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RESEARCH ARTICLE

THE IMPACT OF OPENING A PRIVATE HOSPITAL EMERGENCY DEPARTMENT ON THE HOSPITAL AND PATIENT CHARACTERISTICS

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ABSTRACT

INTRODUCTION

Australian public hospital emergency departments (EDs) are under increasing pressure with higher patient volumes, failure to meet triage target times and increased ambulance wait times. Further, there is limited literature exploring how the opening of an ED affects Australian hospitals. This study focuses on Hollywood Private Hospital (HPH), a large private hospital in Western Australian which opened their ED in November 2021. The research aimed to examine how the introduction of the ED influenced the hospital's service demands and resourcing.

METHOD

This study investigated hospital inpatient characteristics including admissions, clinical deterioration episodes, deaths, after-hours theatre activity and companion care hours. The investigation compared the periods 01 January to 30 June 2021 (2021) and 01 January to 30 June 2022 (2022) to identify differences pre and post the ED opening.

RESULTS

Overall, the number of inpatient admissions was similar from 2021 to 2022 (31,061 and 31,706 respectively). However, there was a statistically significant change in the admission type with a decrease in elective admissions (925.2 in 2021 and 880.4 in 2022 ($p<.001$)) and an increase in emergency admissions (67.4 in 2021 and 111.1 in 2022 ($p<.001$)). A significantly higher incidence rate of rapid response calls was reported in 2022 compared to 2021 ($p=.043$), nonetheless there was no difference in the incidence rates of cardiac arrest ($p=.445$), code blacks ($p=.600$) or patient deaths ($p=.880$). From 2021 to 2022 there was an increase in both after-hours theatre procedures (6.6% to 9.0%; $\chi 2=50.9$ $p<.001$) and median companion care hours (Md = 32.5 to Md=56.3; $U=2.3$, $p=.021$).

IMPLICATIONS

The opening of the HPH ED resulted in increased after-hours and emergency related admissions with a co-occurring increase in companion hours. These impacts necessitate significant resourcing investment such as revised staffing models and rosters, additional recruitment, and change management.

KEYWORDS
private hospital, emergency department opening, patient acuity, resourcing

INTRODUCTION

Australian public hospital emergency departments (EDs) are under increasing pressure with rising presentations and failure to meet triage target times. In Western Australia (WA), from July 2021 - December 2021 there were an average of 61,193.67 monthly attendances at Perth metropolitan public hospital EDs with less than 80% of Triage 2 attendances seen within the recommended timeframe of 10 minutes [1]. Additionally, in many jurisdictions (including WA), ambulance ramping and metropolitan response times are an increasing problem [2].

In WA there are three main tertiary hospital catchment areas – north, south and east metropolitan health services. This research related to Hollywood Private Hospital (HPH), a private hospital located in the North Metropolitan Health Services (NMHS) catchment with over 950 licensed beds providing comprehensive adult services excluding obstetrics and major trauma. HPH is located adjacent to Sir Charles Gairdner Hospital (SCGH), a leading Australian public tertiary hospital with over 600 beds and a busy emergency department [3]. HPH opened an ED (HPH ED) on 1 November 2021 which provided another option for emergency care to patients with private health cover, particularly within the NMHS catchment.

There is limited literature on the impact on an Australian hospital of opening an ED; the majority of studies are International [4-14]. Patient choice of healthcare providers is a complex topic, influenced by both patient and provider characteristics [15]. Studies demonstrate that both distance [16, 17], and wait times in public EDs [18], are relevant variables.

On a background of significant public hospital demand, the proximity of HPH ED to SCGH and the service needs and resourcing changes necessitated by HPH ED (including establishment of on-call rosters, after-hours procedural access, establishment of an Acute Admissions Unit and additional staffing requirements), a key question was to understand how HPH ED opening impacted on the rest of HPH by describing and understanding key patient related impacts. Understanding this impact is important to facilitate planning by other private and public healthcare operators considering opening emergency services. It was hypothesised that hospital activity would increase, particularly in key specialties such as general medicine and general surgery (which are the main reasons for admitted patient care according to Australian Institute of Health and Welfare (AIHW) data for admitted patient activity), [19] as would after-hours activity, and that patient acuity would also rise. Additionally, there were questions around any impact the opening of HPH ED had on public services at neighbouring SCGH, although it was not within the scope of this study to access or analyse data captured by SCGH.

METHODS

This study firstly investigated the patient cohort presenting to HPH ED from 01 January to 30 June 2022. Secondly a comparison of HPH hospital cohorts pre and post the ED opening on 01 November 2021 was performed encompassing all inpatient admissions (day and overnight) from 01 January to 30 June in both 2021 (2021) and 2022 (2022).

Ethical approval was obtained from the Ramsay Health Care WA / SA Human Research Ethics Committee.

MEASURES

ED data was extracted from the hospital Patient Administration System (PAS), specifically the Meditech Universal Patient Admission Report and the Evolution Report. Data was compiled by the business analyst team and comprised patient demographics including age, gender and postcode together with patient disposition (admitted, discharged, transferred). Patients could be represented multiple times within the period.

Hospital data was extracted for companion care hours, rapid response calls, cardiac arrests, code black, after hours theatre procedures, hospital admissions, patient acuity, and medical specialities.

Companion care hours (CCH) were extracted from records from the Clinical Services department of the Hospital and formed its own dataset. CCH data was deidentified and aggregated, and comprised the time required for a staff member to provide CCH over a patient's admission due to reasons including dementia, delirium, confusion, agitation and high falls risk. The data was collected by the clinical services officer and compiled by the principal researcher. CCH were grouped into <24 hours, 24-72 hours, 73-168 hours, and >168 hours.

Incident data was extracted from the hospital incident reporting database (RiskMan) and Safety and Quality Unit records and formed its own dataset. Rapid Response Call (RRC) incidents were defined as any episode of patient clinical deterioration where the rapid response team attended. Cardiac Arrest incidents were defined as the absence of pulse and respiratory effort, and unconsciousness, necessitating the commencement of resuscitation. Code Black incidents were defined as the activation of a code due to a person threatening or attempting to harm themselves or someone else requiring attendance or assistance from security staff. For calculation of the relevant rates, see Appendix 1.

