

Improving Serial Imaging Protocols in Spontaneous Intracerebral Hemorrhage

Kevin Hines MD¹, Karim Hafazalla², Nikolaos Mouchtouris MD¹, Fadi Al-Saiegh MD¹, Giuliana Labella³, Muhammad K Athar MD⁴, Adam Flanders MD⁵, M Reid Gooch MD¹, Stavropoula Tjoumakaris MD¹, Robert H Rosenwasser MD¹, Pascal Jabbour MD¹

¹Neurological Surgery, ²SKMC, ³Neuro Critical Care RN, ⁴Neurological ICU, ⁵Neuroradiology

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 (onset of symptoms, 6 hour interval, 24 hour interval)

The goal of this project has been to decrease unnecessary serial imaging in our patients in order to decrease resource utilization, decrease patient radiation, expedite movement of stable patients out of the ICU and/or disposition

Aims For Improvement

-This project aims to decrease the number of scans in this patient population while increasing faculty/staff satisfaction and efficiency of resource utilization.

The goal was to decrease HCT utilization by 20% without compromising patient care or decision making during initiation of the new CT protocol.

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.

Populations specific data was compiled and analyzed for a publication (QR code) on risk factors for sICH expansion. **Main risk factors for expansion include ICH score greater than or equal to 3, fluid-fluid level on CT, and cortical ICH.**

This allowed for stratification of low risk, moderate risk, and high risk patient populations for HE to design protocol for serial imaging tiers and DVT ppx.

Protocol has been submitted and approved by neurosurgery, neurointensive care, neurology, and radiology teams. Provider education has begun and initiation of a new HCT protocol began 7/2021 at JHN.

Measurement and Results

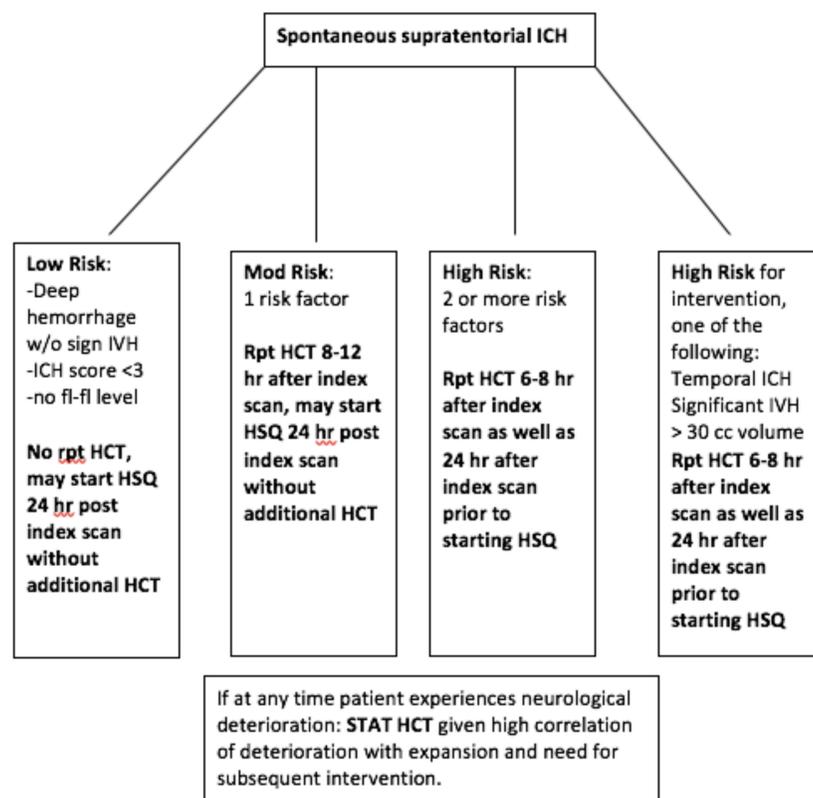
Metrics

Outcome: Percent reduction in CT scan in sICH patients.

