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ORIGINAL RESEARCH

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Characterizing patients hospitalized without an acute care indication: A retrospective cohort study

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Abstract

Background: Hospitalizations by patients who do not meet acute inpatient criteria are common and overburden healthcare systems. Studies have characterized these alternate levels of care (ALC) but have not delineated prolonged (pALC) versus short ALC (sALC) stays.

Objective: To descriptively compare pALC and sALC hospitalizations—groups we hypothesize have unique needs.

Designs, Settings, and Participants: A retrospective study of hospitalizations from March-April 2018 at an academic safety-net hospital.

Main Outcome and Measures: Levels of care for pALC (>3 days) and sALC (1–3 days) were determined using InterQual©, an industry standard utilization review tool for determining the clinical appropriateness of hospitalization. We examined sociodemographic and clinical characteristics.

Results: Of 2365 hospitalizations, 215 (9.1%) were pALC, 277 (11.7%) were sALC, and 1873 (79.2%) had no ALC days. There were 17,683 hospital days included, and 28.3% (n = 5006) were considered ALC. Compared to patients with sALC, those with pALC were older and more likely to be publicly insured, experience homelessness, and have substance use or psychiatric comorbidities. Patients with pALC were more likely to be admitted for care meeting inpatient criteria (89.3% vs. 66.8%, $p < .001$), had significantly more ALC days (median 8 vs. 1 day, $p < .001$), and were less likely to be discharged to the community ($p < .001$).

Conclusions: Patients with prolonged ALC stays were more likely to be admitted for acute care, had greater psychosocial complexity, significantly longer lengths of stay, and unique discharge needs. Given the complexity and needs for hospitalizations with pALC days, intensive interdisciplinary coordination and resource mobilization are necessary.

INTRODUCTION

Patients with prolonged hospitalizations comprise approximately 14% of hospital days in the United States.[1] Often requiring an alternate level of care (ALC), these stays strain hospital capacity and patient flow,[2,3] increase costs,[4] place patients at risk for health-care associated complications (i.e., functional impairment),[5–7] and result in negative patient and clinician experience.[8,9]

Studies have compared patients with ALC versus no ALC stays, but do not delineate between those with prolonged ALC (pALC) and short ALC (sALC) stays. This distinction is important as these groups may have unique care needs that require separate interventions to progress their care. Prolonged hospital length of stay is associated with psychiatric illness,[10] cognitive impairment,[11] low socioeconomic status,[12] older age,[13] and more subacute care needs on discharge, which are all likely barriers to discharge.[14–16] Most studies have focused on factors contributing to pALC stays. Short ALC stays are less well characterized in terms of patient factors, may be potentially avoidable, and may comprise up to 22% of short-length-of-stay admissions.[17] Discharge delays that contribute to sALC stays include insufficient weekend staffing gaps and delays in procedures and diagnostic tests.[18–21] Only one single-site study compared patients with a delayed discharge resulting in ≥19 ALC days to those with <19 ALC days and found that prolonged ALC days were associated with patient-related financial or behavioral barriers, homelessness, and impaired decision-making capacity.[22] It is important to distinguish between sALC and pALC stays because these groups may require unique workflow solutions for health systems and unique discharge planning needs.

Thus, we compared patients with pALC versus sALC stays in a safety-net hospital to better understand the differences between these groups, and to guide interventions that facilitate high-quality discharge in this vulnerable population.

METHODS

Study design, setting, and participants

We performed a retrospective cohort study at an academic safety-net trauma hospital in San Francisco, CA. Safety-net hospitals have a mission to provide healthcare for all individuals regardless of their insurance status or ability to pay. The study hospital has 234 medical-surgical beds and is a part of the San Francisco Health Network, which includes a 30-bed hospital-based skilled nursing facility (SNF) and a 780-bed free-standing long-term care and SNF for uninsured and Medicaid patients. We included inpatient hospitalizations to all clinical services from March 1 to April 30, 2018. We excluded observation hospitalizations. We defined pALC as hospitalizations with 4 or more ALC days, sALC as 1–3 ALC days, and no ALC as 0 ALC days based on InterQual© (Version 16.0) reviews. InterQual© utilizes a validated algorithm which is updated daily by utilization review nurses to classify each hospital day as meeting acute inpatient criteria versus ALC based on chart review of illness severity, intensity of service, treatment response, and comorbidities.[23] We a priori selected a 3-day threshold for pALC based on prior research[18–20] and our groups' multidisciplinary clinical expertise given anticipated short delays in diagnostic tests (i.e., imaging), therapeutic interventions (i.e., procedures), and care coordination (i.e., limited social worker staffing over the weekend). This quality improvement study was deemed exempt by the University of California San Francisco Institutional Review Board.

