Altshuler E, Austin A, Jones K, et al. Clinical Characteristics of the Extensively Prolonged Hospitalization: A Retrospective Analysis at a Large Tertiary Medical Center. *Brown Hospital Medicine*. 2024;3(4):54-60. doi:10.56305/001c.124094

Original Research

Clinical Characteristics of the Extensively Prolonged Hospitalization: A Retrospective Analysis at a Large Tertiary Medical Center

Ellery Altshuler, MD[1], Adam Austin, MD[2], Kirk Jones, DO[1], Rick Y Lin, MD[1], Lindsay Lee, MD[1], Sarah R Sherman, MD[1], David A Gittess, MD[1], Patrick Donabedian, MD[1], Madeline Smoot, MD[1], Maeve Keeley-Mehrad[1], Jeffrey Budd, MD[1]

[1] Department of Medicine, University of Florida,

[2] Pulmonary, Critical Care, & Sleep Medicine, Department of Medicine, University of Florida

Journal of Brown Hospital Medicine

Vol. 3, Issue 4, 2024

Article Information

Keywords: prolonged hospitalization, resource utilization, healthcare policy, resource allocation

https://doi.org/10.56305/001c.124094

Submitted: July 16, 2024 EST

Accepted: September 30, 2024 EST

Abstract

Background

Prolonged hospitalizations have contributed to the concentration of American healthcare spending in a small subset of patients. Research related to such events is scarce.

Methods

The authors performed a retrospective analysis of hospitalizations at a tertiary care center between 2012 and 2022. Extensively prolonged hospitalization (EPH) was defined as an uninterrupted hospital stay of at least 183 days. Patient data, including past medical history, hospital complications, barriers to discharge, and long-term outcomes were collected.

Results

Among 393,474 unique adult hospitalizations, mean length of stay was 5.49 days. There were 42 EPH, making up 0.01% of all admissions and 0.69% of hospital days. Patients with EPH were 62% male and had a median age of 58.5 years old. EPH featured a mean of 8.88 CTs and 2.12 MRIs. MRSA blood culture positivity was documented in 48% of cases. Mechanical ventilation and gastrostomy tube placement were performed in 88% and 71% of EPH, respectively. In 64% of cases, patients were medically stable for discharge and awaiting post-acute facility bed availability for at least three months. In-hospital death occurred in 31% of cases. Among patients who survived hospitalization, none were able to live independently, and median post-discharge survival was 94 days. At five-year follow-up, 1 patient (2%) was still alive.

Conclusions

These findings emphasize the importance of non-medical barriers to discharge in EPH. While larger studies are needed, this study suggests that long-term outcomes in EPH are grim.

INTRODUCTION

Healthcare costs have become increasingly concentrated among a subset of patients: 1% of patients account for 22.7% of healthcare spending.[1] By contrast, the bottom half of the population account for just 2.7% of healthcare spending.[1] More than a third of American healthcare spending goes to hospitals.[2] Efforts aimed at reducing healthcare expenditures have focused on limiting hospital admissions and reducing length of stay. Every year, there are more than 35 million unique hospital stays in the United States, with 6.7% of Americans admitted to the hospital at least once.[3]

Surprisingly, there has been limited research characterizing patients with prolonged hospitalizations. We describe this population in order to help anticipate patients at risk for requiring extended hospitalizations of at least six months. We present a retrospective analysis of admission diagnoses, common medical complications, sociodemographic information, and barriers to discharge with an emphasis on modifiable risk factors of this patient population.

METHODS

This study was approved by the Institutional Review Board at the University of Florida College of Medicine.

We performed a retrospective analysis from January 1, 2012, to January 1, 2022, at University of Florida Health Shands Hospital (UFHSH). Adults with hospitalizations lasting longer than six months were identified using the UFHSH Integrated Data Repository. Patient data was collected from the electronic medical records system.

