

Estimating the burden of intracranial hemorrhage in persons with hemophilia A using administrative claims data

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INTRODUCTION

- Intracranial hemorrhage (ICH) is a serious and life-threatening complication of hemophilia A (HA), although it is less common than other types of bleeds.¹
- Previous studies have reported an incidence rate of ICH between 2–4% in persons with HA (PwHA).^{2,3}
- Few studies have assessed the downstream consequences of ICH in PwHA. Here, we examined the clinical, healthcare resource utilization, and cost burden of HA before and after ICH in PwHA.

METHODS

- US administrative claims data from the MarketScan Commercial Research Database and the PharMetrics Plus Database from 01/01/06 to 12/30/18 (MarketScan data only available until 9/30/18) were searched for ICH events.
- Eligible PwHA were aged ≤65 years, with ≥1 claim involving ICD-9-CM/ICD-10-CM diagnosis codes⁴ for ICH, and were identified using a validated claims-based HA algorithm.⁵
 - Eligible PwHA were continuously enrolled for ≥6 months after the index event (the first ICH event).
 - An inpatient analysis compared healthcare resource utilization and the cost of HA in the 6 months before and after the index event.
- Clinical conditions and major bleeds were identified using ICD-9-CM/ICD-10-CM diagnosis codes and a previously developed algorithm,⁶ respectively.
- Physical therapy (PT), durable medical equipment (DME) use, factor VIII (FVIII) treatment, and bypassing agents (BPAs) were identified using NDC, CPT, or other HCPCS codes.
- Patient clinical characteristics were descriptively examined in the 6 months after the index event (the follow-up period), while healthcare resource utilization and costs were descriptively examined in the 6 months before and after the index event using Wilcoxon signed-rank and McNemar tests for continuous variables (**Table 2**) and categorical variables (**Figure 2**), respectively.

RESULTS

Clinical characteristics (N=69)

- A total of 69 PwHA had ≥6 months of continuous enrollment before the index event (**Figure 1**).
 - The mean age was 21.1 years (standard deviation [SD]: 18.9) and 16 (23.2%) patients were <5 years old (**Table 1**).

Figure 1. Analysis population.

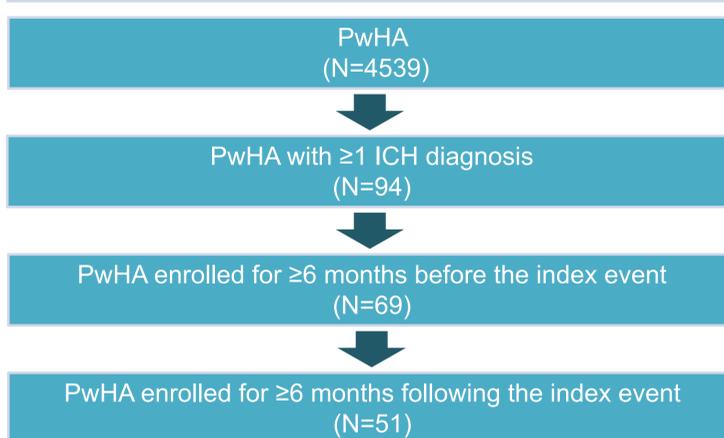


Table 1. Patient demographics and clinical characteristics (N=69).*

Mean age (SD), years	21.1 (18.9)
≤5 years, n (%)	16 (23.2)
6–17 years, n (%)	20 (29.0)
18–65 years, n (%)	33 (47.8)
Male, %	100
Region, n (%) [†]	
Northeast/East	27 (39.1)
North Central/Midwest	14 (20.3)
South	13 (18.8)
West	13 (18.8)
Evidence of a major bleed after ICH, n (%)	26 (37.7)
Evidence of FVIII inhibitors, n (%) [‡]	11 (15.9)
Mean CCI score (SD)	0.9 (1.8)
Common comorbidities, n (%)	
Joint/musculoskeletal conditions [§]	23 (33.3)
Chronic pain diagnosis	22 (31.9)
Fracture	12 (17.4)
Mental health-related diagnosis	11 (15.9)

CCI, Charlson Comorbidity Index; n, number; SD, standard deviation. *Clinical characteristics were examined in the 6-month follow up. [†]Unknown not shown here. [‡]Indicated by a claim for a BPA. [§]Including arthropathy.

