §	0		309	18.28	0	
Relational disorder	0		5	0.30	0	
Post-traumatic stress disorder	0		4	0.24	0	
Borderline personality disorder	0		3	0.18	2	0.12
Lacerations and abrasions	0		0		24	1.42
Social problem	0		0		13	0.77
Ingestion of foreign body	0		0		10	0.59

† International Classification of Diseases, Revision 10, Australian Modification (ICD-10-AM)

‡ Obsessive compulsive disorder (OCD), Oppositional defiant disorder (ODD)

§ Patients not seen by a mental health clinician did not have a mental health clinician diagnosis.

Table 5. Comparison of top five most common diagnostic groups in paediatric mental health presentations to the emergency department (n = 1410)

	Suicidal ideation (n = 634)		Acute behavioural disturbance (n = 295)		Anxiety (n = 204)		Intentional drug overdose(n = 149)		Deliberate Self-harm (n = 128)	
Sex	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Female	472	74.45	102	34.58	127	62.25	123	82.55	109	85.16
Male	162	25.55	193	65.42	77	37.75	26	17.45	19	14.84
Age (years)										
7–10	17	2.68	96	32.54	42	20.59	3	2.01	2	1.56
11 –14	237	37.38	149	50.51	87	42.65	44	29.53	49	38.28
15 –17	380	59.94	50	16.95	75	36.76	102	68.46	77	60.16
Guardianship										
Parent	540	85.17	255	86.44	201	98.53	125	83.89	97	75.78
Child protection order	67	10.57	28	9.49	2	0.98	16	10.74	27	21.09
Other family/guardian	20	3.15	11	3.73	1	0.49	6	4.03	2	1.56
Police custody	0		0		0		1	0.67	2	1.56
Unknown	7	1.10	1	0.34	0		1	0.67	0	
Triage category										
1	2	0.32	11	3.73	1	0.49	2	1.34	4	3.13
2	23	3.63	20	6.78	6	2.94	28	18.79	8	6.25
3	483	76.18	196	66.44	81	39.71	108	72.48	81	63.28
4	125	19.72	65	22.03	103	50.49	11	7.38	34	26.56
5	1	0.16	3	1.02	13	6.37	0		1	0.78
Length of stay (hours)										
≤ 4hrs	382	60.25	190	64.41	157	76.96	62	41.61	89	69.53
> 4 – ≤ 8	203	32.02	68	23.05	45	22.06	61	40.94	30	23.44
> 8 – ≤ 12	25	3.94	14	4.75	2	0.98	8	5.37	8	6.25
> 12 – ≤ 18	16	2.52	15	5.08	0		11	7.38	0	
> 18	8	1.26	8	2.71	0		7	4.70	1	0.78
Arrival day										
Weekday	506	79.81	233	78.98	152	74.51	110	73.83	92	71.88
Weekend	128	20.19	62	21.02	52	25.49	39	26.17	36	28.13

Arrival time										
0000 – 0759	67	10.57	20	6.78	10	4.90	22	14.77	13	10.16
0800 – 1559	226	35.65	119	40.34	94	46.08	52	34.90	39	30.47
1600 – 2359	341	53.79	156	52.88	100	49.02	75	50.34	76	59.38
Afterhours (1700 –0759)	354	55.84	162	54.92	97	47.55	88	59.06	83	64.84
In-hours (0800 – 1659)	280	44.16	133	45.08	107	52.45	61	40.94	45	35.16
Means of arrival										
Private	404	63.72	139	47.12	160	78.43	62	41.61	76	59.38
Ambulance	123	19.40	60	20.34	40	19.61	74	49.66	24	18.75
Police	106	16.72	96	32.54	4	1.96	13	8.72	27	21.09
Unknown	1	0.16	0		0		0		1	0.78
Sectioned										
No	536	84.54	230	77.97	202	99.02	140	93.96	107	83.59
Yes	98	15.46	64	21.69	2	0.98	8	5.37	20	15.63
Unknown	0		1	0.34	0		1	0.67	1	0.78
Disposition from emergency department										
Home	410	64.67	224	75.93	191	93.63	71	47.65	84	65.63
Admitted RCH †	134	21.14	21	7.12	10	4.90	54	36.24	15	11.72
Admitted other	42	6.62	12	4.07	0		9	6.04	4	3.13
Residential care	25	3.94	12	4.07	1	0.49	9	6.04	17	13.28
Other DHHS care ‡	10	1.58	14	4.75	0		2	1.34	0	
Other family/guardian	5	0.79	5	1.69	1	0.49	3	2.01	4	3.13
Police custody	2	0.32	3	1.02	0		0		3	2.34
Absconded	6	0.95	4	1.36	1	0.49	1	0.67	1	0.78
Total discharged	458	72.24	262	88.81	194	95.10	86	57.72	109	85.16
Total admitted	176	27.76	33	11.19	10	4.90	63	42.28	19	14.84
Code grey										
No	598	94.32	241	81.69	200	98.04	136	91.28	113	88.28
Yes	36	5.68	54	18.31	4	1.96	13	8.72	15	11.72
Medication received										
No	543	85.65	207	70.17	177	86.76	132	88.59	113	88.28
Yes	91	14.35	88	29.83	27	13.24	17	11.41	15	11.72