Study measures

We included selected sociodemographic, hospitalization, and post-discharge care characteristics from the electronic health record system. Sociodemographic characteristics included age, sex, self-identified homelessness status, self-identified race and ethnicity, primary language, and primary insurance. Characteristics of the hospitalization included admitting service, principal diagnosis, comorbidities, and if the patient had an in-network primary care physician (PCP). The principal diagnosis for the hospitalization was defined using Major Diagnostic Categories based on the discharge diagnosis. Comorbidities were defined using secondary billing diagnoses from the index hospitalization and categorized according to the Elixhauser Comorbidity Index.[24] The presence of dementia was determined based on the presence of ICD10 codes (F00, F01, F02, and F03) from the index hospitalization. We also characterized utilization and complications during the hospital stay, including whether a patient's admission met acute inpatient criteria, if the InterQual© status changed from ALC to care meeting inpatient criteria during the stay, length of stay, number of ALC days, hospital-acquired complications (HACs, per the Agency for Healthcare Research and Quality Patient Safety Indicators), and discharge disposition. Disposition included home/self (including unsheltered homelessness), subacute nursing facility, shelter/hotel, transfer to acute care, respite, death, psychiatric facility, hospice, and others. SNF discharges included in-network SNFs and those outside of the health system network (community SNF). Postdischarge care included hospital 30-day all-cause readmissions to the study hospital among those with an eligible discharge disposition (home, board and care, hotel, shelter, medical respite, SNF, residential treatment facility, against medical advice, absent without leave, declined service options); and PCP visits within 90 days of discharge among patients with an in-network PCP and with an eligible discharge disposition (home, board and care, hotel, shelter, medical respite, residential treatment facility, against medical advice, absent without leave, declined service options).[25–27]

Analysis

We conducted a series of descriptive analyses to compare patients with pALC stays versus sALC stays. To contextualize our findings of ALC stays, we presented characteristics for stays with no ALC days without statistical comparisons. For dichotomous and categorical variables, we used χ^2 or Fischer's exact test. For normally distributed

continuous variables, we calculated the mean and standard deviation and used *t*-tests to test for differences. For nonnormally distributed continuous variables, we calculated the median and interquartile range and tested for differences using the Wilcoxon rank sum tests. To illustrate how the level of care designation changed during a hospitalization, we created a heat map for the sALC and pALC groups depicting each hospitalization as a single row using Tableau Desktop. Each hospital day was color-coded according to the level of care assigned by InterQual criteria (red as acute or intensive care and yellow as ALC). For ease of interpretation, we limited the maps to the first 40 days of each hospital stay. All other analyses were conducted using SAS version 9.4.

RESULTS

Of 17,683 total hospital days included in the study period, 28.3% (5006 days) were ALC. There were 2365 hospitalizations during the study period, of which 215 (9.1%) included patients with pALC stays, 277 (11.7%) included sALC stays, and 1873 (79.2%) had no ALC days. The 215 patients with pALC stays accounted for 9.1% of admissions but 90.9% of all ALC days during the study period.

Baseline sociodemographic and clinical characteristics

Compared to the sALC group, patients with pALC were older, more commonly experienced homelessness, and had public insurance (Medicare or Medicare-Medicaid) as their primary payor source (Table 1). There were no meaningful differences by race, ethnicity, or primary language among sALC and pALC groups. Compared to patients with sALC stays, patients with pALC had greater comorbidity burden, including higher rates of alcohol use disorder (20.0% vs. 13.0% for sALC, $p = .036$), other drug use disorders (37.7% vs. 27.4% for sALC, $p = .016$), psychosis (28.4% vs. 16.6% for sALC, $p = .002$), neurological disorders (23.3% vs. 8.3% for sALC, $p < .001$), and dementia (14.4% vs. 6.9% for sALC, $p < .001$). Patients with pALC stays had different principal diagnoses compared to patients with sALC stays, with numerically fewer circulatory, respiratory, and digestive system illnesses, but more hospitalizations because of illnesses related to the nervous system (19.1% vs. 10.5% for sALC, $p < .001$), such as toxic encephalopathy. Patients with pALC stays less commonly had an assigned in-network PCP clinic before admission (49.3% vs. 60.6% for sALC, $p = .01$).

