Increasing Median Time Between Interruptions in a Busy Reading Room

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Cincinnati Children's — changing the outcome together

Introduction and Aims

Radiologists are required to perform complex cognitive tasks during the course of their daily work, often interpreting studies with thousands of images. Prior research has shown that repeated interruptions can have a negative effect on humans performing complex tasks, resulting in errors, decreased efficiency and increased stress levels. Interruptions can also increase the amount of time required to perform a specific task, resulting in decreased clinical output.

Cincinnati Children's Hospital Medical Center is a large, quaternary care academic pediatric hospital. The radiology department consists of 36 pediatric radiologists and pediatric neuroradiologists, working with a staff of over 190 technologists and ancillary staff. The main reading room consists of four separate reading rooms (thoracoabdominal, neuroradiology, musculoskeletal and fetal/cardiac), connected by an "L" shaped hallway. The thoracoabdominal reading room is located in the middle of the reading area, and is also where the "resource" radiologist for the day is located (the go-to radiologists for technologist questions), as well as functioning as the primary reading room for the on-call radiologists after hours. As such, radiologists in the thoracoabdominal reading room frequently complained about the number of interruptions that occurred during the workday and many radiologists found the working in this reading room to be a very stressful and unpleasant experience.

The aim of this project was use quality improvement methodology to increase the median time between interruptions that occur daily in the thoracoabominal reading room at Cincinnati Children's Hospital Medical Center by 50% between July 2018 and January 2019. However, this is also an ongoing process improvement project and as such, interventions and testing have continued beyond the initial project period.
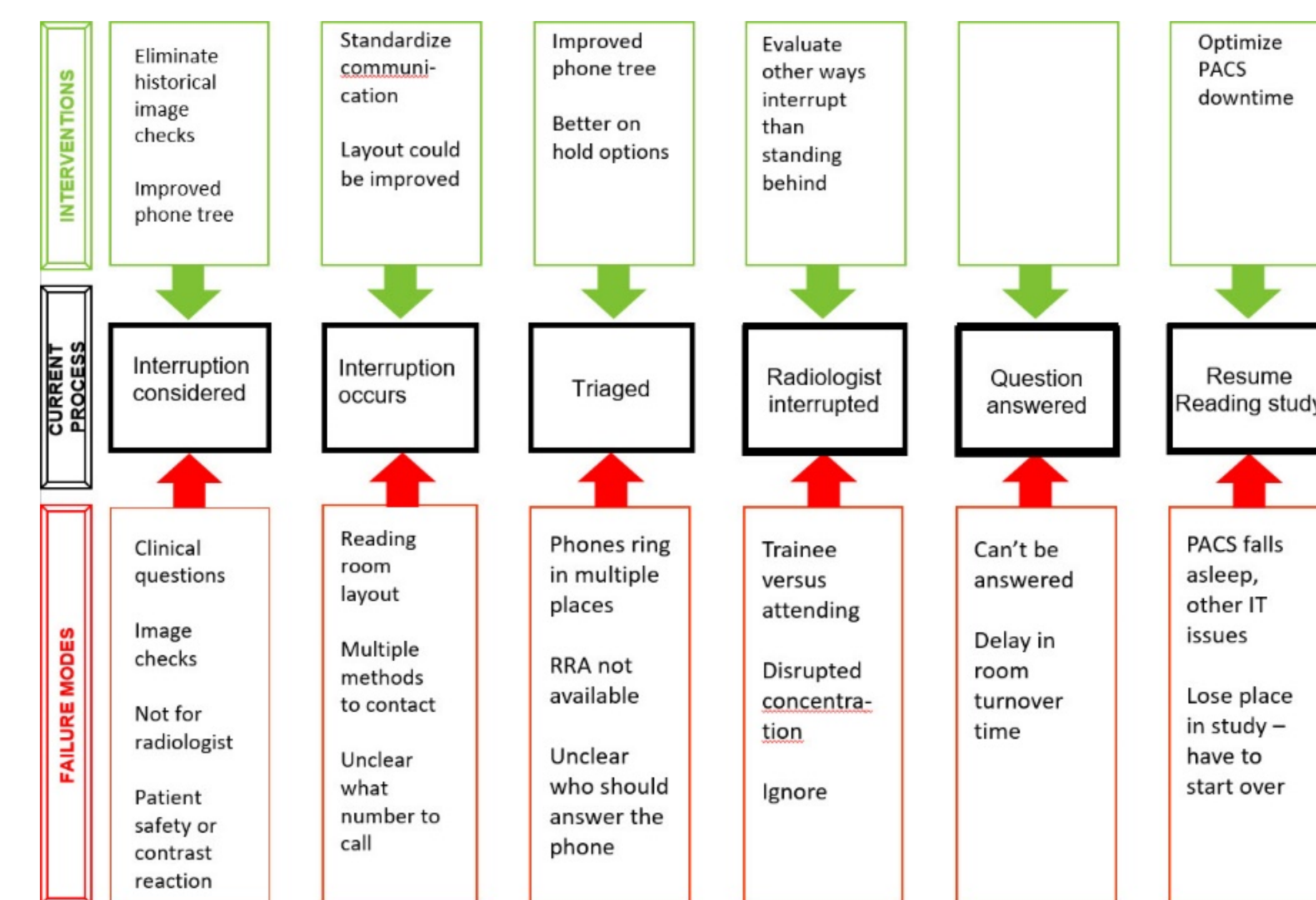

Fig 1. Simplified process map with a summary of failure modes (red) and possible solutions (green).