Intramuscular medication used (of those receiving medications)										
No	89/91	97.80	74/88	84.09	27/27	100.0	13/17	76.47	14/15	93.33
Yes	2/91	2.20	14/88	15.91	0		4/17	23.53	1/15	6.67

† Royal Children's Hospital (RCH)

‡ Department of Health and Human Services (DHHS)

Supplemental Table 1: List of 66 International Classification of Diseases, Revision 10, Australian Modification (ICD-10-AM) Diagnostic Codes used for patient inclusion.

ICD-10-AM Mental Health Diagnostic Codes for patient inclusion
Accidental drug overdose
Accidental paracetamol overdose
Acute anxiety
Acute depression
Acute drug overdose
Acute post-traumatic stress disorder
Acute stress disorder
Affective bipolar disorder
Anorexia
Anorexia nervosa
Anxiety disorder
Behaviour disorder
Behavioural disorder
Borderline personality disorder
Chronic depression
Depression with suicidal ideation
Destructive behaviour
Drug addiction
Drug dependence
Drug ingestion
Drug overdose, multiple drugs
Drug withdrawal
Drug-induced mental disorder
Emotional crisis
Emotional disorder
Emotionally unstable borderline personality disorder
Hallucination
History of self-harm
Hysteria
Intentional drug overdose
Intentional paracetamol overdose
Manic depression
Manic disorder
Mental and behavioural disorders due to use of alcohol, acute intoxication
Mental disorder
Mental health disorder
Multiple drug overdose
Non-accidental drug overdose
Overdose of medication
Overdose of psychotropic
Overdose of sedative or hypnotic
Overdose of tricyclic
Paracetamol overdose
Paracetamol overdose of undetermined intent
Persistent mood disorder
Post-traumatic stress disorder

Psychiatric disorder
Psychosomatic disease
Psychosomatic disorder
Reactive psychosis
Schizophrenia
Social problem
Somatoform disorder
Stress and adjustment reaction
Suicidal ideation
Suicidal risk
Suicidal thoughts
Suicide by hanging
Suicide ideation
Additional ICD-10-AM Diagnostic Codes for patient inclusion
Laceration of upper arm
Laceration of wrist
Forearm laceration
Wrist laceration
Ingestion of foreign body
Swallowed foreign body

Supplemental Table 2: Underlying Mental Health Diagnoses (n=1690)

Underlying Mental Health Diagnosis	Count	% of total encounters
Depression	408	24.14
Anxiety	340	20.12
Autism spectrum disorder	207	12.25
Self-harm	150	8.88
Borderline Personality Disorder	144	8.52
Suicidal ideation	129	7.63
Attention deficit hyperactivity disorder	92	5.44
Post-traumatic stress disorder	74	4.38
Anorexia nervosa and Eating disorder	42	2.49
Drug dependence and substance abuse	30	1.78
Gender dysphoria	28	1.66
Intellectual disability/acquired brain injury	28	1.66
Obsessive compulsive disorder	28	1.66
Emotional dysregulation	27	1.60
Hallucinations	26	1.54
Oppositional defiant disorder	26	1.54
Suicide attempt	24	1.42
Psychosis	22	1.30
Bipolar disorder	21	1.24
Adjustment disorder	16	0.95
Attachment disorder	10	0.59
Relational disorder	8	0.47
Tourette's syndrome	8	0.47
Schizophrenia	5	0.30
Drug overdose	4	0.24
Drug withdrawal	4	0.24
Acute behavioural disturbance	3	0.18
Conduct disorder	3	0.18
Chronic Fatigue Syndrome	3	0.18
Homicidal ideation	3	0.18
Somatoform and Conversion disorder	3	0.18
Schizoaffective disorder	2	0.12
Grief reaction	1	0.06
Nil/not documented	709	41.95