Healthcare resource use and costs (N=51)

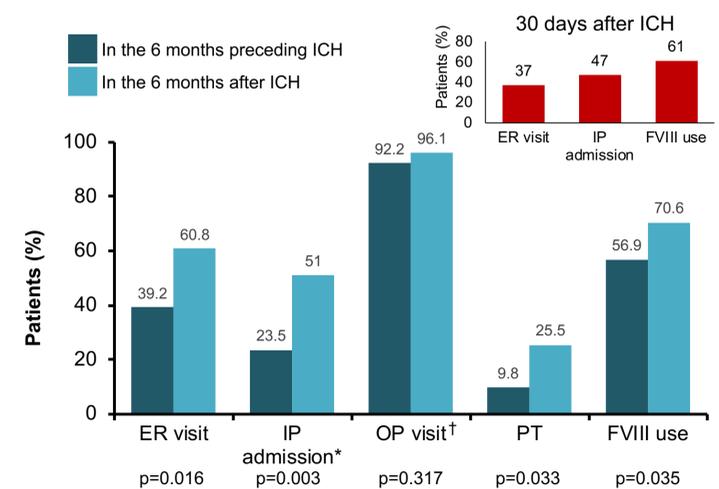
- A total of 51 PwHA had ≥6 months of continuous enrollment before and after the index event (**Figure 1**).
 - In the 6 months preceding the index event, 31 (60.8%) had evidence of any FVIII or BPA use.

Table 2. Average all-cause healthcare service utilization before and after ICH (N=51).

Mean number (SD)	ER visits	In-patient stays	Out-patient visits	Length of stay (days)	FVIII use*
In the 6 months before ICH	0.9 (2.5)	0.3 (0.5)	6.6 (7.0)	1.9 (6.1)	3.8 (11.2)
In the 6 months after ICH	1.3 (1.8)	0.9 (1.2)	13.0 (13.9)	12.5 (32.8)	10 (26.3)
P value	0.048	<0.001	<0.001	<0.001	<0.001

ER, emergency room; SD standard deviation. *>1 claim on the same day counted as separate claims.

Figure 2. Percentage of patients with all-cause healthcare resource utilization before and after ICH (N=51).



ER, emergency room; IP, inpatient; OP, outpatient; PT, physical therapy. % represents those with ≥1 service claim in the respective category. [†]Includes intensive care unit admissions (7.8% vs 37.3% in the 6 months before/after ICH). [‡]Includes OP hospital and office visits.

Table 3. All-cause healthcare costs before and after ICH (N=51).

Mean cost \$ (SD)	Total	In-patient	Out-patient	Pharmacy [†]
In the 6 months before ICH	104,665 (181,549)	9,978 (30,093)	27,430 (57,978)	67,358 (179,167)
In the 6 months after ICH	283,625 (376,317)	114,132 (279,675)	84,615 (128,627)	84,879 (171,461)
P value	<0.001	<0.001	<0.001	0.11
Index cost*	65,906 (106,765)			

SD, standard deviation. *Index cost is the average healthcare cost associated with the index ICH episode. [†]Does not include inpatient drug costs.

- The average all-cause healthcare resource use and cost among PwHA was higher after ICH compared to before (**Figure 2**, **Tables 2** and **3**).
- To contextualize these findings, we estimated the average 6-month healthcare costs of PwHA without any ICH diagnoses to be \$102,548 (SD ±214,065).

CONCLUSIONS

- Although rare, ICH still occurs in both adults and children with HA and is associated with a high comorbidity burden, as well as high healthcare costs and utilization.
- A single episode of ICH can result in significant morbidity and mortality, however the mortality associated with ICH is undetermined in this study. Furthermore, this study may include patients with a history of ICH; thus this analysis underestimates the true burden of ICH in PwHA.
- Early management and treatment of HA may reduce the burden of ICH in this population.

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DISCLOSURES

AM: speakers bureau (Genentech, Alexion, Spark), consultancy (Roche), membership on an entity's Board of Directors or advisory committees (Kedrion); **AP:** employment (Genentech), equity ownership (Roche/Genentech); **EY:** employment (Genentech), equity ownership (Genentech); **IA:** employment (Genentech), equity ownership (Genentech/Roche); **CM:** employment (Genentech), equity ownership (Roche); **CO, RK:** employment (Genentech).

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