An Extensively Prolonged hospitalization (EPH) was defined as an admission to our medical center for an uninterrupted period of at least six-months (183 days). Patients awaiting solid organ transplant or admitted to the psychiatry unit at any point were excluded from the analysis.

Among 393,474 total adult hospitalizations, 73 were identified as having lasted longer than six months. Among the 73 patients, 29 were excluded because they were awaiting transplant (22 for heart transplant and 7 for lung transplants). Two patients were excluded because their stay was in the psychiatric hospital. Forty-two adult patients (0.01%) were included in the final analysis.

Patient data, including past medical history, reason for admission, hospital course, and outcome, were collected. Barrier to discharge was categorized as "unmet post-acute facility need" only if patients were stated to be "medically stable for discharge" for at least three months. A full waiver of informed consent and waiver of HIPAA privacy authorization for identifying and enrolling subjects was obtained under IRB approval. Statistical analysis included Chi-Square tests to analyze factors associated with medical decision-making incapacity. A 95% Confidence Interval and a p value of 0.05 were used to determine statistical significance. Statistical analysis was performed with SPSS 28.0.1.0 (142) (IBM Corp, Armonk, NY).

RESULTS

Patient Characteristics

The characteristics of the study population are summarized in **Table 1**. The study cohort was 62% male with a median age was 58.5 years old (IQR 48.8-67.5; range: 21-80). Median BMI was 25.5 (range: 15.13-63.00). Twenty patients were Caucasian (48%) and 17 were African American (40%). The most common comorbidities were history of CVA (48%), COPD (21%) and congestive heart failure (17%). Three patients had private insurance while thirty-nine patients (93%) were insured by Medicare or Medicaid. Places of living prior to hospitalization included 22 patients (52%) living at home, 11 (26%) at a group-living facility, and 7 (17%) who arrived as transfers from outside hospitals. Thirteen (31%) patients were married and five (12%) had a history of homelessness.

Hospital Presentation

The most common presenting symptoms were neurological (11 patients; 26%) and trauma-related (9 patients; 21%). Specifically, the most common symptoms on presentation were altered mental status (7), sepsis (6), and burn (6). Three additional patients were admitted for a scheduled procedure. Thirty patients (73%) were admitted from the emergency department to a critical care unit.

Hospital Stay

Average length of stay for all hospital stays during the study period was 5.49 days. When hospitalizations that exceeded the 99th percentile were removed, average hospital stay was 5.21 days. Among patients with EPH, mean and median length of hospital stay was 335 and 281 days, respectively (IQR range 229-375 days; range: 189-1052 days) (**Table 1**). Total hospital days during this period were 2,046,065. Though they made up 42 patients studied accounted for 14,080 days (0.69%) of hospitalization days.

The most frequently recorded hospital complications were mechanical ventilation (37) tracheostomy placement (33), and gastrostomy tube placement (30). Other hospital complications included sacral ulcer (17), renal replacement therapy (15), and attempted cardiopulmonary resuscitation (12).

Patients had an average of 8.88 CT scans, including 3.74 CT scans of the head (range: 0-17), 2.50 of the chest (range: 0-10), and 2.64 of the abdomen and pelvis (range: 0-12). Patients received an average of 2.12 MRI scans (range: 0-31). Specifically, blood cultures were positive for methicillin-resistant *Staphylococcus aureus* (MRSA) in 19 patients (45%), vancomycin-resistant *Enterococcus* in 13 patients (31%), carbapenem-resistant organisms (CRO) in 9 patients (21%), and extended spectrum beta-lactamase in 4 patients (10%). Thirty-four patients (81%) had blood cultures result positive for at least one of these organisms at some point during their hospital stay. Palliative care was consulted for 26 patients (62%) while social work was consulted for 37 patients (88%).

Twenty-seven patients (64%) were considered stable for discharge with an unmet post-acute facility need at least three months. The main barrier to discharge was acute medical care necessity in 8 patients (19%) and unknown in 7 patients (17%). Patients had an unmet post-acute facility need at least three months were more likely to have a history of stroke (63% vs. 21%; $p = 0.012$), to have a social work consult (100% vs. 66.7%; $p = 0.001$), and to be deemed incapacitated, ($p = < 0.001$); they were less likely to pursue palliative care (3.7% vs. 60%; $p = <0.001$). There were no statistically significant differences in blood culture positivity, length of stay, or overall survival.