Supplemental Table 3. Comparison by length of stay in paediatric mental health presentations to the emergency department (≤4 hours compared to >4hrs) (n=1690)

	≤ 4 hours length of stay (n=1038)		>4 hours length of stay (n=652)		Comparison
Sex	**n**	**%**	**n**	**%**	**Odds Ratio (95% CI)†**
Female	657	63.29	473	72.55	Female: Male
Male	381	36.71	179	27.45	1.53 (1.24 – 1.90)
Age (years)					
7–10	137	13.20	43	6.60	> 14: ≤14 years
11-14	420	40.46	253	38.80	1.39 (1.14 – 1.70)
15-17	481	46.34	356	54.60	
Guardianship					
Parent	916	88.25	554	84.97	
Child protection order	93	8.96	67	10.28	DHHS: Parent
Other family/guardian	23	2.22	22	3.37	1.21 (0.87 – 1.67)
Police custody	1	0.10	3	0.46	
Unknown	5	0.48	6	0.92	
Triage category					
1	13	1.25	11	1.69	Cat 1-2: Cat 3-5
2	44	4.24	54	8.28	1.91 (1.32 – 2.76)
3	698	67.24	421	64.57	Cat 1-3: Cat 4-5
4	266	25.63	155	23.77	1.10 (0.88 – 1.37)
5	17	1.64	11	1.69	
Arrival day					
Weekday	811	78.13	501	76.84	Weekend: Weekday
Weekend	227	21.87	151	23.16	1.08 (0.85 – 1.36)
Arrival time					
0000 – 0759	84	8.09	75	11.50	
0800 – 1559	368	35.45	278	42.64	After-hours: In-hours
1600 – 2359	586	56.45	299	45.86	0.75 (0.61 – 0.91)
Afterhours (1700-0759)	599	57.71	329	50.46	
In-hours (0800 – 1659)	439	42.29	323	49.54	

Means of arrival					
Private	658	63.39	375	57.52	AV/Police: Private 1.27 (1.04 – 1.55)
Ambulance	209	20.13	153	23.47	
Police	170	16.38	122	18.71	
Unknown	1	0.10	2	0.31	
Sectioned					
No	904	87.09	551	84.51	Sectioned: Not 1.25 (0.95 – 1.66)
Yes	131	12.62	100	15.34	
Unknown	3	0.29	1	0.15	
Disposition from emergency department					
Home	797	76.78	333	51.07	Admitted: Discharged 4.00 (3.17 – 5.05)
Admitted RCH ‡	132	12.72	197	30.21	
Admitted other	18	1.73	66	10.12	
Residential care	47	4.53	27	4.14	
Other DHHS § care	17	1.64	12	1.84	
Other family/guardian	12	1.16	7	1.07	DHHS/Police: Home 1.45 (0.97 – 2.17)
Police custody	6	0.58	4	0.61	
Absconded	9	0.87	6	0.92	
Total discharged	888	85.55	389	59.66	
Total admitted	150	14.45	263	40.34	
Code grey					
No	981	94.51	568	87.12	2.55 (1.79 – 3.62)
Yes	57	5.49	84	12.88	
Medication received					
No	903	86.99	507	77.76	1.91 (1.48 – 2.48)
Yes	135	13.01	145	22.24	
Intramuscular medication used (of those receiving medications)					
No	126/135	6.67	128/145	88.28	1.86 (0.80 – 4.33)
Yes	9/135	93.33	17/145	11.72	
Most common emergency clinician diagnoses					
Suicidal ideation	382	36.80	252	38.65	1.08 (0.88 – 1.32)
ABD ¶	190	18.30	105	16.10	0.86 (0.66 – 1.11)

Anxiety	157	15.13	47	7.21	0.44 (0.31 – 0.61)
Drug overdose	62	5.97	87	13.34	2.42 (1.72 – 3.41)
Deliberate self-harm	89	8.57	39	5.98	0.68 (0.46 – 1.00)

† Odd Ratios (OR) and 95% confidence intervals (CI) calculating the likelihood of presentation variables in patients with a length of stay more than 4 hours, compared to patients staying equal to or less than 4 hours, amongst mental health presentations.

