Addressing Delays and Deficiencies in Radiology Workflows Through Measurement of CT Timestamp Accuracy

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Background

➡️ Each component of the radiology workflow has an associated digital footprint that is derived from various data sources including the imaging modality, the radiology information system (RIS), the electronic medical record (EMR), the DICOM metadata, and the picture archive and communicating system (PACS).

➡️ Time is a critical common data element in these digital footprints.

➡️ Patient safety events can occur due to timestamp discrepancies between the imaging modality, the PACS, and the EMR.

Purpose
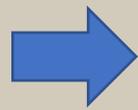
➡️ This project identified and quantified timestamp deviations associated with CT machines at one large academic hospital.
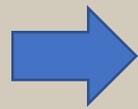
➡️ CT was the focus due to the importance of timely CT imaging for high acuity indications such as cerebrovascular accidents and the relative frequency of CT imaging.

Baseline State

➡️ 2 manual audits of 5 CT machines in the inpatient and clinic settings were conducted 3 months apart in time.

➡️ Timestamp deviation was calculated by subtracting the time associated with each scanner from the coordinated universal time on a cellular device.

Timestamp deviation = UTC – Scanner time

➡️ Problem statement: As of January 11, 2021, there is an average timestamp deviation of 12 minutes and 30 seconds between scanner time and UTC across 5 CT machines.

Target State
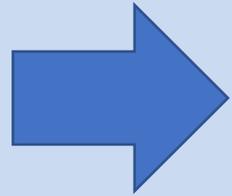
Our goal was to have the timestamp deviation between the CT modality and UTC to be less than 60 seconds on 100% of CT scanners by March 1st, 2021.

< 60 sec on 100% of scanners

Gap Analysis

Radiologist and technologist perceptions of the problem and contributing factors were explored during each audit.

- Lack of awareness of problem
- Not a priority to address
- Lack of automated monitoring and correction
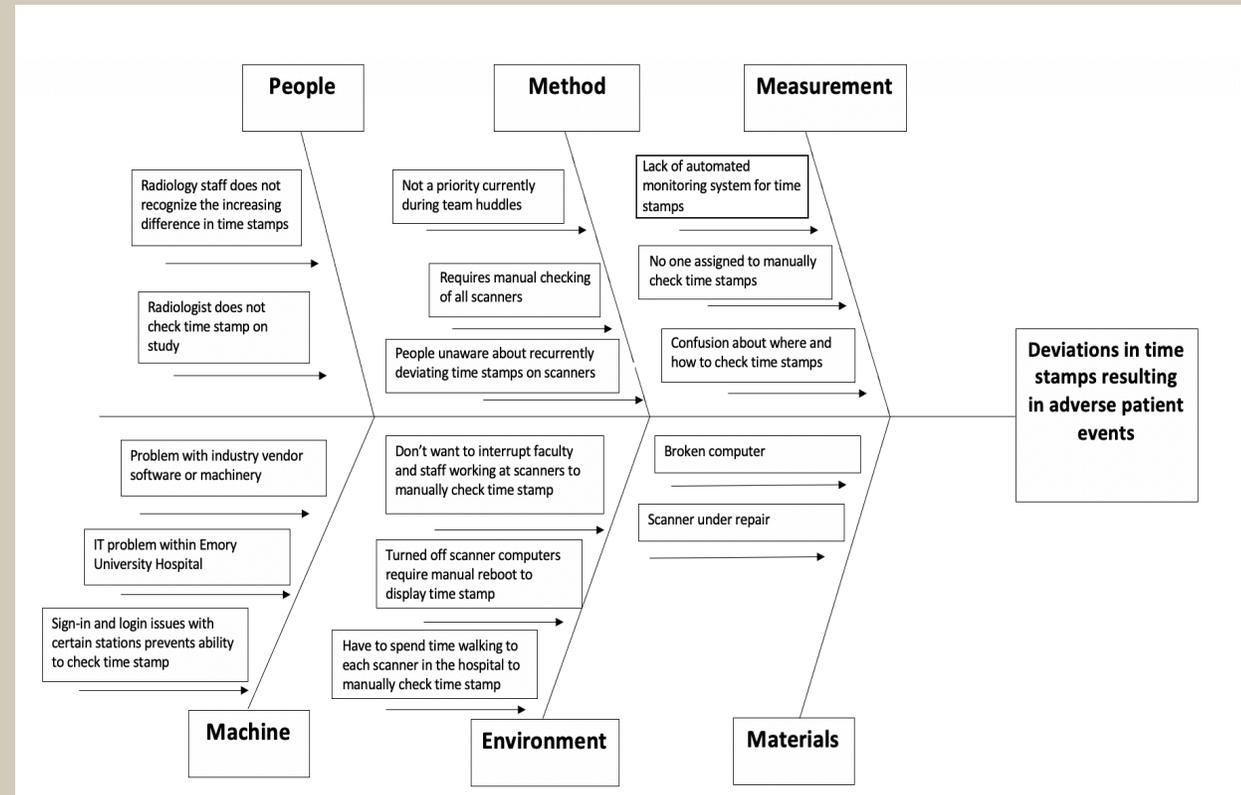
Solution Approach