Table 1. Patient characteristics

Variable	Patients (n=42)
Age, median (range)	58.5 years (21-80)
Sex	
Male	26 (62%)
Female	16 (38%)
Race	
Caucasian	20 (48%)
Black/African American	17 (40%)
Hispanic/Latino	3 (7%)
Asian/Pacific Islander	1 (2%)
Unknown	1 (2%)
Insurance	
Private insurance	3 (7%)
Medicare/Medicaid	39 (93%)
Disposition on admission	
Critical care unit	30 (71%)
Non-critical care unit	11 (26%)
Capacitated at any time during hospitalization	8 (19%)
Main Barrier to Discharge	
Unmet post-acute facility need	27 (64%)
Medical need for acute care	8 (19%)
Missing	7 (17%)
Hospitalization Events	
Tracheostomy	33 (79%)
Sacral ulcer	17 (40%)
Renal replacement therapy	15 (36%)
Cardiopulmonary resuscitation	12 (29%)
Total CT scans, mean (range)	8.88 (1-26)
CT head, mean (range)	3.74 (0-17)
CT chest, mean (range)	2.50 (0-10)
CT abdomen/pelvis, mean (range)	2.64 (0-12)
Total MRIs, mean (range)	2.12 (0-31)
Positive blood cultures	34 (81%)
MRSA	19 (45%)
VRE	13 (31%)
CRO	9 (21%)
ESBL	4 (10%)
Died in the hospital	13 (31%)
Survived to discharge	29 (69%)
Discharged home	3 (10%)
Discharged to hospice	3 (10%)
Discharged to facility*	23 (79%)
Median length of stay, (range)	281 (189-1052)
Median survival from admission, days	442 ± 58
Five-year overall survival	1 (2%)

Medical decision-making

Eight patients (19%) were deemed capacitated to make medical decisions at any point during hospitalization while 34 patients (81%) were deemed incapacitated. Of the 34 incapacitated patients, 0 had an advanced directive documented or an appointed healthcare surrogate. Health care surrogate(s) were most frequently adult child (15), spouses (11), parents (4), sibling (3), court-appointed guardian (3). Seven patients had multiple (≥ 2) decision makers, including one patient with 20 adult children who had equal weight in medical decision-making. Compared to patients who deemed capacitated, incapacitated patients were more likely to have public insurance (84.6% vs. 15.4%, p = 0.029), to have been ready for discharge for at least 3 months (96.3% vs. 3.7%, p = <0.0001), to have placement listed as the main barrier to discharge (96.3% vs. 3.7%, p = <0.0001), and to have a social work consult placed (89.2% vs. 10.8%; p = <0.0001).

Outcomes

Median overall survival from start of hospitalization was 442 days ± 58 days. Thirteen patients (31%) died in the hospital; 5 died despite receiving CPR and 8 died with "do not resuscitate" orders in place. Twenty-nine patients (69%) survived to discharge. Kaplan-Meyer plots are provided below (**Figure 1**). Among the 29 patients who were discharged from the hospital, 23 went to a group-living facility (including subacute nursing facilities and rehabilitation facilities), 3 patients went to hospice facilities, and 3 patients went home with home nursing ordered. Median survival for discharged patients was 94 days.

Two patients were lost to follow-up after leaving the hospital. At follow-up three years since admission date, 3 patients (7%) were confirmed to be still alive. Five years after admission, one patient (2%) was still alive. Of the 3 patients who were still alive three years after admission, none were capable of living independently. Two of the patients were bedbound with severe neurocognitive impairment. One patient was ambulatory and was readmitted several times for self-neglect. This was the only patient confirmed to be alive five years after admission.