‡ Royal Children's Hospital (RCH)

§ Department of Health and Human Services (DHHS)

¶ Acute behavioural disturbance (ABD)

Figure legend: Figure 1: Flowchart identifying key diagnoses for mental health presentations

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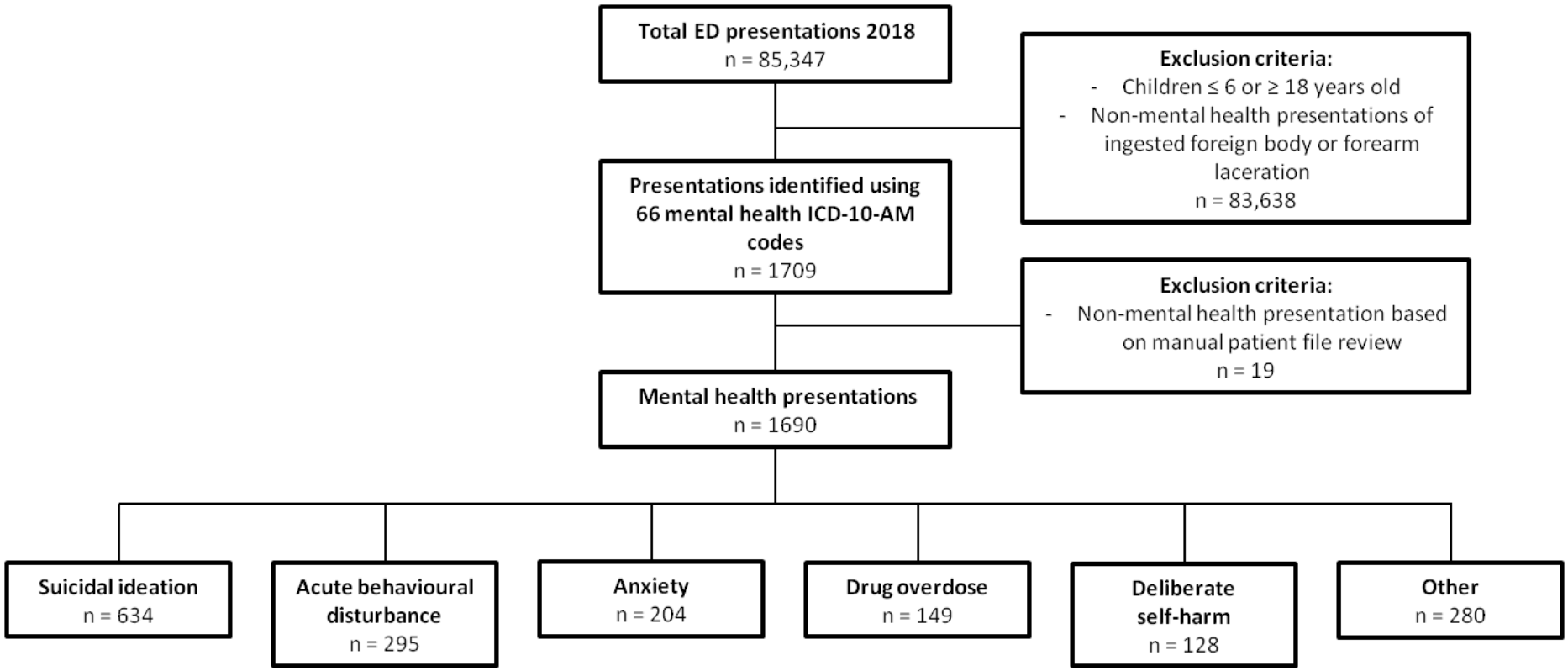

Mental Health Presentations to the Paediatric Emergency Department – A Retrospective Study

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AC and SMOD conceived the study, extracted and analysed the data and revised the draft.
AH assisted in data extraction, data cleaning and training data extractors.
HH conceived the study, obtained ethics approval and revised the draft.
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None

Ethics

This study was approved by the Royal Children's Hospital Human Research and Ethics Committee (HREC QA/51710/RCHM-2019)

Key words: adolescents, children, emergency psychiatry, mental health

Abbreviations
ASD – autism spectrum disorder
ATS – Australasian triage scale
CI – confidence interval
DHHS – department of health and human services
DSH – deliberate self-harm
ED – emergency department
EMR – electronic medical record
ICD-10-AM – International Classification of Diseases, Revision 10, Australian Modification
LOS – length of stay
MH – mental health
OD – odds ratio