



# Optimizing Emergency Radiology Service Excellence at an Academic Medical Center: Decreasing Neuroimaging Final Report Turn-around Time

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# Background and Purpose

Our team has a long-standing collaboration of continuous quality improvement with our Emergency Department (ED) which faces the ubiquitous challenge of providing rapid evaluation, triage and disposition of patients for which imaging often plays a key role. Prior to this project, only preliminary trainee reports were provided after-hours for neuroradiology exams originating in the ED. Residents provided a draft report (not visible to the ED) which was reviewed, edited where necessary and published to the ED as a preliminary report by the on-call neuroradiology fellow. Prelim reports were reviewed and finalized the following morning by the attending on service. Due to variable time between preliminary and final reports, clinical decisions were usually based on the first published report. Discrepancies between the preliminary and final reports had the potential to result in delayed diagnosis or treatment, or lost patient follow-up.

The purpose of this improvement effort was to develop a system to provide 24-hour/day, 7-day/week (24/7) final reports for neuroradiology examinations originating in the ED while maintaining the academic mission of our institution.

# Material and Methods

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We surveyed radiology leadership at 18 similar academic medical to determine existing models for emergency radiology (ER) coverage. Models included:

- Teleradiology
- 24/7 ER division
- After-hours only ER division
- Hybrid ER division comprised of members of existing divisions

Because of the two-year structure of the neuroradiology fellowship at our institution with a Clinical Instructor (CI) role in the second year (non ACGME in 2<sup>nd</sup> year), this was identified as a potential pilot after hours division. Coverage models were evaluated with cost-benefit analysis based on the following 8 criteria:

