Hospital readmissions after spontaneous intracerebral hemorrhage in Southern Portugal

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ARTICLE INFO

ABSTRACT

Objectives: Spontaneous intracerebral hemorrhage (SICH) survivors are at risk of hospital readmissions. Data on readmissions after SICH is scarce. We aimed to study the frequency and predictors of readmissions after SICH in Algarve, Portugal.

Patients and methods: Retrospective study of a community representative cohort of SICH survivors (2009–2015). The first unplanned readmission in the first year after discharge was the outcome. Cox regression analysis was performed to identify predictors of 1-year readmission.

Results: Of the 357 SICH survivors followed, 116 (32.5%) were readmitted within the first-year. Sixty-seven (18.8%) of the survivors were early readmitted (< 90 days), corresponding to 57.8% or all readmissions. Common causes were pneumonia, endocrine/nutritional/metabolic and cardiovascular complications. The risk of readmission was increased by prior to index SICH history of ≥ 3 previous emergency department visits (hazards ratio (HR) = 2.663 (1.770–4.007); P < 0.001), pneumonia during index hospitalization (HR = 2.910 (1.844–4.592); P < 0.001) and reduced in patients discharge home (HR = 0.681 (0.366–0.976); P = 0.048).

Conclusions: The rate of readmissions after SICH is high, predictors are identifiable and causes are potentially preventable. Improvement of care can potentially reduce this burden.

1. Introduction

Up to 75% of spontaneous intracerebral hemorrhage (SICH) survivors are severely disabled or deceased within the first year after the event [1,2]. Post-acute medical and neurological complications are the most relevant contributive factors for this long-term poor prognosis [2,3]. The occurrence of readmissions after hospital discharge from stroke is influenced by the quality of in-hospital management and hospital practices, the organization hospital discharge planning, and by the level of organization of post-acute care [3–6]. Despite its severity and importance, the literature on hospital readmissions has almost exclusively focused on ischemic strokes, with very few studies addressing the causes and predictors of hospital readmissions after SICH. In these studies, infectious and vascular complications were the primary reasons for hospital readmissions [7–12]. Advanced age, discharge functional dependency, specific comorbidities or high comorbid burden, discharge to nursing home emerged as the most common predictive factors for readmission after SICH [8–12]. Better identification of at risk SICH survivors may contribute to improve strategies aiming to reduce hospital readmissions. Therefore, we aimed to describe the causes and predictors of hospital readmissions after SICH in Algarve, the southernmost region of Portugal.

2. Patients and methods

This study is a retrospective analysis of consecutive SICH patients

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discharged from a single tertiary hospital, serving an entire well-defined geographical region, between January 2009 and December 2015. Full details of the study area and data acquisition are described elsewhere [13]. SICH patients who died during the index hospitalization were excluded from the analysis. For each SICH survivor, all episodes of hospitalizations within the first consecutive 365 days after the index SICH were retrieved using the National Platform for Health Data. This electronic health data allows online access to individualized medical and administrative records generated in the Portuguese National Health Service hospitals and primary care services. The first unplanned or emergency rehospitalization for more than 24 h or leading to death was the outcome. Patients readmitted for scheduled procedures or programmed treatments or interventions were not included in the study. The main reasons for readmission were categorized by chart review according to pre-specified criteria (supplementary file 1). As previously used, readmissions were defined as being early or late if they occurred within 90 days or between day 91 and 365 after hospital discharge respectively [12]. A pilot study with 56 survivors (8 each year) was performed to evaluate the consistency and reliability of the proposed data to collect (data not shown). Variables were included in the study if their extraction was possible in at least 80% of the clinical charts. Age (continuous and categorized to < 60, 60–69, 70–79, ≥80 years), gender, marital status, social insertion income, emergency department (ED) and hospitalizations in the two years prior to index SICH, vascular risk factors (hypertension, dyslipidemia, diabetes, unhealthy alcohol use, atrial fibrillation, previous stroke, current smoking),admission parameters (Glasgow coma score, hematoma volume, intraventricular hemorrhage), hematoma location, stroke unit admission, complications during index hospitalization (pneumonia, clinical seizures, hyperactive delirium, urinary tract infection), length of hospitalization (LOH), functional neurological status at discharge (modified Rankin Score/mRS) and discharge destination (home, intensive rehabilitation unit, nursing/convalescence) were included. Differences in baseline demographic, radiological, clinical, and hospital process of care variables between readmitted and non-readmitted survivors were assessed by chi square, Student's t test or Mann-Whitney U test depending on the variable. Kaplan–Meier survival curve using hospital readmission as endpoint was constructed. Based on prior knowledge, relevant covariates for readmissions after SICH were adjusted in multivariable analyses using Cox proportional hazards model, regardless of statistical significance. We also explored the possible contribution of the remain variables (Supplemental file 2). Constant relative hazard assumption was assessed with the Schoenfeld test. The overall significance of the final model was evaluated by Chi-square test of change in 2 log-likelihoods between the null and the saturated model. All analyses used SPSS 21 for Windows (IBM Inc., Armonk, NY, USA). The study was exclusively observational, with no modification of diagnostic procedures and clinical management of patients. All patient data were analyzed after anonymization. The Institutional Ethical Board approved the study. Permission from the National Data Protection Commission was obtained.

