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Original Contribution

Prolonged length of stay in ED psychiatric patients: a multivariable predictive model☆

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ABSTRACT

Background: We aimed to evaluate factors associated with prolonged emergency department (ED) length of stay (LOS) among psychiatric patients and to develop a multivariable predictive model to guide future interventions to reduce ED LOS.

Methods: Electronic health records of ED patients receiving a psychiatric consultation and providing research authorization were reviewed from September 14, 2010, through September 13, 2013, at an academic hospital with approximately 73000 visits annually. Prolonged LOS was defined as ≥8 hours.

Results: We identified 9247 visits among 6335 patients; median LOS was 4.1 hours, with 1424 visits (15%) with prolonged LOS. In the multivariable model, characteristics associated with an increased risk of a prolonged LOS included patient age 12 to 17 years (odds ratio [OR], 2.43; $P < .001$) or ≥65 years (OR, 1.46; $P = .007$); male gender (OR, 1.24; $P = .002$); Medicare insurance coverage (OR, 1.34; $P = .008$); use of restraints (OR, 2.25; $P = .006$); diagnoses of cognitive disorder (OR, 4.62; $P < .001$) or personality disorder (OR, 3.45; $P < .001$); transfer to an unaffiliated psychiatric hospital (OR, 22.82; $P < .001$); ED arrival from 11 PM through 6:59 AM (OR, 1.53; $P < .001$) or on a Sunday (OR, 1.76; $P < .001$); or ED evaluation in February (OR, 1.59; $P = .006$), April (OR, 1.66; $P = .002$), and May (OR, 1.54; $P = .007$).

Conclusions: Many psychiatric patients had a prolonged ED LOS. Understanding the multiple, patient-specific, ED operational, and seasonal factors that predict an increased LOS will help guide allocation of resources to improve overall ED processes and patient care.

1. Introduction

Emergency department (ED) throughput challenges, including overcrowding, increasing patient length of stay (LOS), and the attendant negative impact on quality of care, have received considerable attention in the United States and elsewhere in recent years [1–3]. Overcrowding contributes to treatment delays, ambulance diversion, elopement, undesirable medical events, introduction or exacerbation of existing health care disparities, increased cost of health care delivery, and even patient mortality [4–7]. Previous studies have analyzed factors associated with ED overcrowding and discussed individual patient characteristics associated with prolonged LOS, primarily focusing on the adult population [8–12]. Patients who seek emergency mental health care have an increasingly important role in increasing LOS, and specific factors influencing LOS in the psychiatric population have received considerable attention in the literature [13–17].

From 2000 through 2007, the percentage of all ED visits in the United States attributable to psychiatric care increased from 5.4% to 12.5% [16,18]. This dramatic increase occurred in the context of rising mental health diagnoses and burden, as noted by the World Health Organization [19], along with a decrease in inpatient US psychiatric bed availability, from 524878 beds in 1970 to 211199 in 2002 [20]. The overall reduction of inpatient psychiatric beds without the creation of adequate community-centered mental health treatment facilities has contributed to a crisis in mental health care that often "requires seriously ill

Abbreviations: AUC, area under a receiver operating characteristics curve; ED, emergency department; IQR, interquartile range; LOS, length of stay; OR, odds ratio.

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Table 1
Univariable associations with prolonged length of ED stay