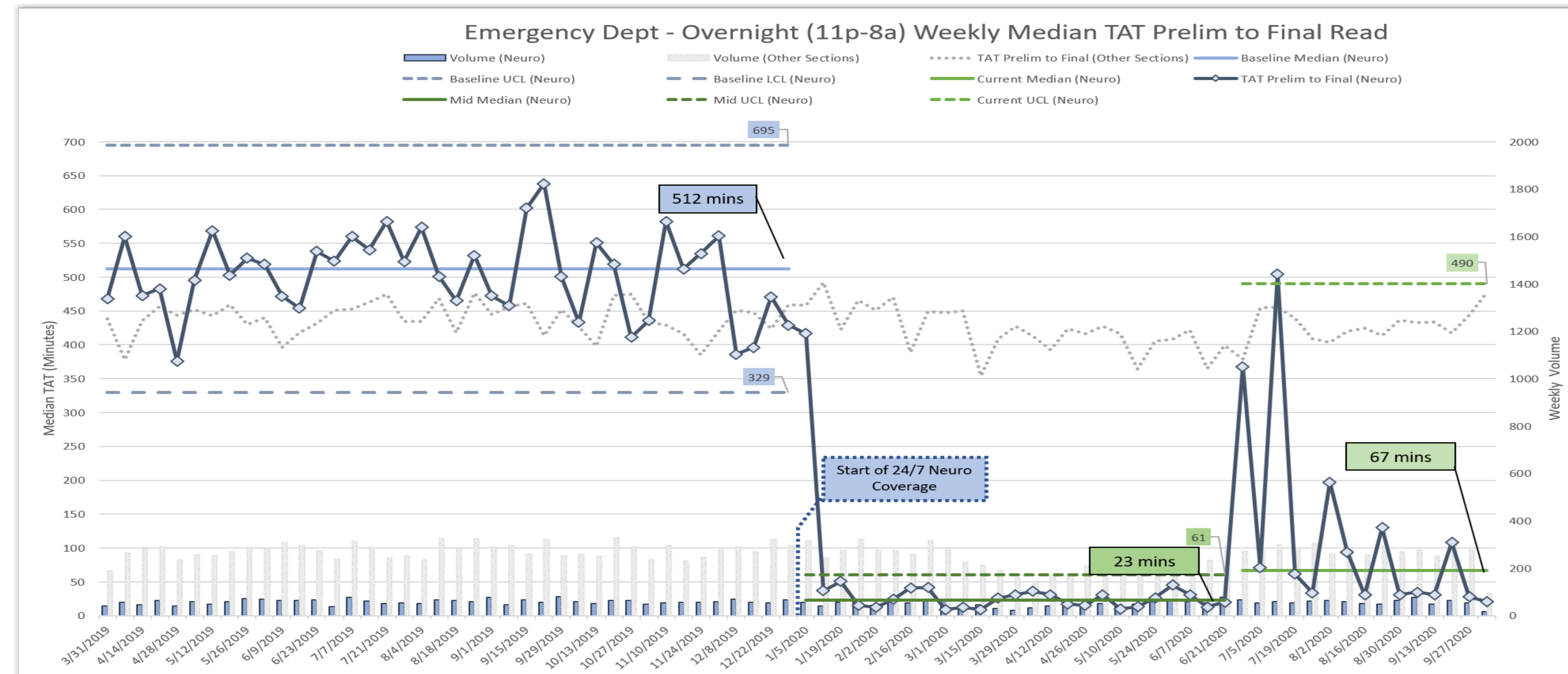
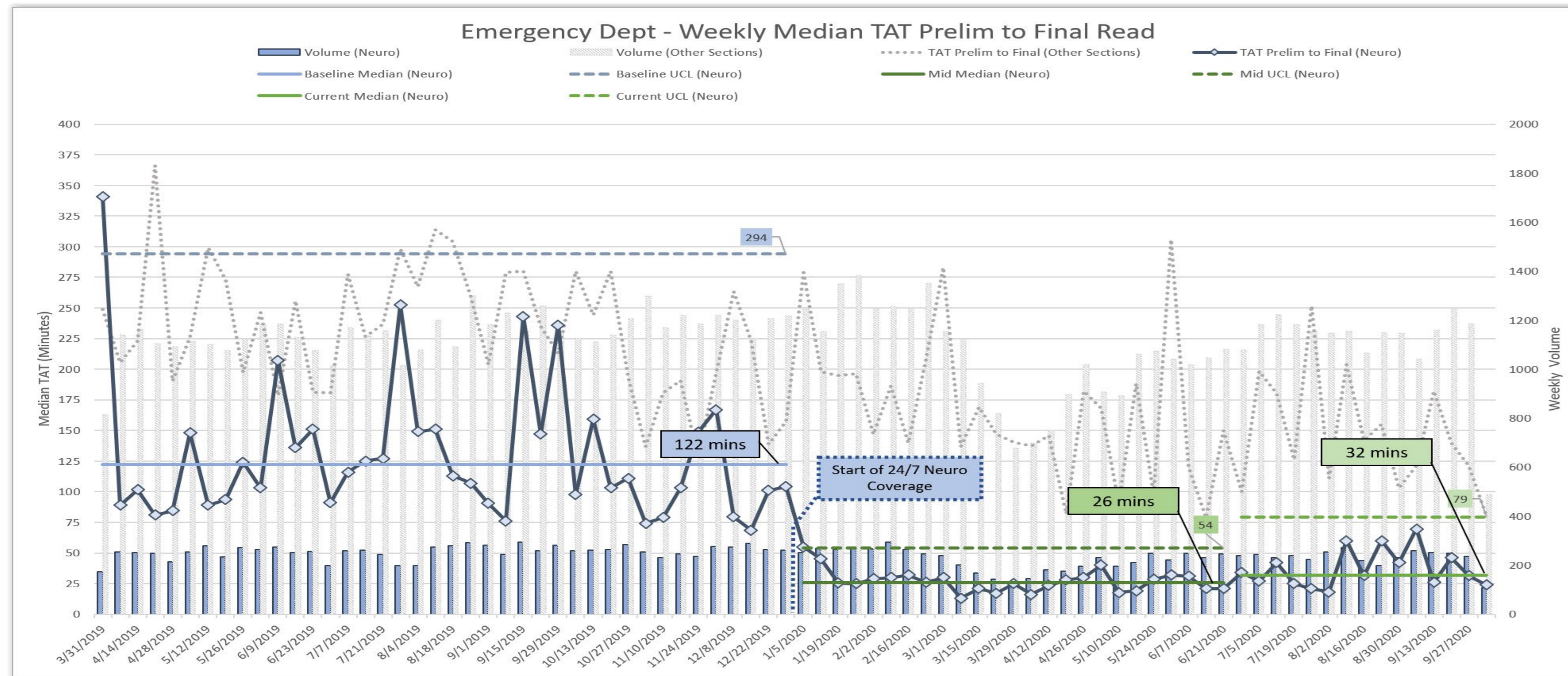
- interpretation quality
- service to clinical providers
- trainee education
- ease of implementation
- recruitment/retention issues
- scalability for enterprise growth
- cost and effects on other department divisions