Health care utilization, complications, and postdischarge care

Compared to patients with sALC stays, patients with pALC stays were more likely to be admitted for an acute inpatient need (89.3% vs. 66.8% of sALC stays, $p \leq .001$), had a considerably longer length of stay (22 vs. 5 days, $p < .001$), more ALC days (8 vs. 1 days, $p < .001$), and experienced a greater proportion of their hospital stay as ALC (56.1% vs. 37.5%, $p < .001$) (Table 2). Over one-quarter of the pALC group developed an acute care need during their hospitalization after being designated ALC, significantly higher than the sALC group (26.0% vs. 14.8%, $p = .002$). Figure 1 shows the pattern of acute and ALC days for pALC and sALC groups. The median time to the first ALC day was 7 days (interquartile range [IQR]: 3–16.5) for the pALC group and 3 days (IQR: 0–5) for sALC group. The sALC group mostly had ALC at the end of their hospital stay (85.2%), while the pALC group experienced more transitions between care meeting inpatient criteria and ALC during their stay. One-quarter (24.9%) of sALC stays had zero acute care days with a median length of stay of 1 day (IQR: 1–2).

Patients with pALC stays had more HACs (8.8% vs. 1.8% for sALC, $p = .001$) and had notably different discharge patterns—fewer were discharged home (27.9% vs. 60.6%, $p < .001$), and more were discharged to an in-network SNF (30.2% vs. 8.3%, $p < .001$). More patients in the pALC group had 30-day hospital readmission (15.3% vs. 12.8% for sALC, $p = .464$), but these differences were not statistically significant. Among patients with an assigned in-network PCP prior to admission, 90-day PCP follow-up was similarly low for all groups (between 27.8% and 39.1%).

DISCUSSION

In this cohort study in a safety-net hospital, we found that one out of five patient days was nonacute (ALC), and nearly 1 in 10 hospitalizations included prolonged ALC of 4 or more days. Compared to patients with short ALC stays, we found that patients with prolonged ALC accounted for a disproportionately large number of ALC days, had a unique burden of mental illness, comorbidities, substance use disorders, and social needs (e.g., homelessness), and were discharged to the community far less often. Despite using a minimum threshold of only 4 days to define pALC stays, we found the median total and ALC days to be significantly longer for patients with pALC stays compared to those with sALC stays. Taken together, these results demonstrate that patients with pALC stays are a unique population that requires extensive care coordination for safe and effective discharge when compared to hospitalized patients with shorter ALC.

Most patients with pALC stays were admitted for care meeting inpatient criteria and then subsequently transitioned to ALC, consistent with prior research.[28,29] Similar to prior studies, we also found that patients with pALC stays were associated with older age, homelessness, substance use disorders, neurological disorders, dementia, mental illness, and dual Medicare-Medicaid payor,[10–13,22,30] which are also likely drivers of prolonged ALC stays. Prompt recognition of these factors would identify patients at greatest risk of pALC who may benefit from early multidisciplinary discharge planning to address physical health, behavioral health, and social needs.[22] Nearly three-quarters of those with a pALC stay were discharged to a facility. Awaiting transfer to SNFs has been shown to

TABLE 1 Sociodemographic and clinical characteristics of hospitalizations by number of alternate level of care days.

