Healthcare Economics of Hydrocephalus after Subarachnoid Hemorrhage in the United States

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Background

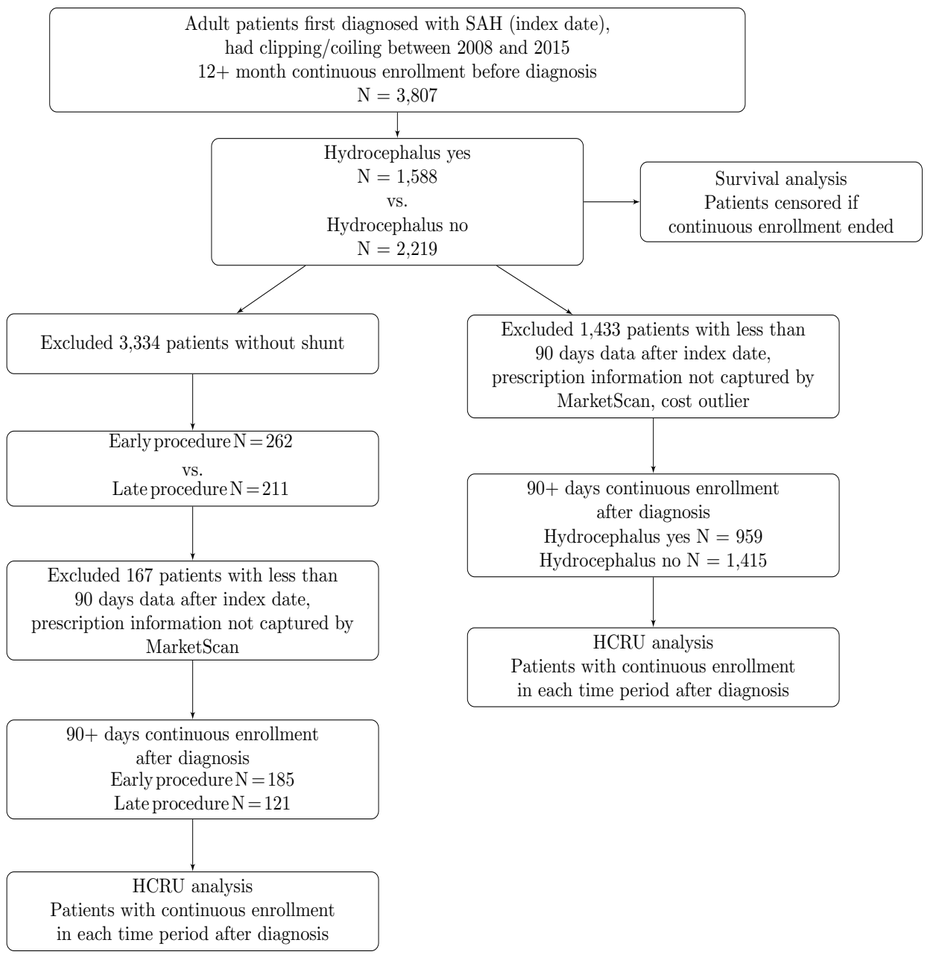
- Aneurysmal subarachnoid hemorrhage (aSAH) is a common but devastating condition, with fatality rates of 8-61% in the 1-month after diagnosis.[1]
- Hydrocephalus is one of the most common sequelae after aSAH, with its incidence ranging from 15-58.4% in the acute stage (48-72 hours after SAH) to 4.3-37% in the chronic stage (>14 days after SAH).[2]
- Management of hydrocephalus involves longer lengths of stay[3] and requires placing extraventricular drains, sometimes followed by conversion to ventriculoperitoneal (VP) shunts or endoscopic third ventriculostomy (ETV).
- Though post-aSAH hydrocephalus is recognized as a common and significant concern, there is scarce literature determining its actual monetary or resource cost.

Objectives

- Quantify the healthcare resource utilization (HCRU) and health economic burden incurred by the US health system due to post-aSAH hydrocephalus.
- Perform a preliminary analysis regarding the effect of timing of permanent CSF diversion procedure (i.e. VP shunt or ETV) on cost.

Methods

- The Truven MarketScan® Research database was used to retrospectively quantify the prevalence and HCRU associated with hydrocephalus in aSAH patients undergoing surgical clipping or endovascular coiling from 2008-2015.
- Multivariable longitudinal analysis was conducted across 5 years to model the relationship between total annual cost (hospital service cost + medication cost) and hydrocephalus status, controlling for Charlson Comorbidity Index, clipping vs. coiling treatment, sex, and insurance status.
- Performed a non-multivariable analysis across 2 years comparing HCRU for patients undergoing early (≤21 days after admission) vs. late (22-90 days after admission) CSF diversion procedures.