Hospitalizations Lasting Longer Than One Year

Eleven patients had hospitalizations lasting longer than one year. With a mean of 483 days, these 11 patients accounted for 6,034 hospital days (42% of the days accounted for by this cohort). With an average LOS 92 times the average, these 11 patients made up 0.00053% of all patients admitted during the studied time and 0.30% of all admission days. The longest hospital stay was 1052 days. Nine of the 11 patients were unable to make medical decisions for themselves at any point during their admission. Patients were considered stable for discharge for at least three months in all but one case. Five patients died during the hospitalization. Six patients were discharged; one was immediately lost to follow-up and five patients died 22, 40, 54, 56, and 94 days after discharge, respectively. One patient had private insurance and 10 had Medicare or Medicaid (**Table 2**).

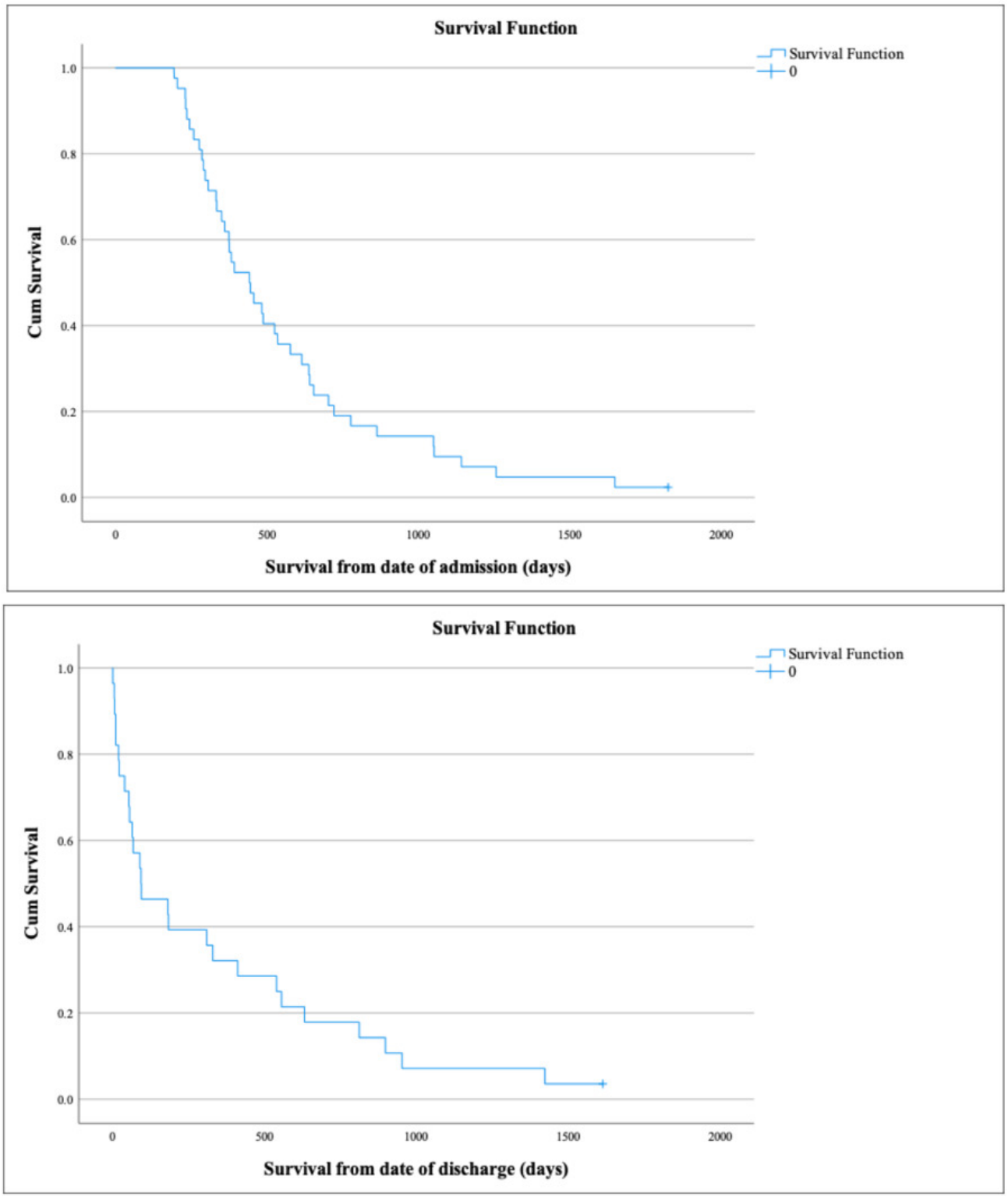

Figure 1. Top: Survival from the data of admission of the 42 adult patients with prolonged hospitalization. Bottom: Survival of the 29 patients who were discharged from the hospital alive.

DISCUSSION

The average length of stay in American hospitals is about 5.2 days, though the range is broad.[3] At the tail end of the curve are patients that stay in the acute hospital setting for greater than six months. We present a retrospective analysis of patients with EPH performed at a large, public tertiary care center in Florida with a catchment area that includes both rural and urban areas. To the best of our knowledge, this is the first study to describe EPH.

Although EPH made up an extremely small percentage of all admissions, they accounted for a significant number of hospital days. With a combined 14,080 hospital days (38 years, 210 days), the 42 admissions accounted

Table 2. Characteristics of the eleven hospitalizations lasting longer than one year.