Procedural data was extracted from the hospital PAS, specifically the Meditech procedural report, and formed its own dataset. After-hours procedures were determined as weekdays 1900 – 0700 hours, and anytime on Saturdays, Sundays and public holidays. Each case was classified as during hours or after-hours.

Patient hospital data was extracted from a Universal Patient Admissions Report run from the PAS which amalgamates server data. Data included average length of stay (LOS) (bed days), admissions, medical specialty areas (Appendix 2), patient deaths and patient admission location for each of the study years. Patient admission location was categorised as admitted from own home, transfers from non-acute care areas of HPH, transfers from the neighbouring tertiary hospital SCGH, and other (combined categories of <0.1%). Patient admissions were categorised as elective, emergency and other. It also included data on Charlson Comorbidity Index (CCI), which was used as a measure of patient acuity and was derived from an approximated score using patient comorbidities which is produced in a business analyst report (Appendix 3). Patients could be represented multiple times within the year period and/or across years.

STATISTICAL ANALYSIS

Emergency Department patient age was described using mean (M), standard deviation (SD), median (Md), and minimum (min) and maximum (max). Patient age was also categorised as <25 years, 25-64 years and ≥65 years and described using frequency (f) and percent (%). Patient disposition and catchment were described using f, %. This dataset was analysed using Excel version 16.82.

CCH, CCI, and LOS was described using M, SD, Md, 25th to 75th interquartile range (IQR), and min and max, with normality assessed as necessary using the Shapiro Wilk test. CCH (categorised), patient admission location, deaths, and medical specialities was described using f and percent %.

Differences in CCH from 2021 to 2022 were assessed using the independent samples Mann-Whitney U test (U) with the standardized test statistic and 2-sided p-value reported. Categorized CCH year differences were assessed using a Fisher-Freeman-Halton Exact Chi square (χ^2) tests with exact 2-sided p-value reported.

Comparison of 2021 to 2022 incidence rates of Rapid Response Calls, Cardiac Arrests, Code Black, deaths, after-hours procedures, patient admission location and admission type were determined using the online Medcalc version 22.017 procedure which reports the incidence rate and incidence rate difference with Poisson 95% confidence intervals (CI) and p-value. Rate is the ratio between the occurrence of interest and total exposed patients for each outcome, reported x1000. The incidence rate ratio (ratio of the two rates R1/R2) is reported with its 95% CI and associated p-value with a significant p-value indicating that the ratio incident rate ratio is significantly different from 1 (which is the case when the rates are equal) [20].

Differences in whether a procedure was during hours or after-hours for 2021 and 2022 were assessed using a Pearson Chi square (χ^2) tests with exact 2-sided p-value reported. Additionally, for the subset of after-hours procedures only, a between specialty area and year effect was examined (Fisher-Freeman-Halton Exact χ^2 test with Monte Carlo 2-sided p-value) to accommodate cell counts less than five.

Hospital patient 2021 and 2022 datasets were merged and a negative binomial with log link generalised estimating equations (GEE) used to assess the effect of year and speciality, including a year x speciality interaction, on outcomes CCI and average LOS. Patients were treated as a repeated measure. Tests of model effect p-values estimated marginal means, and 95% Wald CI were reported or graphically depicted.

Each dataset was analysed separately using IBM SPSS version 29.0 unless otherwise stated [21].

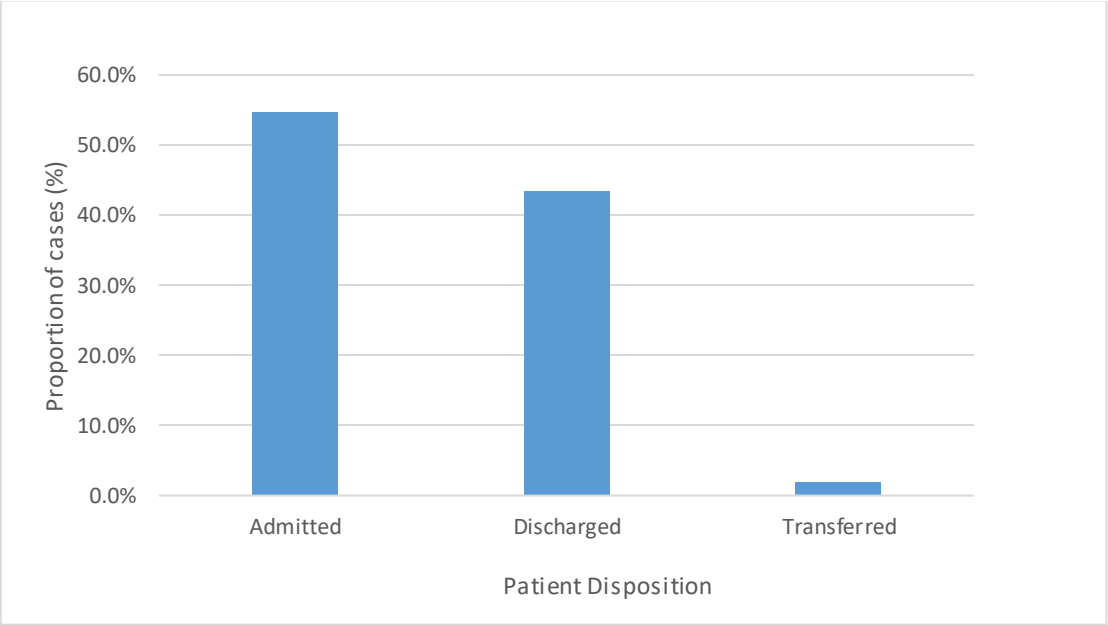
RESULTS

EMERGENCY DEPARTMENT

There were 5,815 presentations to HPH ED from 01 January to 30 June 2022, with approximately 32 presentations/day. There was an admission rate of 54.72% with 43.37% of patients discharged and 1.87% transferred (Figure 1). Disposition data was not captured for 0.03% of presentations.

The patient M_{age} was 63.5 years (Md=68.0, SD 21.9, range 3-103 years). Patient presentations according to age-groups comprised 7% aged <25 years, 37.64% aged 25-64 years, and 55.36% aged ≥65 years. Additionally, 74.22% of patients were from the NMHS catchment (Appendix 4) of which SCGH is the main tertiary hospital [22].