N = 2365	No ALC days, n = 1873	sALC (1–3 days), n = 277	pALC (>3 days), n = 215	sALC vs. pALC p value
Sociodemographic				
Age, years, median (IQR)	55 (40, 66)	57 (46, 68)	61 (51, 72)	.024
Male, *n* (%)	1216 (64.9)	170 (61.4)	145 (67.4)	.164
Homelessness,[a] *n* (%)	376 (20.1)	70 (25.3)	72 (33.5)	.121
Race and ethnicity				.220
White	450 (24.0)	84 (30.3)	66 (30.7)	
Black/African American	392 (20.9)	49 (17.7)	45 (20.9)	
Hispanic	616 (32.9)	90 (32.5)	61 (28.4)	
Asian	323 (17.2)	47 (17.0)	30 (14.0)	
Other/missing	92 (4.9)	7 (2.5)	13 (6.0)	
Primary language				.495
English	1403 (74.9)	212 (76.5)	174 (80.9)	
Spanish	257 (13.7)	35 (12.6)	18 (8.4)	
Chinese[b]	139 (7.4)	20 (7.2)	16 (7.4)	
Other/missing	74 (4.0)	10 (3.6)	7 (3.3)	
Primary insurance				.144
Private	180 (9.6)	15 (5.4)	12 (5.6)	
Medicare	527 (28.1)	83 (30.0)	79 (36.7)	
Medicaid	964 (51.5)	148 (53.4)	111 (51.6)	
Out-of-county insurance	110 (5.9)	20 (7.2)	11 (5.1)	
Other (uninsured, jail, indigent, missing)	92 (4.9)	11 (4.0)	2 (0.9)	
Dual Medicare-Medicaid	397 (21.2)	66 (23.8)	66 (30.7)	.088
Clinical				
Admitting service				.002
Medicine/family medicine	1007 (53.8)	140 (50.5)	127 (59.1)	
Surgery[c]	452 (24.4)	88 (31.8)	62 (28.8)	
Cardiology	219 (11.7)	29 (10.5)	5 (2.3)	
Neurology	93 (5.0)	11 (4.0)	16 (7.4)	
Other	97 (5.2)	9 (3.2)	5 (2.3)	
Principal diagnosis				<.001
Circulatory system	280 (14.9)	36 (13.0)	11 (5.1)	
Nervous system	198 (10.6)	29 (10.5)	41 (19.1)	
Musculoskeletal system	173 (9.2)	53 (19.1)	36 (16.7)	
Respiratory system	209 (11.2)	20 (7.2)	9 (4.2)	
Digestive system	140 (7.5)	28 (10.1)	7 (3.3)	
Other	873 (46.6)	111 (40.1)	111 (51.6)	
Elixhauser Comorbidity Index	884 (47.2)	134 (48.4)	149 (69.3)	<.001
Alcohol abuse	247 (13.2)	36 (13.0)	43 (20.0)	<.001
Drug abuse	518 (27.7)	76 (27.4)	81 (37.7)	.036

(Continued)

TABLE 1 (Continued)

N = 2365	No ALC days, n = 1873	sALC (1–3 days), n = 277	pALC (>3 days), n = 215	sALC vs. pALC p value
Psychoses	293 (15.6)	46 (16.6)	61 (28.4)	.016
Depression	235 (12.5)	37 (13.4)	36 (16.7)	.002
Other neurological disorder	159 (8.5)	23 (8.3)	50 (23.3)	.295
Dementia history	74 (4.0)	19 (6.9)	31 (14.4)	<.001
In-network PCP on admission	1139 (60.8)	168 (60.6)	106 (49.3)	.012

Note: All results shown are *n* (%) or median (interquartile range).

Abbreviations: ALC, alternate level of care; PCP, primary care provider.

[a]Patient homelessness was defined per the US Census definition of homelessness.

[b]Languages grouped under "Chinese" include Cantonese, Mandarin, or Chinese.

[c]Services grouped under "Surgery" include Trauma, Orthopedics, and Neurosurgery.

TABLE 2 Hospitalization characteristics by number of alternate level of care days.

N = 2365	No ALC days, n = 1873	sALC (1–3 days), n = 277	pALC (>3 days), n = 215	sALC vs. pALC p value
Admitted for acute care, *N* (%)	1873 (100.0)	185 (66.8)	192 (89.3)	<.001
Level of care change from ALC to acute, *N* (%)	NA	41 (14.8)	56 (26.0)	.002
Stays with no acute care days, *N* (%)	NA	69 (24.9)	17 (7.9)	<.001
Time to first ALC day, median days (IQR)	NA	3.0 (0.0, 5.0)	7.0 (3.0, 17.0)	<.001
Total Length of Stay, median days (IQR)	3.0 (2.0, 5.0)	5.0 (2.0, 8.0)	22.0 (10.0, 41.5)	<.001
Acute/intensive care	3.0 (2.0, 5.0)	4.0 (2.75, 7.0)	9.0 (4.0, 19.0)	<.001
Alternate level of care	NA	1.0 (1.0, 2.0)	8.0 (5.0, 20.5)	<.001
Percent of stay for ALC, median % (IQR)	NA	37.5 (20.0, 75.0)	56.1 (40.0, 76.5)	<.001
Hospital-acquired complication, any, *N* (%)	19 (1.0)	5 (1.8)	19 (8.8)	.001
Disposition, *N* (%)				<.001
Home (includes home health)	1369 (73.1)	168 (60.6)	60 (27.9)	
Shelter/hotel	74 (4.0)	22 (7.9)	5 (2.3)	
Medical respite	34 (1.8)	10 (3.6)	14 (6.5)	
In-network SNF	49 (2.6)	23 (8.3)	65 (30.2)	
Community SNF	55 (2.9)	23 (8.3)	18 (8.4)	
Psychiatric facility	14 (0.7)	2 (0.7)	11 (5.1)	
Hospice or palliative care	5 (0.3)	4 (1.4)	7 (3.3)	
Transfer to acute care facility	77 (4.1)	1 (0.4)	0 (0.0)	
Died	35 (1.9)	7 (2.5)	11 (5.1)	
Other[a]	161 (8.6)	17 (6.1)	16 (7.4)	
30-day all-cause readmission,[b] *N* (%)	237 (14.3)	33 (12.8)	27 (15.3)	.464
PCP visit within 90 days postdischarge,[c] *N* (%)	391 (39.1)	37 (27.8)	13 (28.3)	.954