Pt no.	LOS (days)	Age (years)	Stroke or dementia	Medical capacity	Chief complaint	Insurance	Primary barrier	Outcome
1	1052	52	Stroke	No	Mechanical trauma	Public	Placement	Died in hospital
2	670	73	Dementia	No	AMS	Public	Placement	Died 56 days after discharge
3	618	54	Stroke	No	Pneumonia	Public	Placement	Died in hospital
4	575	61	Dementia	No	AMS	Public	Placement	Died 40 days after discharge
5	525	69	Dementia	No	Sepsis	Public	Placement	Died in hospital
6	483	70	Dementia	No	Cardiac arrest	Public	Placement	Died in hospital
7	481	62	Neither	Yes	Scheduled procedure	Private	Placement	Died 54 days after discharge
8	445	58	Stroke	No	Sepsis	Public	Placement	Survived, lost to follow-up
9	422	76	Stroke	No	Cardiac Arrest	Public	Placement	Died in hospital
10	393	21	Neither	No	AMS	Public	Clinical instability	Died 94 days after discharge
11	370	70	Neither	Yes	CHF	Public	Placement	Died 22 days later

for 0.01% of hospital admissions and 0.69% of hospital days. Surprisingly, there has been limited research characterizing prolonged hospitalizations (PH), and studies that have analyzed prolonged hospitalization have used thresholds of 14 to 30 days.[3-6] In analyses PH lasting at least 21 days on an internal medicine service at a Colorado hospital, PH was found to be associated with MRSA bacteremia (2%), palliative care consult (15%), ICU stay (59%), and public insurance (Medicare and Medicaid).[6] Two analyses of post-surgical patients also found associations of PH with public insurance.[7,8] In our cohort, all but 3 patients had public insurance. In a separate study of PH among patients admitted through the emergency department, cognitive impairment was found to be independently associated with prolonged hospitalization among patients admitted through the emergency department.[9] In our cohort, 81% of patients were cognitively impaired.