3. Results

Of the 360 SICH patients discharged alive, we were able to retrospectively follow 357 (99.2%) for at least one-year. The mean age was 70.2 (± 12.8) years and 228 (63.9%) patients were men. One-hundred-sixteen (32.5%) patients were readmitted within one-year after being discharged. Of these, 5 (4.3%) patients were admitted in another hospital. The proportion of readmitted patients increased rapidly in the first 3 months after hospital discharge (Fig. 1), with early readmissions occurring in 67 (18.8%) and late in 49 (16.9%) of SICH survivors. On other words, 57.8% of all readmissions occurred in the first 90 days. Table 1 contains baseline demographic, pre-SICH history, clinico-radiological and process of care data and comparison between readmitted and non-readmitted survivors. In comparison to non-readmitted

survivors, the group of readmitted patients was 5.5 years older (P = 0.008); had higher proportion of women (P = 0.024); more patients with previous stroke (P = 0.009); more hospitalizations (P = 0.011) and emergency department (ED) visits (P < 0.001) two years prior to index SICH. Regarding the characteristics of the index SICH, readmitted patients presented more often with lower Glasgow Coma Scale score (P = 0.024); had more often complications such as seizures, hyperactive delirium, and pneumonia (P < 0.05), and longer duration hospitalization (P = 0.021). Non-readmitted patients were discharged from index SICH hospitalization less often with severe neurological impairment (P < 0.001); and were sent more often to intensive rehabilitation and home (P < 0.001). The causes of first unplanned readmission are shown in Table 2. Overall, pneumonia (23.3%), endocrine, nutritional and metabolic disturbances (14.7%), cardiovascular disease (8.6%) and urinary tract infection (7.8%) were the most common causes of hospital readmission. The proportionality of hazards assumption in the Cox regression model (Table 3) was not violated (P = 0.073). Readmissions were increased in patients with history of ≥3 ED visits in the two years prior to index SICH (hazards ratio (HR) = 2.663 (1.770–4.007); P < 0.001) and who had pneumonia during index hospitalization (HR = 2.910 (1.844–4.592); P < 0.001). Patients discharge home had reduced the risk of readmission (HR = 0.681 (0.366–0.976); P = 0.048). Categorized age, hematoma volume and intraventricular hemorrhage were not independently associated with SICH readmission (Supplemental file 2) were independently associated with readmissions. Stroke unit admission during index hospitalization was associated with reduced readmission only on unadjusted analysis. The overall goodness-of-fit of the full regression model (Table 3) was significant (P < 0.001).

4. Discussion

This is the first study describing the causes and factors associated with hospital readmissions after SICH in Portugal. One third of SICH survivors were readmitted at least once within the first year. The two previous studies addressing the annual readmission rate after SICH in the two last decades found higher rates, 40.6% in Norway [12], and 44.7% in Taiwan [14]. Unfortunately, in addition to the methodological differences between the studies, the presence of a myriad of socio-demographic, patient level variables and clinical processes of care factors contributing to hospital readmissions hampers any consistent comparisons [3]. For instance, the in-hospital mortality rate was 24.5% Norway [12] and 25% in Taiwan [14], substantially inferior to that from our region (34.4%) [13]. It is conceivable that the lower readmission rate in our study could be partially in relation to a relative reduction of the pool of severe SICH patients surviving. Unfortunately neither our nor any of the aforementioned studies included the analysis of limitation of care practices, an independent risk factor of death [15], that would potentially improve the understating of post-acute stroke occurrences, including readmissions. Although not statistically significant, patients treated at the stroke unit were less often readmitted. This favors that better stroke care reduces readmission of SICH patients. The rate of early readmissions after SICH was higher than both the average Portuguese global rate of early readmissions for patients aged ≥ 65 years (5.3%) and the early readmission rate of patients with higher comorbidity burden recently hospitalized in an Internal Medicine ward in Portugal (16.8%) [16,17]. This suggests that either because of post-SICH status or its comorbid conditions, survivors may be particularly prone to complications leading to hospitalization.

Consistent with previous studies, potentially preventable complications such metabolic derangements, falls, thromboembolism, but mostly infections, were responsible for readmissions after SICH also in our cohort [3,14,12]. In contrast to the findings from others [18,19] the economic income was not an important factor for readmission in our study. The universal free access to the public health care in the country may explain this result. The main significant predictors of one-year