## Material and Methods (cont.)

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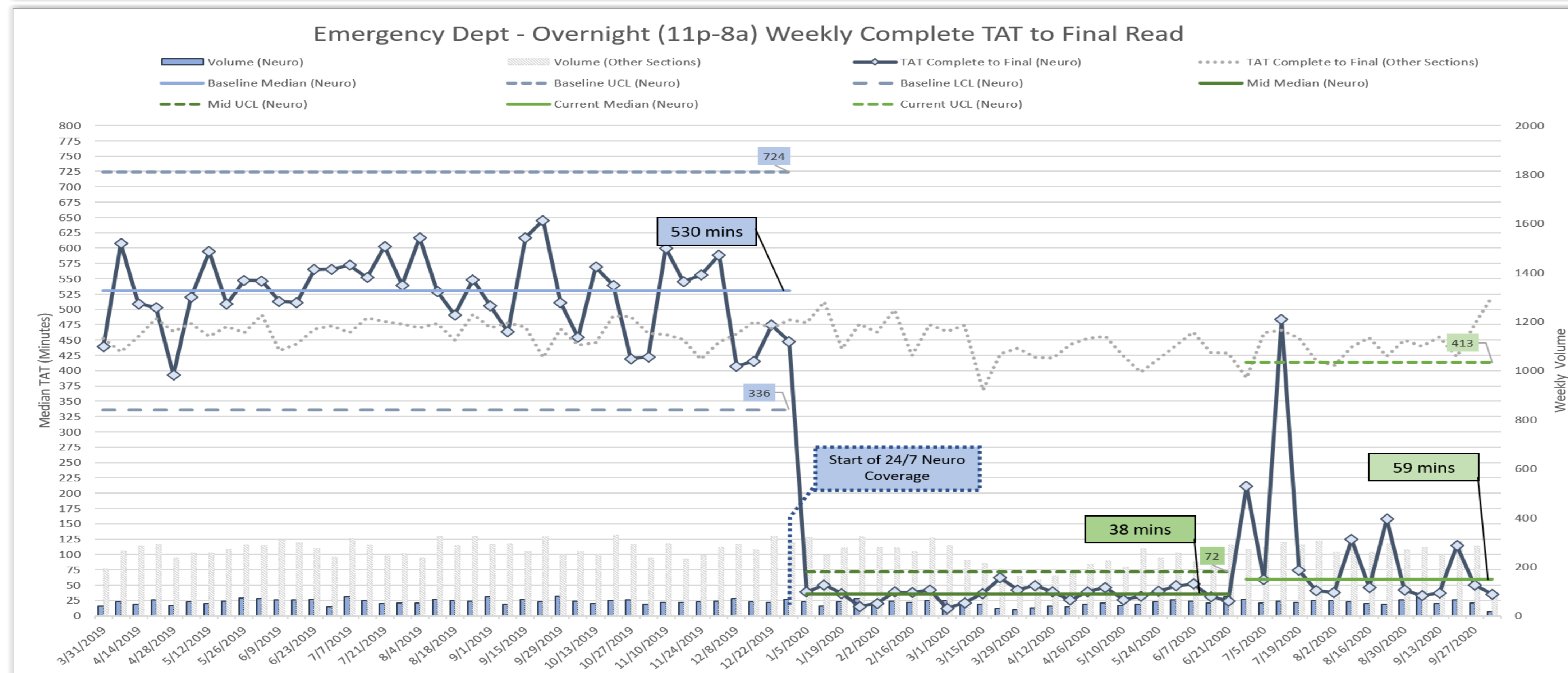
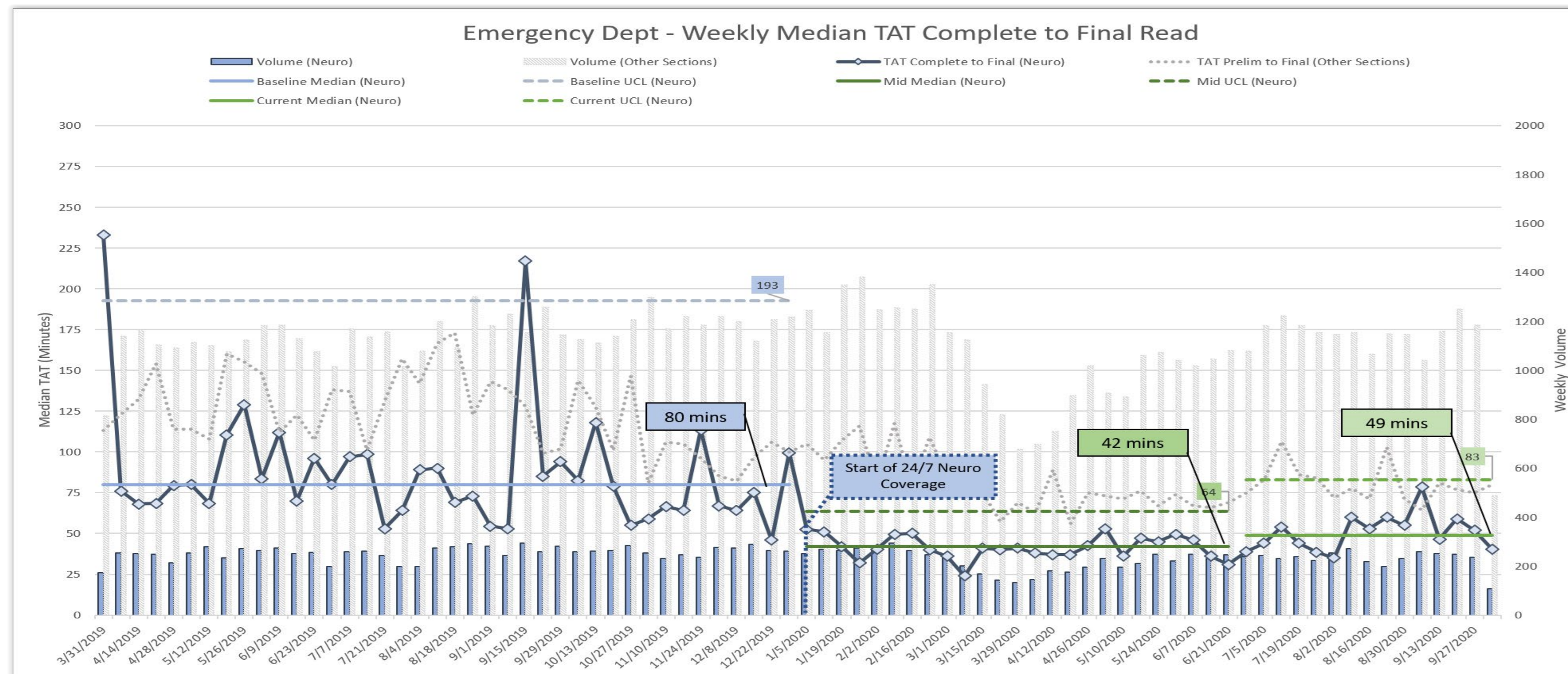
A CI based after-hours model was selected for neuroimaging after consideration of these criteria whereby residents were now permitted to release preliminary reports which were reviewed, edited where necessary and published as final reports by the CI. In order to confirm exam interpretation quality, 25 exams which were final read by a CI in their first week were randomly selected for overread by two experienced neuroradiology faculty. Additionally, fellows' ability to provide accurate interpretations was observed throughout their first year of fellowship by faculty, prior to assuming this new responsibility. CIs were provided additional compensation for their added responsibilities. A neuroradiology faculty member was on call to support the CI as needed, and the CI had the option to issue a preliminary report rather than final sign the study if they felt complexity warranted overreading by the faculty. Time from preliminary report (provided by residents) to final report both after-hours (11 pm to 8 am provided by CI) and overall was tracked for the original cohort of CI (CI1) from January to June 2020 and for the next cohort of CI (CI2) in the new academic year from July to October 2020. Additionally, time from exam completion to final report was tracked for both after-hours and overall.