FIGURE 1. EMERGENCY DEPARTMENT PATIENT DISPOSITION 01 JANUARY TO 30 JUNE 2022



HOSPITAL

Companion Care Hours

CCH were reported for 68 patients in 2021 and 119 patients in 2022 (Table 1). There was a total of 5,404.75 CCH in 2021 and 15,934.75 in 2022. Median CCH were significantly higher in 2022 (Md=56.3) compared to 2021 (Md=32.5)(U=2.3, p=.021). When CCH groups were considered, no significant difference was detected between years 2021 and 2022 (χ^2=6.02, p=.109) although 2022 depicted lower counts of <24 and 24-<73 CCH and higher counts of 73-168 and >168 CCH (Figure 2 and Table 1).

FIGURE 2. PROPORTION OF CASES IN EACH COMPANION CARE HOURS GROUP FOR 2021 AND 2022.

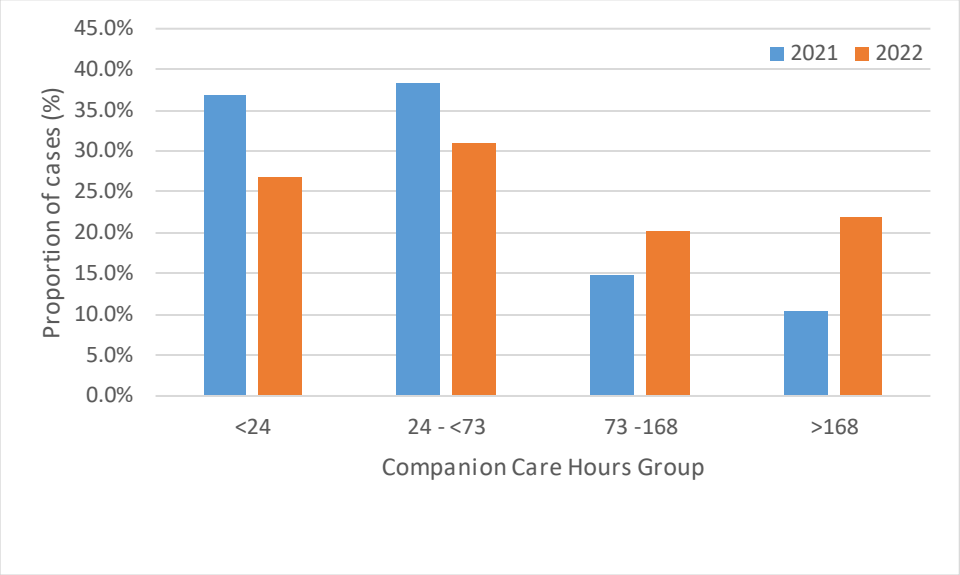


TABLE 1. COMPANION CARE HOURS SUMMARIES FOR 2021 AND 2022.

Companion Care Hours *	2021	2022
Mean (SD)	79.5 (139.9)	133.9 (201.8)
Md (IQR)	32.5 (14.3-74.3)	56.3 (18.0-147.0)
Min - max	4.0 - 801.0	3.5 – 1,218.5)
Companion Care Hour Groups	**f (%)**	**f (%)**
<24 hours	25 (36.8%)	32 (26.9%)
24 - <73 hours	26 (38.2%)	37 (31.1%)
73 -168 hours	10 (14.7%)	24 (20.2%)
>168 hours	7 (10.3%)	26 (21.8%)
Total (n)	68 (100%)	119 (100.0%)

Note. IQR = 25th and 75th percentiles f = frequency %=percent;
* statistically significant difference between 2021 and 2022 (U=2.3 p=.021)

Incident rates

Incident rates for RRC, cardiac arrests and code black are summarised in **Error! Reference source not found.**. A significantly higher incidence rate of RRCs was reported in 2022 compared to 2021 (p=.043). No significant differences were detected in the incidence rates of cardiac arrests (p=.445) or code blacks (p=.600).

TABLE 2. RAPID RESPONSE CALL, CARDIAC ARRESTS AND CODE BLACK INCIDENCE RATES SUMMARY TABLE AND COMPARISON.

	Observed events	Occupied Bed days	Incidence Rate (x1000)	95% CI Incidence Rate (x1000)	p-value
Rapid Response Calls					
2021	240	92,716	2.59	2.27 to 2.94	
2022	271	87,480	3.10	2.74 to 3.49	
Incidence rate difference			0.51	0.02 to 1.00	**.043***
Incidence rate ratio			1.20	1.00 to 1.43	**.043***
Cardiac Arrests					
2021	10	92,716	0.11	0.05 to 0.20	
2022	13	87,480	0.15	0.08 to 0.25	

