Frequent Emergency Department Visits After Spontaneous Intracerebral Hemorrhage: Who Is at Risk?

The Neurohospitalist
2018, Vol. 8(4) 166-170
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DOI: 10.1177/1941874418755951
journals.sagepub.com/home/NHO

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Abstract

Background: The long-term prognosis of spontaneous intracerebral hemorrhage (SICH) is poor. Frequent emergency department (ED) visits can signal increased risk of hospitalization and death. There are no studies describing the risk of frequent ED visits after SICH. **Methods:** Retrospective cohort study of a community representative consecutive SICH survivors (2009-2015) from southern Portugal. Logistic regression analysis was performed to identify sociodemographic and clinical factors associated with frequent ED visits (≥ 4 visits) within the first year after hospital discharge. **Results:** A total of 360 SICH survivors were identified, 358 (98.6%) of whom were followed. The median age was 72; 64% were males. The majority of survivors ($n = 194$, 54.2%) had at least 1 ED visit. Reasons for ED visits included infections, falls with trauma, and isolated neurological symptoms. Forty-four (12.3%) SICH survivors became frequent ED visitors. Frequent ED visitors were older and had more hospitalizations ($P < .001$) and ED visits ($P < .001$) prior to the SICH, unhealthy alcohol use ($P = .049$), longer period of index SICH hospitalization ($P = .032$), pneumonia during hospitalization ($P = .001$), and severe neurological impairment at discharge ($P = .001$). Pneumonia during index hospitalization (odds ratio [OR]: 3.08; confidence interval [CI]: 1.39-6.76; $P = .005$) and history of ED visits prior to SICH (OR: 1.64; CI: 1.19-2.26, $P = .003$) increased the likelihood of becoming a frequent ED visitor. **Conclusions:** Predictors of frequent ED visits are identifiable at hospital discharge and during any ED visit. Improvement of transitional care and identification of at-risk patients may help reduce multiple ED visits.

Keywords

frequent, emergency department utilization, intracerebral hemorrhage, survivors

Introduction

Spontaneous intracerebral hemorrhage (SICH) is the most severe form of stroke with a 1-month median case fatality rate of 40% (13.1%-61.0%).¹ As a result of the interaction of pre-existent and acquired comorbidities, immobilization, and poststroke complications, SICH survivors remain at higher risk of death.² Early patient discharge may put patients at risk of postdischarge clinical deterioration with subsequent emergency department (ED) visits and readmissions. A substantial number of these readmissions may be preventable using structured transitional care and follow-up.³ Identification of patients at risk of hospital readmission or death in the ED has shown to reduce recurrent ED visits.⁴ Frequent ED users are considered a heterogeneous group of patients with 4 or more ED visits in a 12-month consecutive period.⁵ Frequent ED users are at higher risk of death.⁶ The characteristics of and risk factors for frequent ED users may vary according to the

specific chronic disease.⁵ There are no studies describing the characteristics of and risk factors for frequent ED users in SICH survivors. This information is crucial to establish effective interventions to reduce ED visits and possibly hospital readmissions after SICH.^{4,5} Therefore, we decided to study the factors associated with frequent ED visits within the first year after SICH.

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Table 1. Comparison Between Frequent and Infrequent Emergency Department Visitors Within the First Year After Hospital Discharge From Spontaneous Intracerebral Hemorrhage in Algarve.

Characteristics	Discharged Patients (SICH Survivors)	Patients With EDV		
		Infrequent	Frequent	P Value
Number (% of total)	358	314 (87.7)	44 (12.3)	
Age, median (IQR)	72 (18)	71 (18)	77.5 (11)	.008
Male gender, n (%)	229 (63.96)	203 (64.6)	26 (59.1)	.143
Marital status, n (%)				.724
Married	202 (56.4)	174 (55.6)	28 (63.6)	
Not married	155 (43.3)	139 (44.4)	16 (36.4)	
Social assistance income, n (%)	116 (32.4)	101 (32.2)	15 (34.1)	.832
Length of index hospitalization, median (IQR)	17.50 (17)	16.50 (16.25)	22.5 (20)	.032
Selected medical conditions, n (%)				
Diabetes	101 (28.2)	85 (27.1)	16 (36.4)	.559
Alcohol abuse	71 (19.8)	69 (22.0)	2 (4.5)	.049
Dementia	38 (10.6)	29 (9.2)	9 (20.5)	.083
Hematoma location, n (%)				.462
Deep	208 (58.1)	185 (58.9)	23 (52.3)	
Lobar	88 (24.6)	74 (23.6)	14 (31.8)	
Infratentorial	50 (14)	4 (14.0)	6 (13.6)	
Other (multiple locations, periventricular)	12 (3.4)	11 (3.5)	1 (2.3)	
In-hospital SICH episode complications, n (%)				
Clinical seizures	23 (6.4)	20 (6.4)	3 (6.8)	.845
Hyperactive delirium	58 (16.2)	53 (16.9)	5 (11.4)	.424
Deep vein thrombosis (DVT)	8 (2.2)	7 (2.2)	1 (2.3)	.722
Pneumonia	84 (23.5)	66 (21.0)	18 (40.9)	.001
Cardiac complications (infarction, cardiac failure)	7 (2)	6 (1.9)	1 (2.3)	.300
Discharge mRS, n (%)				.001
mRS $\leq$ 2	150 (41.9)	136 (43.3)	14 (31.8)	
mRS = 2-5	208 (58.1)	178 (56.7)	30 (68.2)	
Initial discharge destination, n (%)				
Home	126 (38.8)	115 (36.6)	11 (25)	.099
Intensive rehabilitation unit	93 (26)	80 (25.5)	13 (29.5)	.938
Other (convalescence/nursing home)	139 (38.8)	119 (37.9)	20 (45.5)	.223
Number of EDV in the 2 years prior to SICH, n (%)	259 (72.35)			<.001
<3	215 (60.1)	201 (64.0)	14 (31.8)	
$\geq$ 3	143 (39.9)	113 (36.0)	30 (68.2)	
Number of hospitalizations in the 2 years prior to SICH, n (%)	124 (34.7)			<.001
<3	332 (92.7)	297 (94.6)	35 (79.5)	
$\geq$ 3	26 (7.3)	17 (5.4)	9 (20.5)	

