Problem Definition

There is no universally agreed upon protocol to image patient presenting with intra-parenchymal hemorrhage of non-traumatic etiology (sICH). At our institution, it is common practice for a patient to have 3 CT’s done within 24 hours. They are often at onset of symptoms or presentation, 6 hours post onset of symptoms, and finally 24 hours post bleed onset.

The goal of this project will be to assess the safety and efficacy of obtaining this repeat imaging in our patients in the hopes that limiting unnecessary CT head studies will decrease resource utilization, decrease patient radiation, expedite movement of stable patients out of the ICU and/or disposition.

Intervention

Multidisciplinary attendings, residents, nurses, technologists involved in the care of sICH patients were surveyed. This helped to identify perceived strengths/weakness in current imaging protocols. Results were compiled and will be used for comparison to a post intervention survey.

This project examined a cohort of patients presenting to JHN within the past 2-3 years with non-traumatic intraparenchymal hemorrhage not secondary to vascular malformation, aneurysm, neoplasm, or infectious etiology. Risk factors for hematoma expansion (HE) were identified in our institution’s population. This allowed for identification of low risk, moderate risk, and high risk patient populations for HE to stratify which patients are most appropriate for serial CT imaging. In conjunction with survey results, a new ICH imaging protocol was developed.

Aims For Improvement

Aim to decrease unnecessary use of serial imaging in sICH patients.

-This project plans to decrease the number of scans in this patient population while increasing faculty/staff satisfaction and efficiency of resource utilization.
- The goal is to decrease HCT utilization by 20% without compromising patient care or decision making.
- After finalizing and approving the HCT protocol, implementation of a trial period for two months and compare resource utilization before and after intervention.

Measurement and Results

Outcome Measures: # of CT’s in sICH patients obtained monthly, reduction in CT usage, increase in satisfaction with CT protocol (survey)

Process Measures: % patients following protocol algorithm

Balancing Measures: # of sICH patients admitted

While the trial phase of this project has not been completed as of yet, assessment of the intervention with the above measures. In evaluating our sICH population, the following results have been obtained regarding risk factors for hematoma expansion. They heavily contributed to protocol design.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Odds Ratio</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICH Score ≥3</td>
<td>4.76</td>
<td>2.60-8.72</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Cortical ICH</td>
<td>1.77</td>
<td>1.03-3.04</td>
<td>0.038</td>
</tr>
<tr>
<td>Fluid level</td>
<td>6.46</td>
<td>2.28-18.26</td>
<td>&lt;0.001</td>
</tr>
</tbody>
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Next Steps and Lessons Learned

**Next steps:**

1. Finish final approval of protocol (neuroradiology, neurosurgery, neurology, neurological ICU, nursing)
2. 1 month trial period
3. Compare CT usage 1 month pre and post protocol implementation.
4. Resend survey to evaluate satisfaction with change in protocol.
5. Standardize sICH.
6. Evaluate for applications to imaging such as traumatic subdural/subarachnoid in trauma patients in ED/Gibbon trauma team.

**Lessons Learned:**

1. Traditional risk factors for HE are not always applicable in our population (quick BP control and AC reversal).
2. Standard 6/24 mold of scans may not allow enough flexibility
3. Scan protocol should be more individualized or targeted to allow for more efficient resource use
4. Stratifying by risk factors forces providers to critically assess patient clinical and radiographic risk factors.