Analysis of Symptom Clusters for Adult Patients with Hematologic Malignancies Suffering from ICH

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Background

Using a root-cause analysis, the signs and symptoms surrounding intracranial hemorrhage (ICH) among adult hematologic malignancy patients was examined following an event in 2013 where a 72 year old acute myeloid leukemia patient experienced a fatal ICH. Prior to diagnosis, the patient manifested new-onset nausea, vomiting, headache, hypertension, and bradycardia, prompting the nurse to request a CT scan. This diagnostic scan was ultimately delayed 12 hours after the onset of symptoms and resulted in delayed treatment.

Signs and symptoms of ICH often mimic those of chemotherapy, which complicates diagnosis and may mask severity. As a result, this study aims to identify clusters of early signs and symptoms of ICH to better differentiate between an imminent or occurring ICH versus side effects of chemotherapy. Using these findings, an interdisciplinary communication tool will be produced to guide provider actions when hematologic malignancy patients present with these clustered manifestations, which will enable more prompt diagnosis and treatment of ICH.

A completed literature review found 35 articles related to ICH incidence among patients with a hematologic malignancy. However, within these articles was a dearth of information specifically dedicated to the identification of relevant manifestations of ICH among this population. Research does point to ICH as a leading cause of mortality in patients with AML, second to infection.

Methods

Following IRB approval, a retrospective chart review was conducted on 49 patients. Using ICD-9 coding, 27 patients were identified as ICH cases and confirmed using CT/MRI scans. Patients with confirmed ICH prior to admission were excluded. An additional 27 hematologic malignancy patients who did not experience an ICH were identified as controls and best matched with cases for diagnosis, treatment, age, sex, and race.

Using Eclipsys Sunrise Clinical Manager, a retrospective chart review was conducted on both case and control groups with the following parameters:

	ICH Cases	Controls
Lab data	Data collected from day of admission through day of ICH	Data collected from day of admission through day of discharge
Assessment and vital signs data	Data collected from day of admission through 24 hours post-ICH	Data collected from day of admission through day of discharge

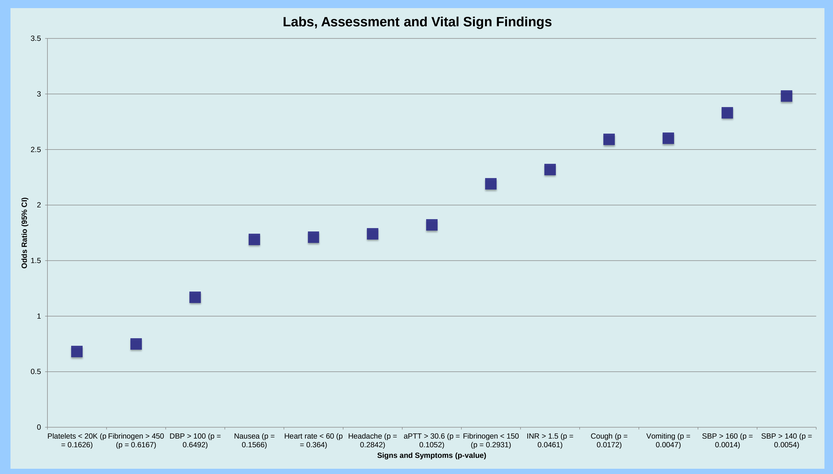
Results

Data analysis was completed for all lab, assessment, and vital signs data. An odds ratio for each data category was calculated, where an odds ratio greater than 1 indicates a greater likelihood of occurrence among the ICH group. Next, using a 95% confidence interval, a p-value for each data category was calculated to illuminate the statistical significance of the data. Items with an odds ratio greater than 1 **and** a p-value less than 0.05 were considered relevant signs and symptoms of ICH.

Using the above parameters, it was found that the following are statistically significant clinical manifestations of an impending or occurring ICH.

Data Category	Odds Ratio	p-Value
International Normalized Ratio (INR) > 1.5	2.32	p = 0.0461
Cough	2.59	p = 0.0172
Emesis	2.60	p = 0.0047
Systolic blood pressure > 140	2.98	p = 0.0054
Systolic blood pressure > 160	2.83	p = 0.0014
Presence of a headache was not statistically significant, but headaches with higher pain ratings did correlate with a greater incidence of ICH.		

Platelets, fibrinogen < 150 or > 450, diastolic blood pressure > 140, nausea, heart rate, activated partial thromboplastin time (aPTT) were found to be insignificant. Plotted below are combined significant and insignificant data.



Additional findings are as follows:

- 3.3% of hematologic malignancy patients experienced an ICH.
- Site of ICH, by descending incidence: subdural (41%), intraparenchymal (32%), subarachnoid (21%), and intraventricular (6%)

Conclusions

Ultimately, special attention and assessment for ICH should be paid to patients within this population who manifest an INR >1.5, SBP > 140 or 160, cough, emesis, and/or higher-than-usual headache pain rating. Upon finding these signs and symptoms, efforts should be taken to reverse INR, lower blood pressure, and limit cough and emesis, which may further increase intracranial pressure.

Further, recognition of these clustered signs and symptoms by nurses and physicians alike will help to appropriately elevate a patient's status and provide a more rapid diagnostic work-up and relevant treatment.

A noted limitation is that data obtained is based on a retrospective chart review using a small study sample and population. Additionally, assessment and documentation is inherently inconsistent, and possibly incomplete, among varying providers.

Future Directions

An additional 12 cases and 12 controls have been identified and data collection for identical parameters on these patients is underway in an attempt to increase the sample size and strengthen the data's significance.

Following analysis and inclusion of additional data, a multidisciplinary team will be developed to create a communication tool used to guide the identification, diagnosis, and early treatment of hematologic malignancy patients exhibiting identified signs and symptoms of ICH.

References

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