Feature	All (N = 9247)	<8 hours (n = 7823)	≥8 hours (n = 1424)	OR (95% CI)	*P*	AUC
Age, y, No. (%)						
≤11	364 (4)	311 (4)	53 (4)	1.08 (0.89-1.46)	.62	0.555
12-17	1244 (13)	944 (12)	300 (21)	2.01 (1.74-2.33)	<.001	
18-64	6628 (72)	5724 (73)	904 (63)	1.0 (reference)		
≥65	1011 (11)	844 (11)	167 (12)	1.25 (1.05-1.50)	.01	
Gender, No. (%)						
Female	4917 (53)	4220 (54)	697 (49)	1.0 (reference)		
Male	4330 (47)	3603 (46)	727 (51)	1.22 (1.09-1.37)	<.001	0.525
Race, No. (%) (n = 8764)						
White	8400 (96)	6502 (88)	1161 (86)	1.0 (reference)		
Other	364 (4)	905 (12)	196 (14)	1.21 (1.03-1.43)	.02	0.511
Insurance, No. (%)						
Commercial	3074 (33)	2652 (34)	422 (30)	1.0 (reference)		
Medicaid	2312 (25)	1931 (25)	381 (27)	1.24 (1.07-1.44)	.005	0.525
Medicare	2246 (24)	1875 (24)	371 (26)	1.24 (1.07-1.45)	.005	
Other or self	1615 (17)	1365 (17)	250 (18)	1.15 (0.97-1.36)	.10	
Mode of arrival, No. (%) (n = 9226)						
Private vehicle or walk-in	6027 (65)	5154 (66)	873 (61)	1.0 (reference)		
Emergency medical service	2277 (25)	1916 (25)	361 (25)	1.11 (0.97-1.27)	.12	0.528
Law enforcement	893 (10)	713 (9)	180 (13)	1.49 (1.25-1.78)	<.001	
Commercial vehicle or other	29 (<1)	21 (<1)	8 (1)	2.25 (0.99-5.09)	.05	
Combined analysis of breath and blood alcohol						
Not done or negative	9060 (98)	7677 (98)	1383 (97)	1.0 (reference)		
Positive	187 (2)	146 (2)	41 (3)	1.56 (1.10-2.22)	.01	0.505
Normal saline administered	341 (4)	277 (4)	64 (4)	1.28 (0.97-1.69)	.08	0.505
Medical or physical restraints used	74 (1)	37 (<1)	37 (3)	5.62 (3.55-8.89)	<.001	0.511
Haloperidol administered	294 (3)	162 (2)	132 (9)	4.83 (3.81-6.13)	<.001	0.536
Lorazepam administered	1107 (12)	795 (10)	312 (22)	2.48 (2.15-2.87)	<.001	0.559
Final diagnosis (n = 9246)						
Anxiety	662 (7)	606 (8)	56 (4)	1.0 (reference)		
Cognitive disorder or dementia	91 (1)	64 (1)	27 (2)	4.57 (2.70-7.73)	<.001	0.591
Disorder of childhood and adolescence	148 (2)	123 (2)	25 (2)	2.20 (1.32-3.66)	.002	
Medical	1951 (21)	1743 (22)	208 (15)	1.29 (0.95-1.76)	.11	
Mood	3142 (34)	2633 (34)	509 (36)	2.09 (1.57-2.80)	<.001	
Other	836 (9)	717 (9)	119 (8)	1.80 (1.28-2.51)	<.001	
Personality disorder	63 (1)	49 (1)	14 (1)	3.09 (1.61-5.95)	<.001	
Psychosis	716 (8)	545 (7)	171 (12)	3.40 (2.46-4.69)	<.001	
Suicidal ideation or homicidal ideation	1204 (13)	969 (12)	235 (17)	2.62 (1.93-3.57)	<.001	
Substance use	433 (5)	373 (5)	60 (4)	1.74 (1.18-2.56)	.005	
Disposition type						
Admit to affiliated psychiatric hospital	3341 (36)	2931 (37)	410 (29)	1.37 (1.18-1.58)	<.001	0.695
Admit to medical service	851 (9)	769 (10)	82 (6)	1.04 (0.81-1.34)	.75	
Discharge	4178 (45)	3790 (48)	388 (27)	1.0 (reference)		
Transfer to county detoxification center	166 (2)	137 (2)	29 (2)	2.07 (1.37-3.13)	<.001	
Transfer to other (unaffiliated) psychiatric hospital	711 (8)	196 (3)	515 (36)	25.67 (21.12-31.19)	<.001	
ED saturation status at hour of visit (n = 9246)						
Green	6181 (67)	5303 (68)	878 (62)	1.0 (reference)		
Yellow or red	3065 (33)	2519 (32)	546 (38)	1.31 (1.17-1.47)	<.001	0.531
Maximum ED saturation on day of visit (N = 8610)						
Green	2817 (33)	2423 (33)	394 (30)	1.0 (reference)		
Yellow or red	5793 (67)	4864 (67)	929 (70)	1.18 (1.03-1.33)	.01	0.517
Psychiatric patients present at arrival						
<3	2600 (28)	2302 (29)	298 (21)	1.0 (reference)		
≥3	6647 (72)	5521 (71)	1126 (79)	1.58 (1.37-1.81)	<.001	0.542
Hour of arrival						
7 AM–2:59 PM	3711 (40)	3205 (41)	506 (36)	1.0 (reference)		
3 PM–10:59 PM	4299 (46)	3596 (46)	703 (49)	1.24 (1.09-1.40)	<.001	0.530
11 PM–6:59 AM	1237 (13)	1022 (13)	215 (15)	1.33 (1.12-1.59)	.001	
Day of visit						
Monday	1450 (16)	1196 (15)	254 (18)	1.35 (1.10-1.66)	.004	0.550
Tuesday	1479 (16)	1244 (16)	235 (17)	1.20 (0.98-1.48)	.08	
Wednesday	1398 (15)	1208 (15)	190 (13)	1.0 (reference)		
Thursday	1436 (16)	1216 (16)	220 (15)	1.15 (0.93-1.42)	.19	
Friday	1327 (14)	1165 (15)	162 (11)	0.88 (0.71-1.11)	.28	
Saturday	1055 (11)	912 (12)	143 (10)	1.00 (0.79-1.26)	.98	
Sunday	1102 (12)	882 (11)	220 (15)	1.59 (1.28-1.96)	<.001	
Day of visit[a]						
Weekday	6505 (70)	5539 (71)	966 (68)	1.0 (reference)		
Weekend	2742 (30)	2284 (29)	458 (32)	1.15 (1.02-1.30)	.02	0.515
Month of visit						
January	787 (9)	645 (8)	142 (10)	1.75 (1.32-2.31)	<.001	0.566
February	652 (7)	525 (7)	127 (9)	1.92 (1.44-2.56)	<.001	
March	751 (8)	626 (8)	125 (9)	1.59 (1.19-2.11)	.002	
April	727 (8)	577 (7)	150 (11)	2.06 (1.56-2.73)	<.001	