Abbreviations: EDV, emergency department visit; IQR, interquartile range; mRS, modified Rankin score; SICH, spontaneous intracerebral hemorrhage.

Methods

We conducted a retrospective cohort study of community representative consecutive SICH survivors (2009-2015) from a single tertiary hospital serving the entire well-defined region of Algarve in Portugal. This cohort was originally established to evaluate the short- and long-term outcome of SICH in the region. Details of the study region, selection of patients, and health-care organization are described elsewhere.^{7,8} Patients with other causes of intracerebral hemorrhage (fistulas, trauma, subarachnoid hemorrhage, hemorrhagic transformation of ischemic stroke, and cerebral venous thrombosis) and nonresidents were excluded. The primary data source was the hospital's electronic medical record system which stores clinical and paraclinical data. This system is linked to the National

Health Data Platform that registers all patients' contacts with the public health system and private hospitals. The electronic chart of each survivor was searched retrospectively to identify all ED visits within 1 year after hospital discharge. Patients with ≥ 4 ED visits (frequent ED users) within 365 days after hospital discharge were identified. Comparison against infrequent ED users (≤ 3 ED visits) was made on the basis of demographics, number of ED visits in the 2 years prior to index SICH, number of hospitalizations in the 2 years prior to index SICH, presence of comorbidities, and SICH hospitalization characteristics including duration, complications, neurological impairment, discharge destination, and modified Rankin score (mRS) at discharge. Complications included deep vein thrombosis, pneumonia, myocardial infarction,

Figure 1. The reason for a first emergency department visit within 1 year after hospital discharge due to spontaneous intracerebral hemorrhage.

Table 2. Logistic Regression Analysis of Factors Associated With Frequent Emergency Department Visits Within the First Year After Spontaneous Intracerebral Hemorrhage in Algarve.

Characteristics	OR	95% Confidence Interval		P value
		Lower	Upper	
Age, per additional year	1.237	0.801	1.910	.338
Length of hospitalization, per additional day	1.032	0.973	1.126	.548
History of previous hospitalizations	1.280	0.870	1.882	.210
History of previous emergency department visits	1.639	1.186	2.267	.003
Alcohol abuse	0.251	0.054	1.156	.076
Pneumonia during hospitalization	3.075	1.398	6.766	.005
mRS ≤ 2	0.882	0.401	1.937	.754
Discharge destination				
Home	1	.	.	
Intensive rehabilitation unit	0.787	0.301	2.879	.688
Nursing/resting/convalescence	1.632	0.872	2.793	.032

Abbreviations: mRS, modified Rankin score; OR, odds ratio.
 $P < .05$.

cardiac failure, clinical seizures, and hyperactive delirium. Neurological impairment was defined by discharge mRS ≥ 3 .

Statistical Analysis

Risk factors were first assessed using bivariate comparisons with the χ^2 test or Fisher exact test for categorical variables or

Mann-Whitney U test for continuous data. Variables showing an association in the bivariate analysis ($P \leq .05$) were included in the multivariate analysis. Statistical analysis was performed using IBM SPSS Statistics 23. The study was approved by the study site's institutional review board, and a waiver of informed consent was granted. The database was approved by the National Data Protection Commission.