Process (future study): LOS in NICU prior to transfer orders to see if protocol is facilitating quicker downgrades, % patients starting DVT ppx within 24 hours of ictus, review % ICH expansion versus categorization of high, moderate, or low risk ICH to see if we are predicting these correctly

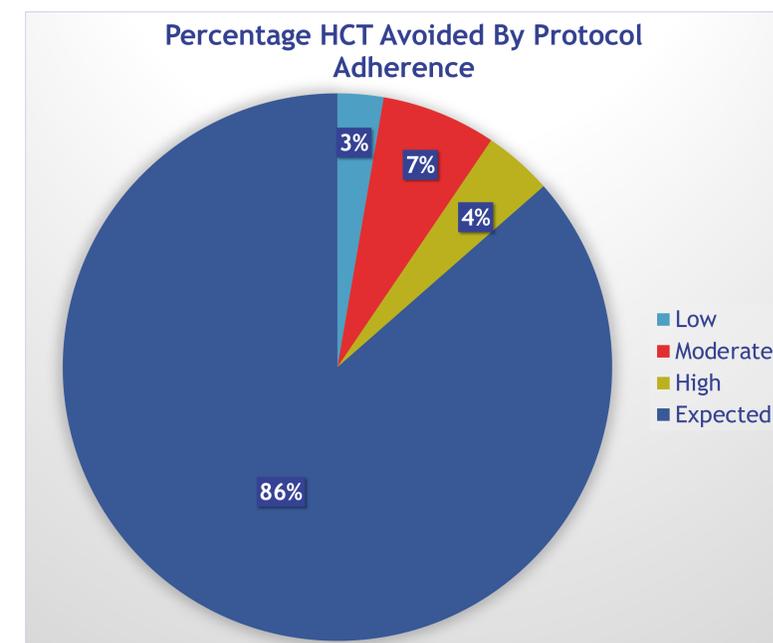
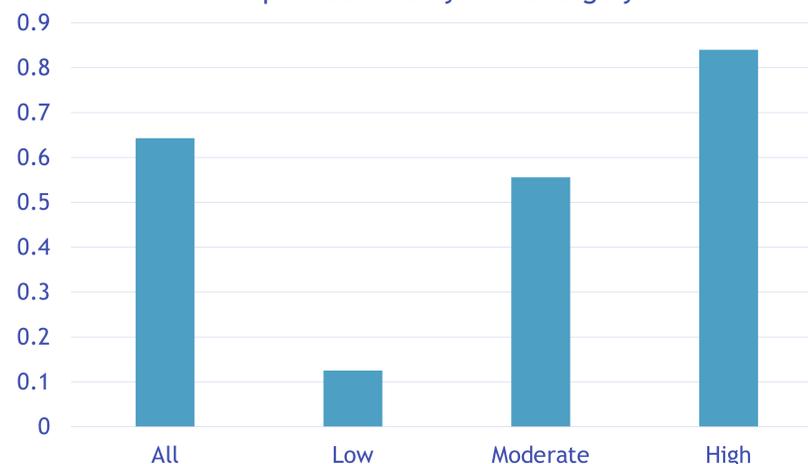
Balancing measures: neurological changes requiring scans beyond protocol recommendations

Forty-two patients with sICH were eligible for the protocol. Three patients experienced hemorrhagic expansion (all categorized as high risk). **Compliance with the protocol totaled 27 (64.3%).**



Risk Category	Avg # scan per patient not following protocol
Low	2.9
Moderate	3
High	3.6

Compliance Rate By Risk Category



During implementation, the number of HCT obtained have been reduced by 14% from expected.

Next Steps and Lessons Learned

Lessons Learned:

1. We have developed a population-based risk profile that safely and effectively stratifies patients into serial imaging protocol arms.
2. Institution of a new HCT protocol is challenging as it requires cooperation and education of many providers. Most of compliance issues were a result of neurosurgery residents changing rotations, patient transfers to other services, and overnight residents' unfamiliarity with the protocol. Until this is addressed, compliance may remain new protocol low.
3. The results are promising. Even with compliance issues, especially in the low and moderate risk categories, we saw a 14% decrease from expected HCT numbers using the old method of serial imaging as a projection.

Next steps:

1. Commence multidisciplinary education on new protocol to all services including neurosurgery, neurology, NICU, and radiology. Develop onboarding for each resident changing rotation to minimize loss in compliance with new personnel.
2. Begin to track other outcomes such as cost, patient outcomes, DVT prophylaxis, and gather larger sample size to validate prediction of sICH expansion in this population.
3. Resend survey to evaluate satisfaction with change in protocol.
4. If positive outcomes confirmed, build into EPIC order set to include stratification and recommend the appropriate serial imaging protocol.
5. Evaluate for applications to imaging such as traumatic subdural/subarachnoid in trauma patients in ED/Gibbon trauma team.