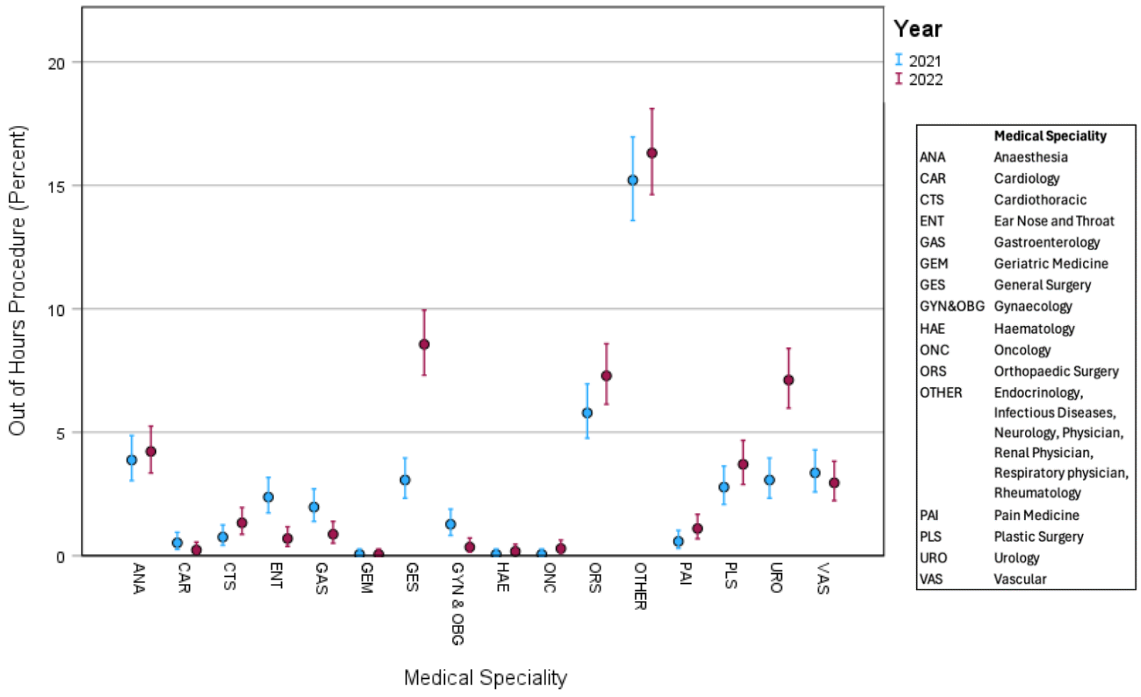
Incidence rate difference			0.04	-0.06 to 0.15	.444
Incidence rate ratio			1.38	0.56 to 3.51	.454
Code Black					
2021	10	92,716	0.15	0.08 to 0.25	
2022	16	87,480	0.18	0.10 to 0.30	
Incidence rate difference			-0.03	-0.15 to 0.09	.600
Incidence rate ratio			0.83	0.37 to 1.81	.606

Note. CI = confidence intervals; * **bolded** indicates a statistically significant difference in rates.

After-hours theatre procedures

More after-hours theatre procedures occurred in 2022 than 2021 (n=1,113/12,407, 9.0%; n=873/13,251, 6.6%; χ^2=50.9 p<.001) (Table 3). The proportion of specialty areas reporting after-hours theatre procedures are depicted in Figure 3 with a significant between-group difference detected (n=1,986, χ^2=110.6 p<.001). Notably in 2021, lower proportions of theatre procedures were reported for General Surgery (GES) (n=53/873, 6.1% versus n=148/1,113, 13.3%) and Urology specialties (URO) (n=53/873, 6.1% versus n=123/1,113, 11.1%).

FIGURE 3. PERCENTAGE OF OUT OF HOUR PROCEDURES BY SPECIALTY AREA



Note. Percentage with 95 percentile confidence intervals

TABLE 3. THEATRE AFTER HOURS PROCEDURES

	After Hours Procedures	Procedures	Incidence Rate	95% CI	p-value
Theatre					
2021	873	13,251	65.9	61.6 to 70.4	
2022	1,113	12,407	89.7	84.5 to 95.1	
Incidence rate difference			-23.8	-30.6 to -17.0	**<.0001***

Note. Rate is the ratio between after hours procedure and total procedures; ***bolded** indicates statistically significant incident rate difference p<.05.

Patient admissions

In 2021 there were 31,061 presentations by 21,712 patients with one-third of cases representing repeat attendances (n=9,349 cases, 30.1%). In 2022 there were 31,706 presentations by 21,503 patients with one-third repeat attendances (n=10,203, 32.2%). There were 3,425 patients represented in both the 2021 (15.8%) and 2022 (15.9%) cohorts.

Patients were equally represented in sex for both 2021 (Female=10,684 49.2%; Male=11,028 50.8; U=0) and 2022 (Female=10,539 49.0%; Male=10,963 51.0%; U=1 <.01%). In 2021 and 2022 patient age ranged from 6 to 104 years (M= 59.0 SD=17.5 Md=62.0 IQR 48-72 years and M= 59.5 SD=17.8 Md=62.0 IQR 48-73 years respectively).

The combined dataset included 62,767 presentations. CCI, average LOS, admission location, admission type and deaths presentation data are summarised in Table 4. For CCI, the GEE model reported a statistically significant effect for specialty (p<.001), however, no significant effects were detected for year (p=.770) nor a year x specialty interaction (p=.147) (Figure 4). For LOS the GEE model reported a significant effect for specialty (p<.001), a significant year x specialty interaction (p<.001), however, no significant effect was observed for year (p=.650) (Figure 5).

Patient admission location incidence rates (x1000) were examined with a significant difference detected for transfers from the neighbouring SCGH where the incidence rate was 11.8 in 2021 and 3.1 in 2022 (p<.001); and for other (11.5 and 7.5 respectively, p<.001). There was a total of 367 transfers from SCGH in 2021, but only 97 transfers in 2022. No significant incident rate differences were detected for own home (p=.138) or transfers from non-acute areas of HPH (p=.166) (Table 4).

Admission type (elective, emergency and other) was examined with a significant difference detected for elective where the incidence rate (x1000) was 925.2 in 2021 and 880.4 in 2022 (p<.001); emergency where the incidence rate was 67.4 in 2021 and 111.1 in 2022 (p<.001), but no significant difference for other (7.4 in 2021 and 8.5 in 2022 (p=0.119)) (Table 4).

TABLE 4. HOSPITAL AND PATIENT ACUITY MEASURES

	2021	2022
N	31,061	31,706
Charlson Comorbidity Index		
Mean (SD)	2.4 (2.4)	2.5 (2.4)
Md (IQR)	2.0 (1.0 – 3.0)	2.0 (1.0 – 3.0)
Min - max	0 - 20	0 - 20
Length of stay (days)		
Mean (SD)	2.0 (3.6)	2.1 (3.7)
Md (IQR)	1.0 (1.0 – 1.0)	1.0 (1.0 – 1.0)
Min - max	1 – 104	1 - 95
Admission location *(f, %)*		
Own home[1]	30,107 (96.9)	31,103 (98.1)
Transfer from non-acute area of HPH[2]	231 (0.7)	267 (0.8)
Transfer from SCGH[3*]	367 (1.2)	97 (0.3)
Other[4*]	356 (1.2)	239 (0.8)
Admission type ***(f, %)***		
Elective[5*]	28,739 (92.5)	27,915 (88.0)
Emergency[6*]	2,092 (6.7)	3,521 (11.1)
Other[7]	230 (0.7)	270 (0.9)
Deaths ***(f, %)***		
Death with autopsy	4 (<0.1)	3 (<0.1)
Death without autopsy	130 (0.4)	132 (0.4)
Total deaths	134 (0.4)	135 (0.4)

Note.