Results of the audit and fishbone analysis were presented at Radiology Department-wide meeting
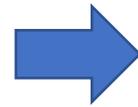
Focus group was convened to brainstorm solutions

Test of change was implemented based on automated approach

Proposed solutions:
- Manual correction of timestamps by technologists as part of their daily workflow
- Automated approach to work with vendors to configure each scanner to refer to network time protocol (NTP) service.
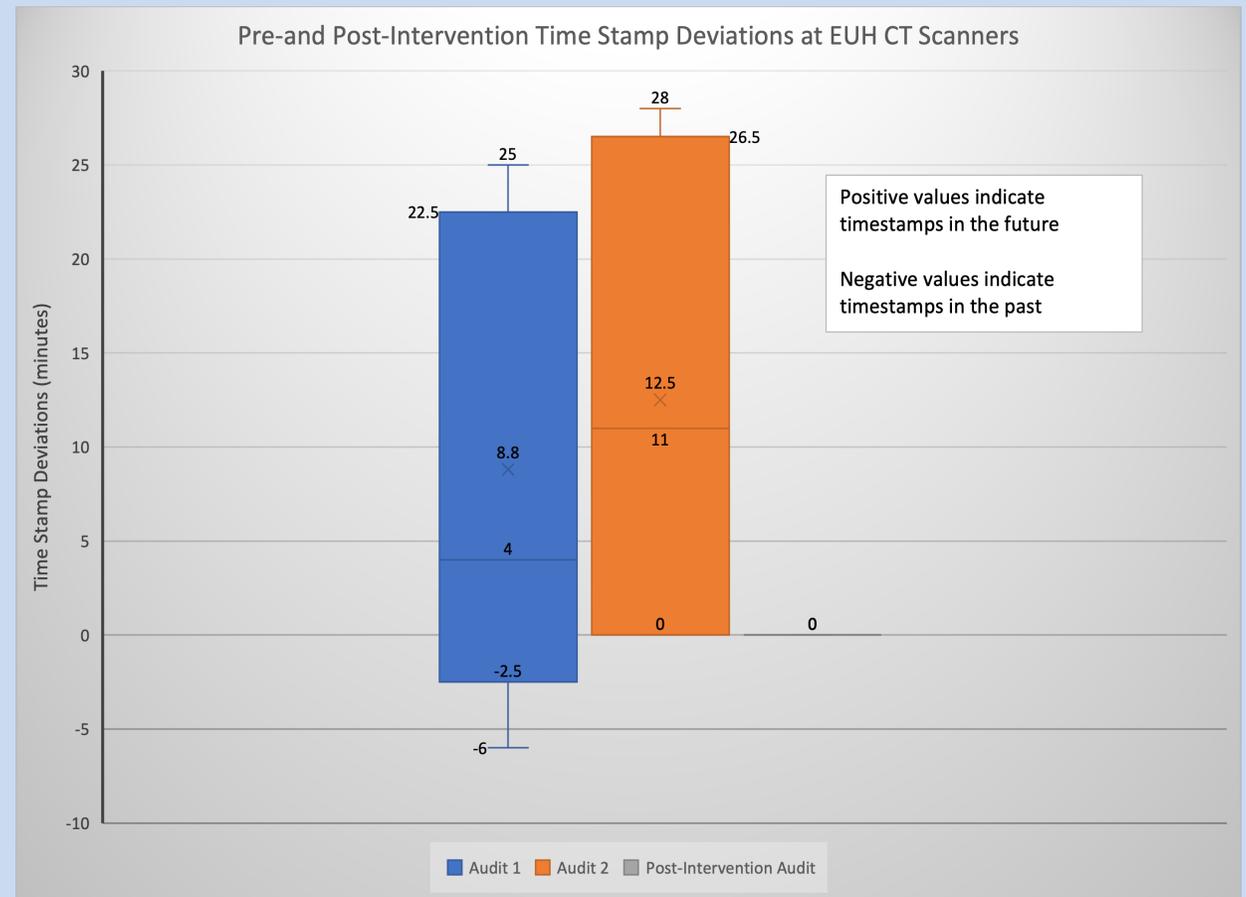
Confirmed State

The radiology department partnered with contracted imaging service company to manually configure each scanner to refer to NTP service, which was to be managed by institutional information services.

Post-intervention audit revealed 100% of scanners showed NO timestamp deviations relative to UTC.

Pre-and Post-Intervention Time Stamp Deviations at EUH CT Scanners

Positive values indicate timestamps in the future

Negative values indicate timestamps in the past

Audit 1   Audit 2   Post-Intervention Audit

Conclusions

→ Implementation of automated solution was effective in correcting 100% of CT timestamp discrepancies at a single hospital site.

→ Getting engagement in addressing this problem by using department wide communications and an empowered focus group lead to a simple solution that can prevent patient safety events.

→ This automated approach has now been extended to the CT machines at all other hospitals and imaging centers throughout the system.

→ Future directions include expanding to other imaging modalities, including MR, US, and XR.

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Thank you!

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