Abbreviations: ALC, alternate level of care; PCP, primary-care physician; SNF, subacute nursing facility.

[a]Included against medical advice, absent without leave, declined service options, jail, missing data, and others.

[b]Restricted to the 2097 admissions with an eligible disposition (home, board & care, hotel, shelter, medical respite, SNF, residential treatment facility, against medical advice, absent without leave, declined service options) and readmission to the same facility

[c]Restricted to 1178 admissions by patients with an in-network PCP, and with a discharge disposition of home, board & care, hotel, shelter, medical respite, residential treatment facility, against medical advice, absent without leave, declined service options.

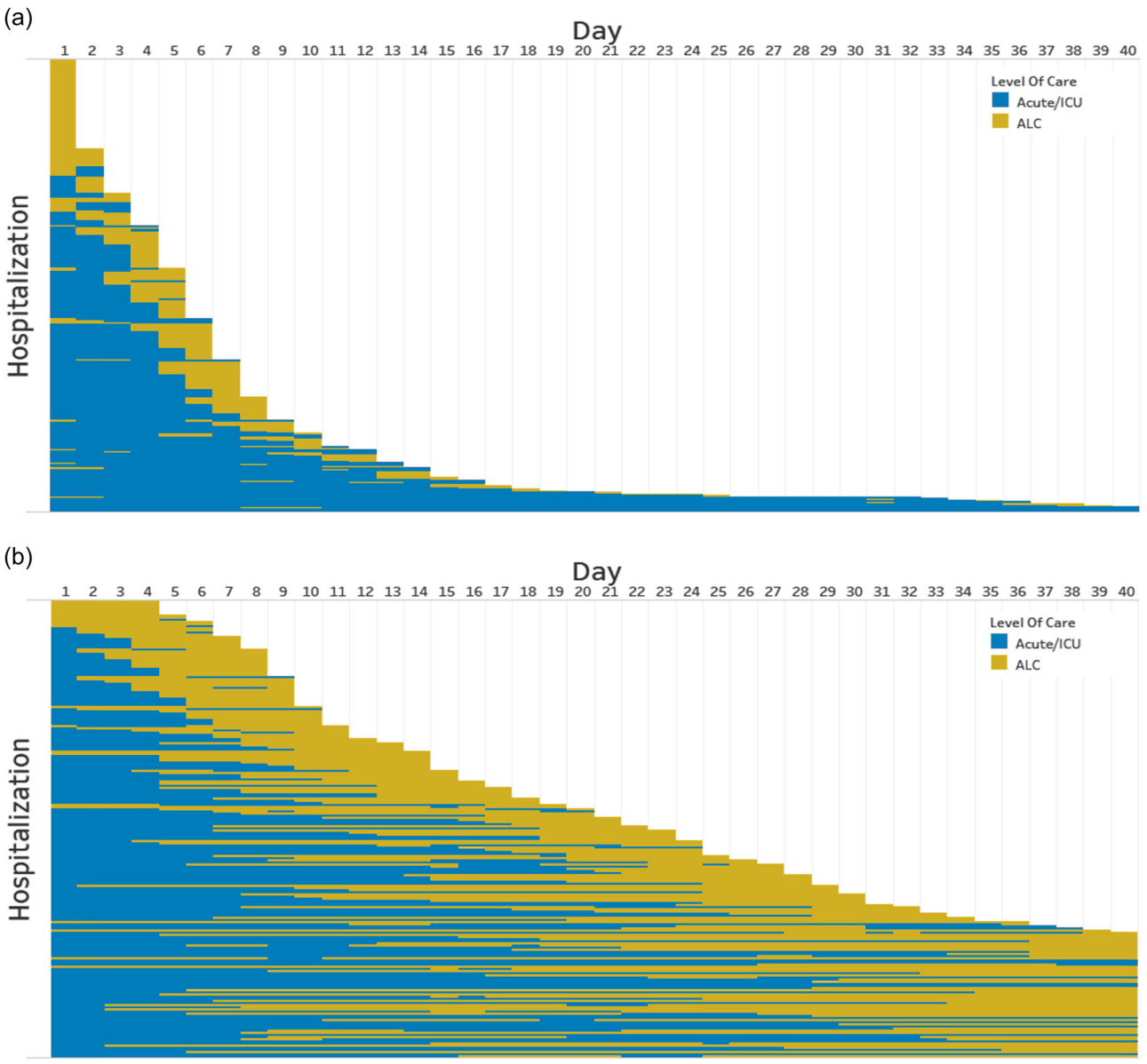

FIGURE 1 Heat map of level of care by hospital Day.[1] (a) Short alternate level of care stays. (b) Prolonged alternate level of care stays. [1]The heat maps depict each admission included as a single row. Each hospital day is color-coded according to the level of care assigned by InterQual© criteria (red as acute or intensive care; yellow as ALC). For ease of interpretation, we limited the maps to the first 40 days of each hospital stay.

contribute to longer hospital stays due to limited SNF bed capacity,[1,10,15] which likely contributed to the longer length of stay observed in the pALC group. Safety-net hospitals that do not have contracted or in-network SNFs and nursing homes may have even more prolonged ALC stays and should consider investing in these options to improve hospital capacity.[31] Lastly, we found that in-network PCP visits within 90 days were similarly low between pALC and sALC groups. Given the increased medical and psychosocial complexity, patients with pALC stays may benefit from greater linkage to primary care postdischarge. Further, to reduce the length of stay and effectively utilize hospital resources, community engagement and county and state government support are needed to increase services for those with mental illness, dementia, and substance use disorder, and provide housing services to those experiencing homelessness.[3,32,33]

We also found that patients with pALC stays more often transitioned to meeting acute inpatient criteria after ALC designation and were more likely to experience a HAC than patients with short ALC stays. These findings may be because prolonged hospitalization itself results in adverse clinical outcomes.[4,6,8] Alternately, this could be because patients with pALC stays were more likely to be admitted for care meeting inpatient criteria and had a greater comorbidity burden, suggesting that this population may be more vulnerable to clinical instability and complications. Further research is needed to assess whether pALC stays increase the risk of HACs, and if HACs during pALC stays are preventable