[1] Incidence rate difference between 2021 and 2022 p=.138

[2]Incidence rate difference between 2021 and 2022 p=.166

[3*]Incidence rate difference between 2021 and 2022 p<.0001

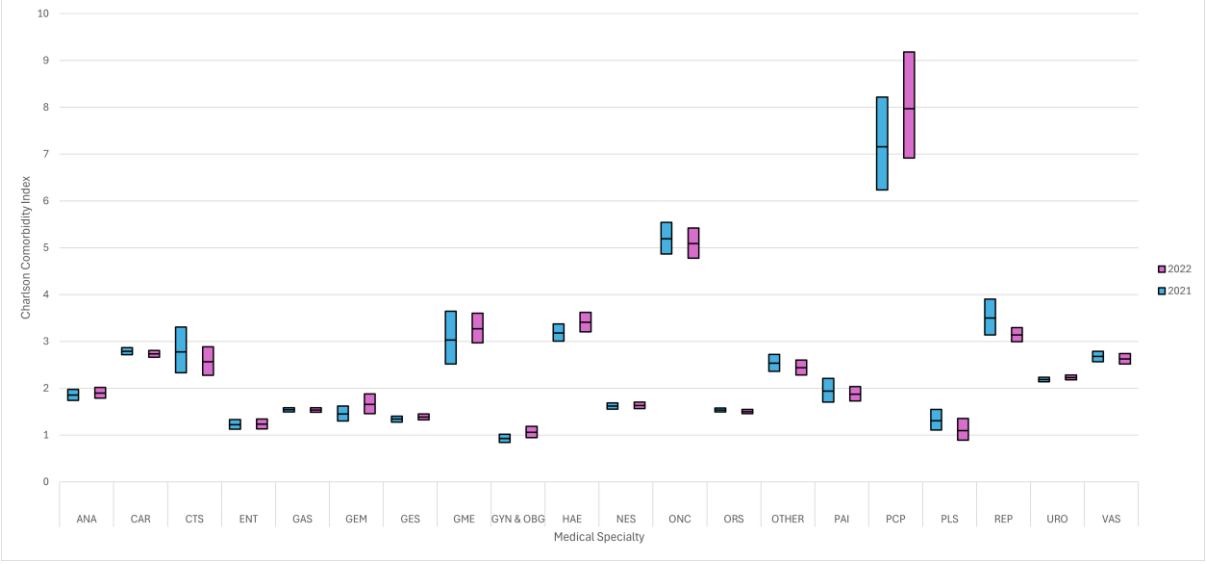
[4*]Incidence rate difference between 2021 and 2022 p<.0001

[5*]Incidence rate difference between 2021 and 2022 p<.0001

[6*]Incidence rate difference between 2021 and 2022 p<.0001

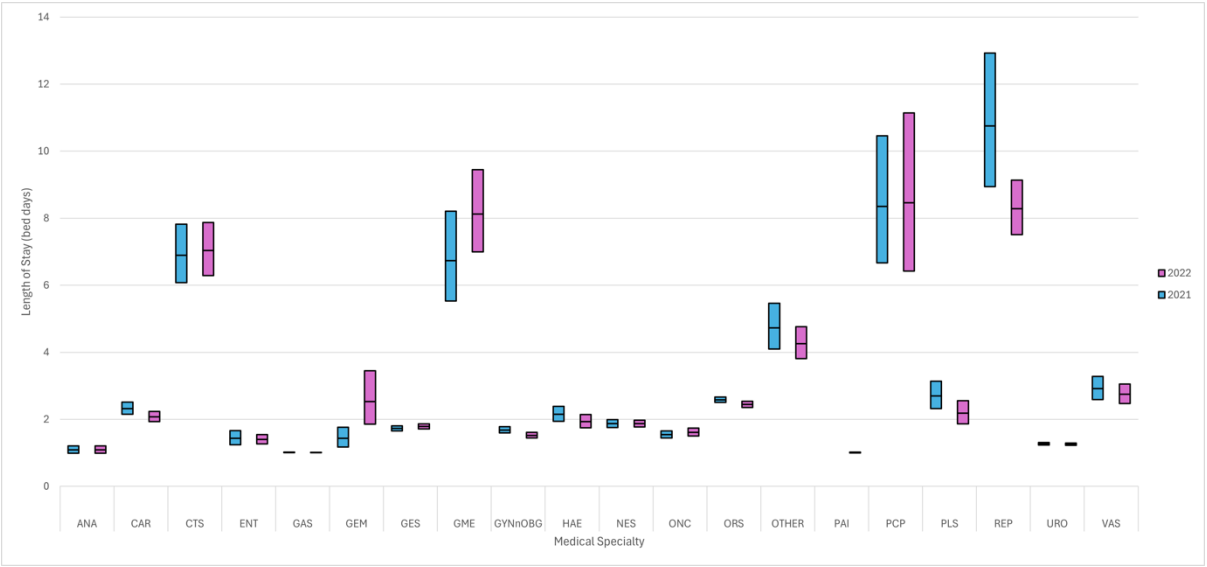
[7]Incidence rate difference between 2021 and 2022 p=.119

FIGURE 4. CHARSLON COMORBIDITY INDEX FOR EACH SPECIALTY BASED ON GENERALISED ESTIMATING EQUATIONS MODEL.



Note. Results are based on the Generalised Estimating Equations model and report estimated marginal means with 95% Wald confidence intervals. No significant Bonferroni corrected post hoc differences for each specialty between 2021 and 2022 in the generalised estimating equation model were detected.

FIGURE 5. LENGTH OF STAY FOR EACH SPECIALTY AND YEAR BASED ON GENERALISED ESTIMATING EQUATIONS MODEL.



Note. Results are based on the Generalised Estimating Equations model and report estimated marginal means with 95% Wald confidence intervals. No significant Bonferroni corrected post hoc differences for each specialty between 2021 and 2022 in the generalised estimating equation model were detected.