The main barrier to discharge in our cohort was an unmet need for post-acute facility bed, which was the case for at least three months for 27 patients (64%). In contrast, only 8 patients (19%) had a medical need requiring ongoing hospitalization for acute care as their primary barrier to discharge. In-hospital waiting for discharge is linked to a number of adverse outcomes and is independently associated with increased mortality.[9,10]

In a study of geriatric patients with PH ≥ 20, the primary barrier to discharge was medical necessity for inpatient stay in 55% of cases and difficulty coordinating discharge to subacute nursing or rehab facility in 22% of cases.[11] In a study of VA patients, meanwhile, post-acute care facility needs were the most common cause of extended hospitalization.[12] Difficulties in finding an adequate post-acute care bed were often multifactorial, including complex medical needs such as requirement for ventilator management, requirement of treatment for multi-drug resistant organisms requiring isolation, outstanding bills, lack of adequate insurance, and criminal record.[12] EPH were associated with poor outcomes. Thirteen patients died in the hospital. Of the 29 patients who survived their hospitalization, 26 were discharged to a facility and 3 were discharged home with home nursing care. Strikingly, median post-discharge survival was just 94 days. Two patients were immediately lost to follow-up. Among the 27 patients, 26 had died within 5 years. None of the patients who were discharged were ever able to live independently.

There was a paucity of advanced care planning among patients with EPH. Only 1 of the 42 patients completed an advanced directive or designated a healthcare surrogate. These medical documents are important for guiding care when patients are medically incapacitated.[13,14]Capacity to make medical decisions is defined as the ability of a patient to understand the risks and benefits of an intervention and to understand the alternatives.[13] When patients are incapacitated to make decisions, advanced directives are used to help a surrogate is responsible for making decisions on behalf of the patient.

The lack of advanced care planning meant that many patients had medical decisions made for them by the legal default healthcare proxy. Of the 42 patients included, 34 were deemed to be incapacitated to make medical decisions throughout their hospitalization. None of these patients had completed an advanced directive or designated a healthcare surrogate, so default healthcare proxy was used in each case. In the state of Florida, the order of proxy is as follows: spouse, adult child, parent, sibling, adult relative, or close friend.[15] When no suitable proxy can be found, as was the case for three patients, a court-

appointed proxy is used. The 34 incapacitated patients received many procedures, including gastrostomy-tube placement, tracheostomy tube placement, and cardiopulmonary resuscitation that we cannot know if they would have consented for. While surrogates are encouraged to make decisions on behalf of the patient's best interest, several studies have shown that there is often discordance.[16] These findings stress the importance of advanced care planning.

There are no case series on patients with hospitalizations lasting longer than one year. In our cohort, there were 11 such patients. Making up 0.00053% of all hospital admissions, the 11 patients with PH exceeding one year accounted for 0.3% of all hospital days. Of the 11 patients, just two were deemed capacitated to make medical decisions for themselves at any point during their admission. Most of the patients had long-term neurocognitive impairment; 4 patients had severe dementia and 4 had suffered a CVA. Of the 6 patients who survived to discharge one was immediately lost to follow-up and the other 5 died within the next 94 days.

Caution should be used in interpreting our findings, as the cohort was quite small and there was no comparison group. Factors that appear to stand out, such as the high rate of medical incapacity, may be unique to our cohort and not associated with EPH. Additionally, our cohort was included patients from 2012 to 2022. While this group was treated homogenously, changes in access to healthcare, availability of nursing home beds, and many other factors undoubtedly changed during this period and are continuing to change.

In our cohort, no patient with an EPH survived to live independently, and just one was alive after five years. Long-term were extremely poor. Larger studies are needed to further investigate these poor outcomes, which could play an important role in helping patients and families decide whether to undergo invasive procedures and to assist healthcare providers in goals of care discussions.

Author Contributions

All authors have reviewed the final manuscript prior to submission. All the authors have contributed significantly to the manuscript, per the International Committee of Medical Journal Editors criteria of authorship.

- Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND
- Drafting the work or revising it critically for important intellectual content; AND
- Final approval of the version to be published; AND
- Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Disclosures/Conflicts of Interest

The authors declare they have no conflicts of interest

Corresponding author:

Ellery Altshuler, MD
Department of Internal Medicine
University of Florida
1600 Archer Road, Gainesville, Florida 32608
Ellery.Maya-Altshuler@medicine.ufl.edu
(305) 389-6231

REFERENCES

1. Cohen SB. *Differentials in the Concentration of Health Expenditures across Population Subgroups in the U.S., 2012*. Agency for Healthcare Research and Quality; 2014.