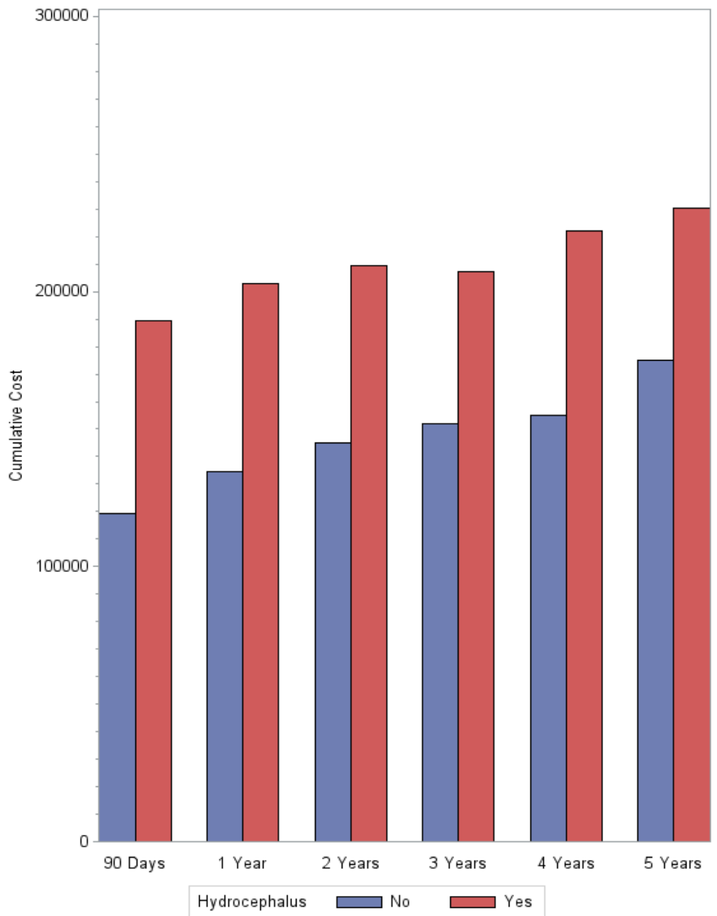


Results

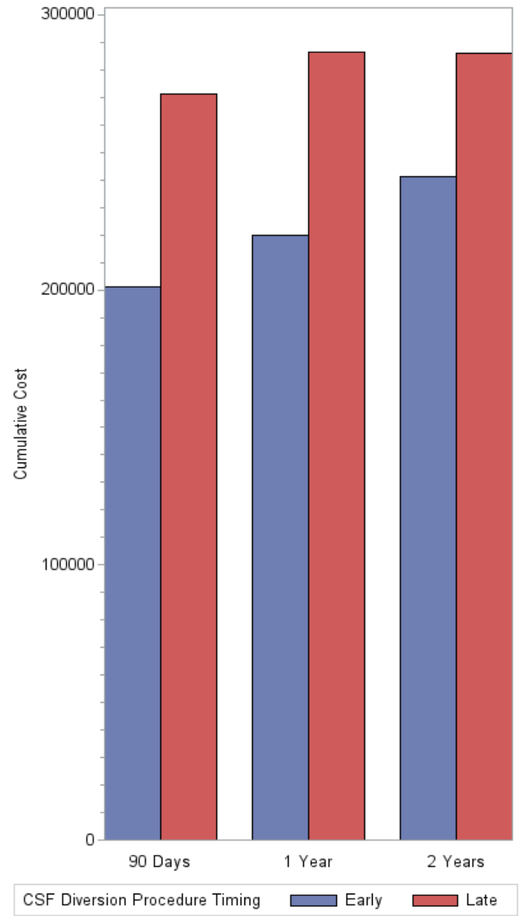
- In total, 2374 patients were included; hydrocephalus was diagnosed in 959 (40.4%).
- In the preliminary HCRU analysis of early vs. late CSF diversion procedures, 306 patients were included.

HCRU Metric	Hydrocephalus	Non-Hydrocephalus	*p*
Initial length of stay (median)	19.0 days	12.0 days	< 0.001
30-ray readmission rate	20.5%	10.4%	< 0.001
5-year cumulative total cost (median)	$230,282 (IQR: 166,023 to 318,962)	$174,897 (IQR: 110,474 to 271,404)	-
Cost multiplier relative to annual baseline (first 90 days, controlled through multivariable regression)	24.60 (95% CI: 20.13 to 30.06)	11.52 (95% CI: 9.89 to 13.41)	< 0.001

Cumulative Cost by Hydrocephalus Status



Cumulative Cost by Timing of CSF Diversion Procedure



Conclusion

- Our study characterizes one of the largest cohorts of aSAH patients in the United States.
- The healthcare resource utilization due to post-aSAH hydrocephalus in the United States is substantial, resulting in cost increase of nearly $70,000 in first 90 days and $55,000 at 5 years.
- Future research should further quantify the potential resources that could be saved with early intervention for post-aSAH hydrocephalus.

References

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