Specialty area admissions and deaths are described, with admission rate differences p-values reported at Table 5. Most specialties reported a significant difference in admission incidence rate (x1000) between 2021 and 2022. Significant changes included higher admission rates in 2021 for Gastroenterology from 129.3 in 2021 to 115.9 in 2022 (p<.001), General medicine 12.3 to 10.1 (p=.008), Gynaecology 28.2 to 22.3 (p<.001), Neurosurgery 59.0 to 53.3 (p=.002), Orthopaedics 136.3 to 116.2 (p<.001), Plastic surgery 7.2 to 5.2 (p=.001), Urology 135.6 to 124.3 (p<.001) and Vascular 28.0 to 25.2 (p<.001) respectively. Lower admission rates were reported in 2021 for Geriatric medicine from 9.2 in 2021 to 11.5 in 2022 (p=.005), General Surgery 91.5 to 96.9 (p=.030), Haematology 71.2 to 84.1 (p<.001), Oncology 134.0 to 142.7 (p=.003), Pain management 5.3 to 12.1 (p<.001), Rehabilitation 11.1 to 30.6 (p<.001), and Other specialities 32.1 to 43.2 (p<.001) respectively.

The number of patient deaths were similar in 2021 (f=124, 0.4%) and in 2022 (f=129, 0.4%) (Table 5). No significant difference in death incidence was detected between 2021 and 2022 for any specialty, or for the sample as a whole (one death for every 250 patients in 2021, one death for every 246 patients in 2022, p=.880) (Table 6).

TABLE 5. SPECIALTY AREA ADMISSIONS AND DEATHS FOR 2021 AND 2022 PERIODS.

	2021 (n=31,061)				2022 (n=31,706)				Admission Incidence difference
Specialty	Admissions f	%	Deaths f	%	Admissions f	%	Deaths f	%	p-value
Anaesthesia	585	1.9			608	1.9			0.756
Cardiology	1,600	5.2	5	0.3	1,604	5.1	6	0.4	0.609
Cardiothoracic Surgery	134	0.4			158	0.5	2	1.3	0.219
Ear Nose Throat	1,004	3.2			943	3	2	0.2	0.066
Gastroenterology	4,015	12.9			3,675	11.6			**<.0001***
Geriatric Medicine	285	0.9			364	1.1	1	0.3	**.005***
General Surgery	2,843	9.2			3,071	9.7	2	0.1	**.030***
General Medicine	382	1.2	8	2.1	319	1	4	1.3	**.008***
Gynaecology	877	2.8			708	2.2			**<.0001***
Haematology	2,212	7.1	18	0.8	2,666	8.4	11	0.4	**<.0001***
Neurosurgery	1,833	5.9			1,689	5.3			**.002***
Oncology	4,163	13.4	23	0.6	4,526	14.3	23	0.5	**.003***
Orthopaedics	4,234	13.6			3,683	11.6			**<.0001***
Pain Management	165	0.5			382	1.2			**<.0001***
Palliative	83	0.3	53	63.9	67	0.2	53	79.1	0.152
Plastic Surgery	224	0.7			165	0.5			**.001***
Rehabilitation	344	1.1	5	1.5	970	3.1	14	1.4	**<.0001***
Urology	4,211	13.6			3,940	12.4			**<.0001***
Vascular	870	2.8	1	0.1	799	2.5	1	0.1	**<.0001***
Other	997	3.2	11	1.1	1,369	4.3	10	0.7	**<.0001***

Note. Other includes specialities Endocrinology, Infectious diseases, Neurology, Physician, Renal Physician, Rheumatology and Respiratory Physician.

Blank cells for deaths (%) indicate no deaths were reported for that specialty.

Admission incidence difference compares the admissions for that speciality in 2021 compared to 2022. The significance result is reported for the incidence rate difference. * **bolded** indicates statistically significant incidence rate difference p<.05.

TABLE 6. DEATH INCIDENCE RATES PER MEDICAL SPECIALTY SUMMARY TABLE AND COMPARISON.

	Patient Deaths	Patients	Incidence Rate (x1000)	95% CI (x1000)	p-value
Cardiology					
2021	5	1,600	3.1	1.0 to 7.3	
2022	6	1,604	3.7	1.3 to 8.1	
Incidence rate difference			-0.6	-4.7 to 3.4	.766
Cardiothoracic surgery					
2021	0	134	0	0 to 27.5	
2022	2	158	12.7	1.5 to 45.7	
Incidence rate difference			-12.7	-31.7 to 6.4	.193
Ear Nose Throat					
2021	0	1,004	0	0 to 3.7	
2022	2	943	2.1	0.3 to 7.7	
Incidence rate difference			-2.1	-5.0 to 0.7	.145
Geriatric Medicine					
2021	0	285	0	0 to 12.9	
2022	1	364	2.7	0.1 to 15.3	
Incidence rate difference			-2.7	-8.8 to 3.3	.376
General Surgery					
2021	0	2,843	0	0 to 1.3	
2022	2	3,071	0.7	0.1 to 2.4	
Incidence rate difference			-0.7	-1.6 to 0.3	.174
General Medicine					
2021	8	382	20.9	9.0 to 41.2	
2022	4	319	12.5	3.4 to 32.1	
Incidence rate difference			8.4	-11.0 to 27.9	.397
Haematology					
2021	18	2,212	8.1	4.8 to 12.9	
2022	11	2,666	4.1	2.1 to 7.4	
Incidence rate difference			4.0	-0.3 to 8.4	.071
Oncology					
2021	23	4,163	5.5	3.5 to 8.3	
2022	23	4,526	5.1	3.2 to 7.6	
Incidence rate difference			0.4	-2.6 to 3.5	.777
Palliative					
2021	53	83	638.6	478.3 to 835.2	
2022	53	67	791.0	592.5 to 1034.7	
Incidence rate difference			-152.5	-423.1 to 118.1	.269
Rehabilitation					
2021	5	344	14.5	4.7 to 3.4	
2022	14	970	14.4	7.9 to 24.2	
Incidence rate difference			0.1	-14.7 to 14.9	.989
Vascular					
2021	1	870	1.1	<0.1 to 6.4	
2022	1	799	1.3	<0.1 to 7.0	
Incidence rate difference			-0.1	-3.4 to 3.2	.952
Other					
2021	11	997	11.0	5.5 to 19.7	

	Patient Deaths	Patients	Incidence Rate (x1000)	95% CI (x1000)	p-value
2022	10	1,396	7.2	3.4 to 13.2	
Incidence rate difference			3.9	-3.7 to 11.5	.319
Total Sample					
2021	124	31,061	4.0	3.3 to 4.8	
2022	129	31,706	4.1	3.4 to 4.8	
Incidence rate difference			-0.1	-1.1 to 0.9	.880

Note. Rate is the ratio between patient deaths and total patients.