2. Andrea M, Keehan SP, Poisal JA, et al. National Health Expenditure Projections, 2018–27: Economic and Demographic Trends Drive Spending and Enrollment Growth. *Health Affairs*. 2019;38(3):491-501. doi:10.1377/hlthaff.2018.05499

3. Freeman WJ, Weiss AJ, Heslin K. *Statistical Brief #246: Overview of U.S. Hospital Stays in 2016: Variation by Geographic Region*. Healthcare cost and utilization project; 2018.

4. Doctoroff L, Hsu DJ, Mukamal KJ. Trends in Prolonged Hospitalizations in the United States from 2001 to 2012: A Longitudinal Cohort Study. *Am J Med*. 2017;130(4):483.e1-483.e7. doi:10.1016/j.amjmed.2016.11.018

5. Towle RM, Mohammed Hussain ZB, Chew SM. A descriptive study on reasons for prolonged hospital stay in a tertiary hospital in Singapore. *J Nurs Manag*. 2021;29(7):2307-2313. doi:10.1111/jonm.13360

6. Anderson ME, Glasheen JJ, Anoff D, et al. Understanding predictors of prolonged hospitalizations among general medicine patients: A guide and preliminary analysis. *J Hosp Med*. 2015;10(9):623-626. doi:10.1002/jhm.2414

7. Hwabejire JO, Kaafarani HM, Imam AM, et al. Excessively long hospital stays after trauma are not related to the severity of illness: let's aim to the right target! *JAMA Surg*. 2013;148(10):956-961. doi:10.1001/jamasurg.2013.2148

8. Krell RW, Girotti ME, Dimick JB. Extended length of stay after surgery: complications, inefficient practice, or sick patients? *JAMA Surg*. 2014;149(8):815-820. doi:10.1001/jamasurg.2014.629

9. Rossman SR, Reb CW, Danowski RM, et al. Selective Early Hospital Discharge Does Not Increase Readmission but Unnecessary Return to the Emergency Department Is Excessive Across Groups After Primary Total Knee Arthroplasty. *J Arthroplasty*. 2016;31(6):1175-1178. doi:10.1016/j.arth.2015.12.017

10. Nobili A et al. Polypharmacy, length of hospital stay, and in-hospital mortality among elderly patients in internal medicine wards. The REPOSI study. *Eur J Clin Pharmacol*. 2011;67(5):507-519. doi:10.1007/s00228-010-0977-0

11. Keverline KJ, Mow SJ, Cyr JM. Barriers to Discharge in Geriatric Long Staying Inpatient and Emergency Department Admissions: A Descriptive Study. *Geriatrics*. 2021;6:78. doi:10.3390/geriatrics6030078

12. Meo N, Liao JM, Reddy A. Hospitalized After Medical Readiness for Discharge: A Multidisciplinary Quality Improvement Initiative to Identify Discharge Barriers in General Medicine Patients. *Am J Med Quality*. 2020;35(1):23-28. doi:10.1177/1062860619846559

13. Barstow C, Shahan B, Roberts M. Evaluating medical decision-making in clinical practice. *Am Fam Physician*. 2018;98(1):40-46.

14. Tunzi M. Can the patient decide? Evaluating patient capacity in practice. *Am Fam Physician*. 2001;64(2):299-306.

15. *65E-5.2301. Health Care Surrogate or Proxy. Specific Authority 394.457(5) FS. Law Implemented 394.4598, 765, Parts I, IV, 765.204 FS. History–New 11-29-98, Amended 1-16-01, 4-4-05.*

16. Comer AR, Hickman SE, Slaven JE, et al. Assessment of Discordance Between Surrogate Care Goals and Medical Treatment Provided to Older Adults With Serious Illness. *JAMA Netw Open*. 2020;3(5):e205179. doi:10.1001/jamanetworkopen.2020.5179