Results

A total of 360 SICH survivors were identified; 358 (98.6%) patients were followed. Table 1 summarizes the overall clinical description of SICH survivors. The median age was 72 (interquartile range = 18); the majority were males (64%). A total of 388 ED visit episodes occurred during the first-year post-SICH. The majority of patients ($n = 194$, 54.2%) had at least 1 ED visit. Forty-four (12.3%) of the SICH survivors were frequent ED users. The main reasons of ED visit occurrences were infections, falls with trauma, and isolated neurological symptoms (Figure 1). Frequent ED users were older (median age was 77.5 years vs 71 years of patients with ≤ 3 ED visits) and had more frequent hospitalizations ($P < .001$) and ED visits ($P < .001$) prior to index SICH, unhealthy alcohol use ($P = .049$), longer index SICH hospitalization period ($P = .032$), pneumonia during hospitalization ($P = .001$), and higher mRS at hospital discharge ($P = .001$; Table 1). In logistic regression analysis, pneumonia during index SICH hospitalization (odds ratio [OR]: 3.08; confidence interval [CI]: 1.39-6.76; $P = .005$) and history of ED visits

prior to SICH (OR 1.64; CI: 1.19-2.26; $P = .003$) increased the likelihood of becoming frequent ED users within 1 year after hospital discharge due to SICH (Table 2). Rehospitalization occurred in 31 (75.6%) and in 85 (27%) of frequent and nonfrequent ED users, respectively. Nineteen (43.2%) of hospital readmitted frequent ED users died.

Discussion

This is the first study specifically designed to identify the factors associated with frequent ED visits after SICH. The most common reasons for ED visits may have been preventable, such as infections and falls. Close to a third of post-SICH frequent ED users were hospitalized within the first year after hospital discharge. This highlights the importance of early identification of at-risk SICH survivors to prevent further clinical deterioration. As previously shown in other diseases, appropriate identification and referral in the hospital can potentially prevent a substantial part of ED visits and rehospitalizations.^{4,9} The involvement of the ED staff in the chain of subacute stroke care management system is also important to identify at-risk patients when the system fails to trace them during the index hospitalization. Aging, a known marker of frailty,¹⁰ was associated in our study with an increased risk of becoming a frequent ED user within 1 year of hospital discharge. In this study, hospital admissions and ED visits prior to SICH were shown to be independent predictors for becoming a frequent ED user after index SICH. This may be an indirect marker of frailty, at least with regard to elderly patients, as their functional status may rapidly decline during hospitalization.¹¹ This and other factors found in the study such as duration of index hospitalization, pneumonia, and neurological dependency at discharge from the index SICH are readily available data and should be taken into account when planning a patient's hospital and ED discharge. Discharge to a nursing home or convalescence increased the likelihood of becoming a frequent ED user, although this difference did not reach statistical significance in our study. This may reflect heterogeneous postacute SICH care among different convalescent or nursing homes. Rather than a single cause, multiple ED visits are frequently multifactorial.^{4,5,9,12} As in other chronic conditions, the ED may not be the appropriate setting for management of postdischarge SICH complications.¹²⁻¹⁵ Socioeconomic status, including poverty, plays an important role in predicting ED admissions in some studies.¹² However, in our country, health care is universal and free of charge. This may justify the lack of statistical impact of economic status related to frequent ED visits. Our study has limitations that need to be taken into account. Comparisons were made between frequent and infrequent ED visitors, meaning that patients with serious complications having a single ED visit leading to death or hospitalization were considered as nonfrequent ED visitors. The inclusion of patients with clinically worse profiles among the nonfrequent ED visitors potentially reduced the weight of

some factors typically associated with post-SICH readmissions in the literature, such as post-discharge mRS, hospitalization complications, among others. This analysis, however, was not the objective of our study and is most suitable for studies aiming to find factors associated with hospital readmissions or postdischarge deaths rather than multiple ED visits. Furthermore, single ED visit is likely to be subject to random factors which are inherently difficult to predict.¹⁶ Lastly, some specific factors previously associated with hospital readmissions and ED visits after stroke^{14,15} were not investigated in our study. These include access to primary health care, proximity to the hospital, time to first poststroke outpatient consultation, and various comorbidities.

In conclusion, our study revealed the characteristics and risk factors associated with frequent ED visits among SICH survivors. Such patients are older, frail, and had more complications during the index SICH hospitalization. These risk factors are easily retrieved from hospital electronic charts. Therefore, establishing a system to flag patients as high risk prior to discharge and as recently discharged or otherwise high risk when presenting to the ED are possible solutions. A dedicated team in the ED could use the window of opportunity of the first postdischarge ED visit to offer a patient-guided care program to enhance understanding and improve treatment compliance.⁴ Early referral to specialist care is also considered of major importance, for example, in such cases as percutaneous endoscopic gastrostomy for recurrent aspiration or poor nutritional status due to dysphagia, botulinum toxin treatment for spasticity, or treatment of behavioral symptoms. Further studies and possibly multicenter studies to address risk factors, including appropriate interventions to reduce multiple ED visits, are needed to diminish clinical deterioration and hospital readmission among SICH survivors.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

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