DISCUSSION

PRINCIPAL FINDINGS

ED cohort and admission rates

Compared to Australian Institute of Health and Welfare (AIHW) data for public EDs nationally for 2021-2022, HPH ED had an older patient cohort (46% AIHW patients aged 25-64 years versus 37.64% HPH, 21% AIHW patients aged ≥65 years versus 55.36% HPH) and higher admission rate (28% AIHW versus 54.72% HPH) [23].

Contributing factors to the admission rate likely include the age of patients presenting to HPH ED (the AIHW data notes a higher admission rate of 52% for patients ≥65 years), and also the nature of HPH ED being private.

Impacts on patient acuity

The opening of HPH ED demonstrated an overall impact on HPH patient acuity including higher median CCH, increased rate of RRCs and more after-hours theatre activity, particularly among the general surgery and urology specialities. Given that HPH transitioned from a model where acute admissions were only accepted before 2200 hours, to a hospital with a 24-hour ED, this was not surprising.

Regarding the general hospital cohorts, however, there weren't consistent increases as expected in admission numbers, LOS and CCI across the hospital cohorts as a whole from 2021 to 2022 or all specialty groups where this had been hypothesised. General medicine, was one of the key areas predicted to be affected (19), however the number of admissions significantly declined from 2021 to 2022. However, significantly higher admission rates in other specialties were noted following opening of HPH ED including geriatric medicine, general surgery and rehabilitation. Although the number of admissions was similar across HPH from 2021 to 2022 (31,061 and 31,706 respectively), there was a significant change in the admission type from 2021 to 2022 with a decrease in elective admissions and an increase in emergency admissions highlighting a change in patient acuity.

Origin of patient admissions

The number of transfers from neighbouring SCGH declined significantly from 2021 to 2022, coupled with the fact that 74.22% of patients presenting to HPH ED were from NMHS catchment, suggests that SCGH patients were electing to present to HPH directly rather than the historical pathway of attending SCGH ED for emergency care prior to transfer to HPH. This aligns with literature suggesting that hospital distance and public ED wait times are impactful on patient choice. However, this was an indirect measure only and the specific impact on SCGH ED was not explored in this study.

Strengths and Limitations

There is minimal Australian literature available on the impact of opening an ED, particularly a private ED. This study presents new insights for a private hospital setting following a significant change to patient flows via opening of a private ED. These findings, however, should be considered in light of study limitations.

Coronavirus-19 is a confounding variable that significantly impacted the hospital during the study periods. Government-stipulated community lockdowns in WA in 2021 and 2022 negatively affected hospital activity (24) The effect appeared to be greater in the 2022 period based on budgeted hospital activity versus actuals following opening of the WA border in March 2022 due to surgical restrictions, high levels of community spread, staff furloughing and patient behaviours. This may explain to some degree why higher admission numbers weren't seen consistently across specialty groups and HPH as a whole. CCH was aggregated, hence patients with multiple case entries could not be identified limiting analysis. Regarding after-hours procedure data, weekend lists were included in the definition of after-hours procedures, however it is likely they represented a mix of planned booked lists or emergency lists. Additionally, it was not within the scope of this study to access or analyse data captured by the adjoining tertiary hospital SCGH.

MEANING OF THE STUDY

The study highlights the impacts a private hospital may experience following opening of an ED. Opening an ED in a private hospital will require significant resourcing and service changes to restructure a hospital that is used to a large volume of elective work to effectively resource and support an ED.

Change Management

Significant investment was required to engage with hospital staff and medical specialists to effectively support and resource the HPH ED. The establishment of medical, surgical and anaesthetic on-call rosters, after-hours procedural area access, and preparation of the wards to accept admissions overnight of acute and undifferentiated patients was a drastic cultural change and it was important not to underestimate the time and investment that these changes require.

Patient Flow

Patient flow became less predictable and more difficult to manage with HPH ED. To assist flow, in October 2022 an Acute Admissions Unit was established with 24-hour dedicated junior doctor cover, and an electronic hospital bed management system was introduced across the whole hospital.

Patient Acuity

Due to the increased patient acuity, medical staffing changes were required. This included increased staff in a number of specialties, review of after-hours staffing, implementation of an on-call roster for junior doctors, and additional recruitment of intensive care registrars to permit extra seniority in the hospital overnight.

Additionally, the increase in CCH necessitated a comprehensive review of the model of care for these patients. In 2023, patients with companions began to be cohorted to a designated area of the hospital to facilitate enhanced patient care.

Opening an ED was a new experience for HPH. Whilst some impacts were predicted, others were unforeseen. Despite this, HPH remained agile and responsive and acted quickly to implement supports such as reviewed staffing models and an acute assessment unit as challenges arose.

FUTURE RESEARCH

A key unanswered question relates to the direct impact of a private ED opening on a neighbouring tertiary hospital. Future research could explore trends in emergency department presentations between the public and private hospital and evaluate the role of private health insurance cover on patients' choice of hospital for emergency care.

A longitudinal analysis post coronavirus-19 would help to disentangle any potential confounding by government imposed restrictions on health services and evaluate the impact of ED opening on CCH, increased after-hours theatre activity, admission type and RRCs to determine whether these changes are sustained, and potentially increase further, over a longer period.

CONCLUSIONS

The opening of the HPH ED resulted in increased after-hours and emergency related admissions with a co-occurring increase in companion hours. These impacts necessitate significant resourcing investment such as revised staffing models and rosters, additional recruitment, and change management.

ETHICAL APPROVAL

Ethical approval for this research project was obtained from the Ramsay Health Care WA / SA Human Research Ethics Committee (Project ID: 2023/PID/0003, HREC ID: 2023/ETH/0000)

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CONFLICT OF INTEREST DECLARATION

The Author(s) declare(s) that there is no conflict of interest.