through hospital-based interventions or expedited discharge to a more appropriate level of care.

Patients with short ALC stays also had notable differences in postdischarge care. Prior research has suggested that short ALC stays were primarily driven by limited postacute care bed availability.[1,21,34] However, we found that most patients with sALC stays returned to the community. Another key finding was that approximately one-third of patients with sALC stays were not admitted for care meeting inpatient criteria and were discharged shortly thereafter. For one-quarter of sALC stays, the entire stay was ALC. This represents an opportunity to avert nonacute hospitalizations entirely when patients without acute care need first present to the emergency department, where over 20% of all admissions may be preventable.[17] This is especially important as even avoidable short-stay admissions impact hospital flow and has patient harm.[35,36] Interventions focused on better meeting the needs of emergency department patients with low medical acuity, but high social complexity could reduce ALC stays.[19,37,38] These patients may also be better served in a dedicated observation unit.[39]

Our study has several limitations. First, we defined level-of-care using InterQual© criteria. These criteria are an industry-standard tool that is widely used by hospitals to define the level of care and determine the appropriateness of hospitalization and payment,[23] but the details of the algorithm are unknown since it is proprietary. Second, our 2-month time period in the Spring may have underestimated the burden of ALC due to seasonal differences, such as winter capacity surges. Third, this is also a single-site study conducted at an urban safety-net hospital in a region with a high prevalence of homelessness and income inequality, so generalizability to other hospitals is uncertain. However, given our use of InterQual© criteria, our approach can be easily replicated and comparable to hospitals in other regions.

CONCLUSION

Within a safety-net hospital, ALC is common, and patients with pALC stays are distinct from patients with sALC stays regarding their reason for hospitalization, length of stay, medical and psychosocial history, and postdischarge care. To minimize or prevent unnecessary sALC stays, interventions include expediting care delivery and averting avoidable admissions through the emergency department. However, reducing pALC stays will require more complex care coordination that should start early during the patient's hospitalization and should address behavioral health and social needs. Recognizing the different types of barriers among patients with short versus prolonged ALC stays will allow for targeted interventions.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

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