# Results (Prelim to Final Read TAT)



At baseline, preliminary to final report turnaround (TAT) for neuroradiology was 122 minutes overall and 512 minutes for after-hours exams. After implementation of our new after-hours coverage plan, preliminary to final report TAT decreased to 26/32 and 23/67 minutes for overall and after-hours exams respectively (CI1/CI2). This represents a 79%/74% and 96%/87% decrease in preliminary to final report TAT for overall and after-hour neuroradiology exams respectively (CI1/CI2).

# Results (Exam Completion to Final Read TAT)



At baseline, exam complete to final report TAT for neuroradiology was 80 minutes overall and 530 minutes for after-hours exams. After implementation of our new after-hours coverage plan, exam complete to final report TAT decreased to 42/49 and 38/59 minutes for overall and after-hours exams respectively (CI1/CI2). This represents a 48%/38% and 93%/89% decrease in exam complete to final report TAT for overall and after-hour neuro-radiology exams respectively (CI1/CI2).

# Results

Since the beginning of the 2020-21 academic year, reports for 8 studies out of 371 (2.2%) were issued as preliminary rather than final after hours to be final signed by the neuroradiology faculty in the morning. These were more likely to be complex studies (Table 1), all patients were appropriately dispositioned, and no discrepancies were present in the final reports.

Feedback from the ED has been uniformly positive without any noted increase in diagnostic 'misses'. No significant discrepancies were discovered from random audit of the clinical instructor reports.

<b>Table 1.</b>	
Total overnight cases	371
Preliminary reports issued by CI	8 (2.2%)
MRI Brain	2
MRI complete spine	2
CTA head and neck	2
CT head and Cervical spine	1
CT neck	1

# Discussion

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Balancing the needs of high quality and timely radiology reporting with educating trainees is a challenge for all academic radiology departments which interpret studies for the emergency department. For interpretation of overnight ED studies, many different models have been adopted from resident overnight reads to teleradiology to final attending reads from in house dedicated emergency radiology faculty. Each model strikes its own balance between the needs of education and timely reporting. We instituted a new model capitalizing on the in-house expertise and clinical instructor (CI) role of the second year neuroradiology fellows. This model allowed for our residents to dictate studies and continue to be involved in clinical care, but with close oversight by the on-call CI. Our time to final report dramatically improved with overnight final signing by the CI.

One potential issue is final report quality, as less experienced radiologists are interpreting the studies compared with neuroradiology faculty. We did not find significant discrepancies or misses based on random audit of the CIs reports. The CIs had all completed a year of dedicated neuroradiology training at our institution prior to taking on the overnight role, which constitutes the common duration of a neuroradiology fellowship, and as such are appropriately prepared for the role and may have more dedicated neuroradiology training than other emergency radiologists who could fill this role.



## Discussion (cont.)

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CI are also supported by neuroradiology faculty on call overnight and the ability to issue preliminary reports in difficult cases for faculty overread, though both support options were rarely utilized. There were modest differences in TAT between the 1<sup>st</sup> and 2<sup>nd</sup> cohorts of CI but both groups showed a marked decrease in TAT from baseline.

This model also allows for several advantages relative to teleradiology. By keeping interpretation within the institution, our specific protocols are well known to the interpreting radiologists including advanced MR sequences and perfusion, critical in assessment of stroke. Additionally, there are no technical issues or risks regarding transfer of data to outside groups that may occur with teleradiology. From an educational perspective, this model has the benefit of CIs knowing the residents who are initially reviewing the studies and interfacing with the ED, so there is immediate and familiar feedback. And for the CIs themselves, it provides a valuable opportunity to practice relatively independently with faculty support in a junior attending role, an important step up in responsibility and experience prior to leaving fellowship.

An obvious limitation of this model is that the vast majority of radiology programs do not have non-ACGME 2<sup>nd</sup> year fellows as a resource to provide such staffing.

# Conclusion

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Implementation of a new after-hours neuroradiology coverage model at our institution resulted in dramatic decreases in both after-hours and overall preliminary to final report and exam complete to final report TAT, allowing clinical decisions to be based on final rather than preliminary reports without compromising interpretation quality. Implementation of this model also increased resident autonomy and arguably improves education for both residents and CIs.