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APPENDIX 1 – CALCULATION OF RAPID RESPONSE CALL, CARDIAC ARREST AND CODE BLACK RATES

Rates were calculated as follows:

RRC Rate = number of rapid response calls / occupied bed days (overnight AND day only) x 1,000

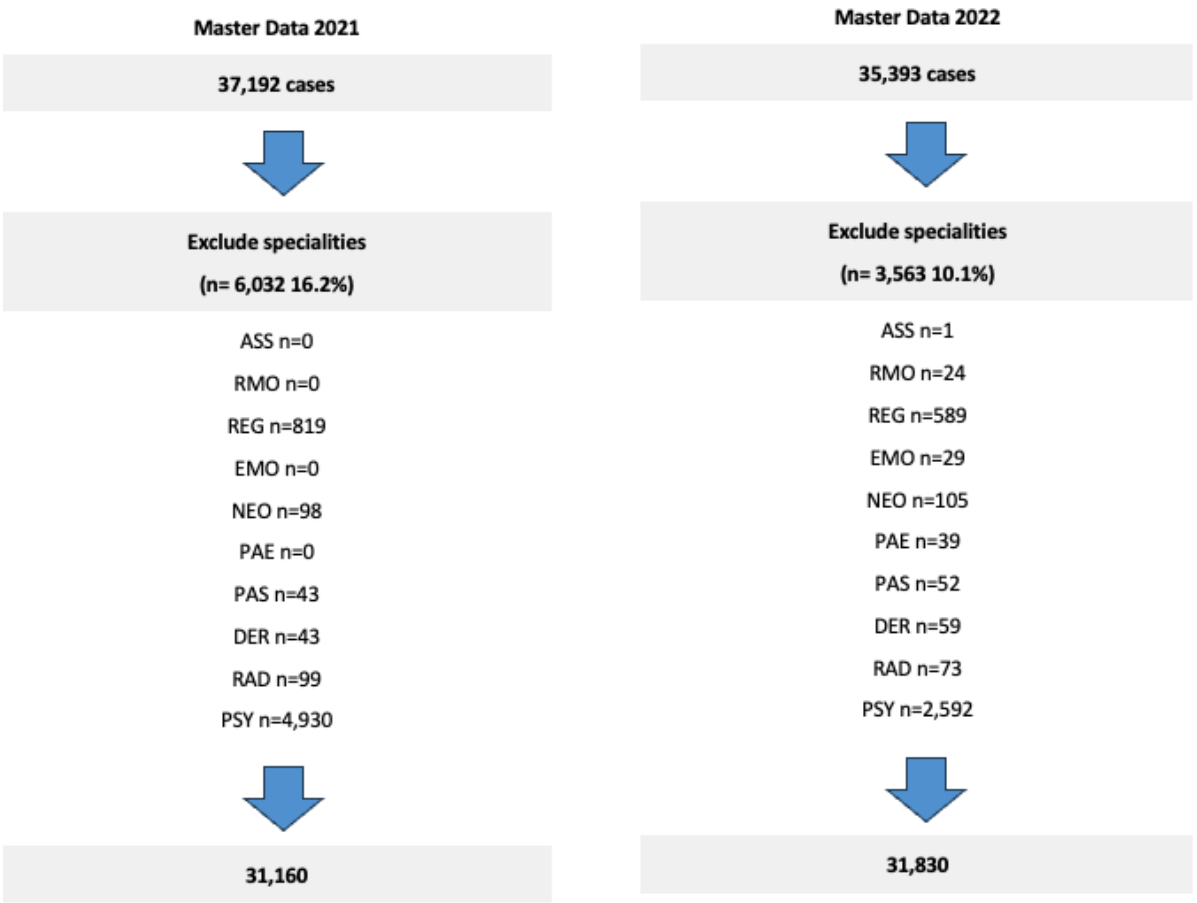
Cardiac Arrest Rate = number of patients experiencing a cardiac arrest / occupied bed days (overnight AND day only) x 1,000

Code Black Rate = number of Code Blacks / occupied bed days (overnight AND day only) x 1,000

APPENDIX 2 – SPECIALTY INCLUSIONS AND EXCLUSIONS

Specialty terminology was derived from the Patient Administration System report. Specialties considered for all hospital admission datasets were Anaesthesia, Cardiology, Cardiothoracic Surgery, Ear Nose Throat, Gastroenterology, Geriatric Medicine, General Surgery, General Medicine, Haematology, Neurosurgery, Gynaecology, Oncology, Orthopaedics, Pain Management, Palliative, Plastic Surgery, Rehabilitation, Urology, Vascular and Other. Other medical specialties included Endocrinology, Infectious Diseases, Neurology, Physician, Renal Physician, Respiratory Physician, Rheumatology.

Specialties excluded from this study were Assisting Surgeon, Dermatology, Emergency Medical Officer, Neonatology, Paediatrics, Paediatric Surgery, Psychology, Radiology and Registrar (see Flowcharts below).



APPENDIX 3 - CHARLSON COMORBIDITY INDEX

The business report approximates the score using the comorbidities that are available in the coded data under Australian Coding Standards which includes both active conditions such as neoplasms, as well as chronic conditions which are always coded when documented including Peripheral Vascular Disease, Cerebral Infarcts where deficits are ongoing, HIV as per ACS 0102 "HIV/AIDS" and chronic conditions as per ACS 0003 "Supplementary Codes for Chronic Conditions". Specifically, this includes the following chronic conditions: Chronic Heart Failure, Dementia, Chronic Obstructive Pulmonary Disease, Liver Disease, Diabetes Mellitus, Hemiplegia, Chronic Kidney Disease. The score was then adjusted to include an age component by adding a score for age as follows: 0 for <50 years; +1 for 50-59 years; +2 for 60-69 years; +3 for 70-79 years; +4 for ≥80 years.

APPENDIX 4- NORTH METROPOLITAN HEALTH SERVICE CATCHMENT DEFINITION

The North Metropolitan Health Service was defined as the following postcodes: 6005-6012, 6014-6038, 6050, 6059-6062, 6064-6067, 6077-6078 and 6090 (22).