METHODS

Baseline data was collected manually by trained observers. Observers sat in the thoracoabominal reading room and manually counted the number of interruptions that occurred, the type of interruption (telephone, pager, in-person), and the time between each interruption (in seconds) for 1 hour per day, 5 days per week, between the hours of 10 am – 3 pm. Weekends and holidays were excluded. The median time between interruptions was calculated. Data was displayed in a run chart. An improvement team was established, consisting of 2 radiologists, 2 technologists, a reading room coordinator and an operations and quality improvement specialist.

A basic process map was developed and a simplified failure modes effect analysis was performed. Failures were grouped into 1 of 5 categories by the project leader (EAS). A Paretto chart was produced demonstrating the most common failures, and a key driver diagram was developed. To address common failures, several interventions were tested on a small scale and ramped up to a larger scale or abandoned, depending on their success. Successful interventions were adopted. Throughout the project, data was manually collected in the same manner previously described for the baseline data collection. Approximately 6 months after the initial project timeframe, an additional 2 week observation period was performed (10 total hours of observation).
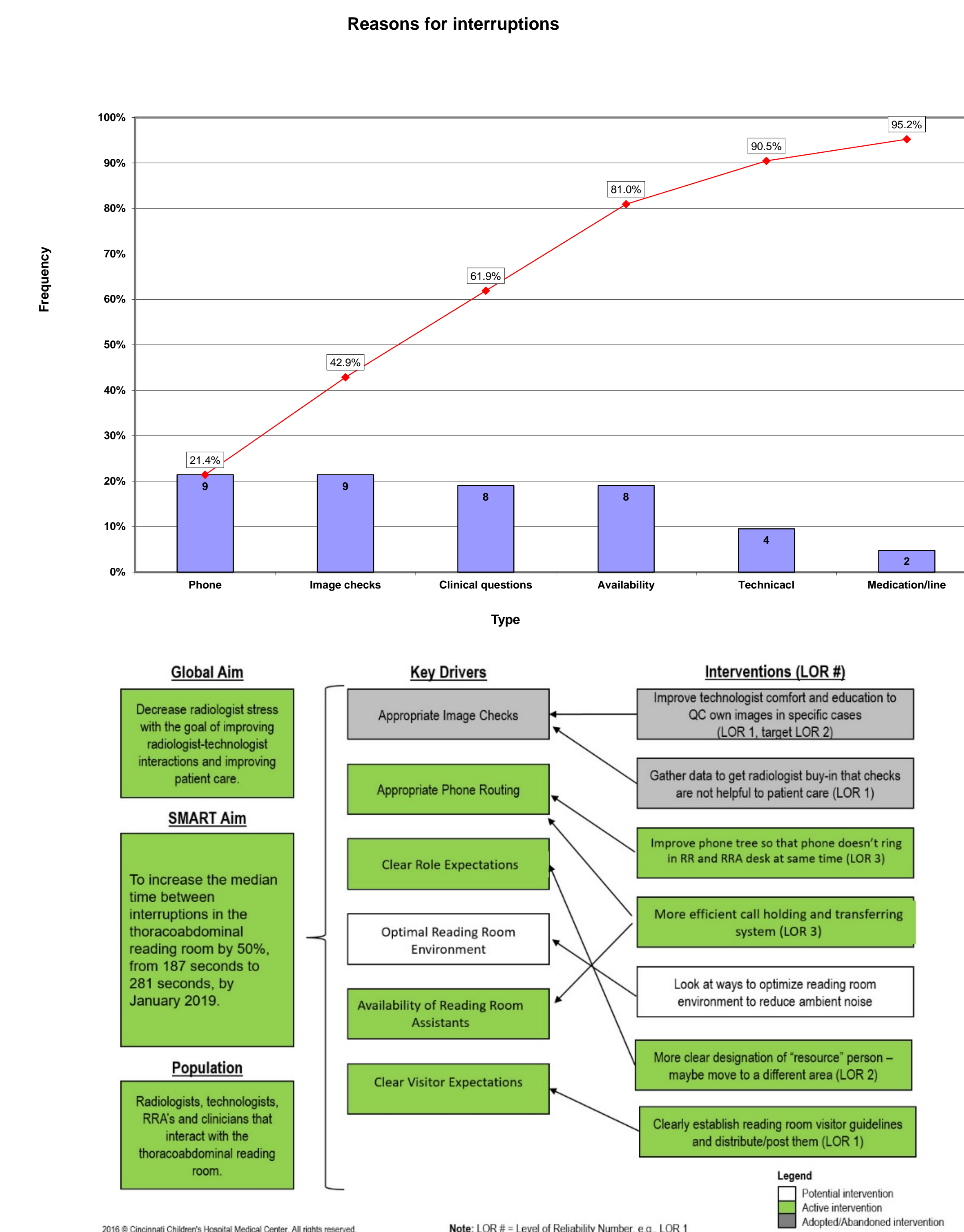
Figs 2&3. Paretto chart showing frequency of different interruptions. Key driver diagram listing key drivers and potential interventions.

RESULTS

At baseline, the median time between interruptions was 187 seconds. The most common failures (most frequent sources of interruptions) were technologists calling for image "checks" (image QC), redundant phones ringing in multiple locations, and in person visits to the reading room, mostly by clinical colleagues. Key drivers included making sure image "checks" were appropriately limited, having clear expectations for clinicians and other visiting the reading room, and working on an upgraded phone system to reduce redundant phone calls. The interventions tested included eliminating mandatory checks on almost all types of CT imaging (excluding trauma), allowing technologists to QC their own airway radiographs, adding signage to the reading room directing visitors to the reading room assistants for appropriate triage, and developing a phone system that will eliminate the problem of multiple phones ringing at once by eliminating redundant phone numbers and having a central system that allowed the reading room assistants to route phone calls to the appropriate area of the reading room. At the end of the project period, the median time between interruptions was increased to 336 seconds, a 77% increase. The improvement was maintained at 6 months after the initial project period.
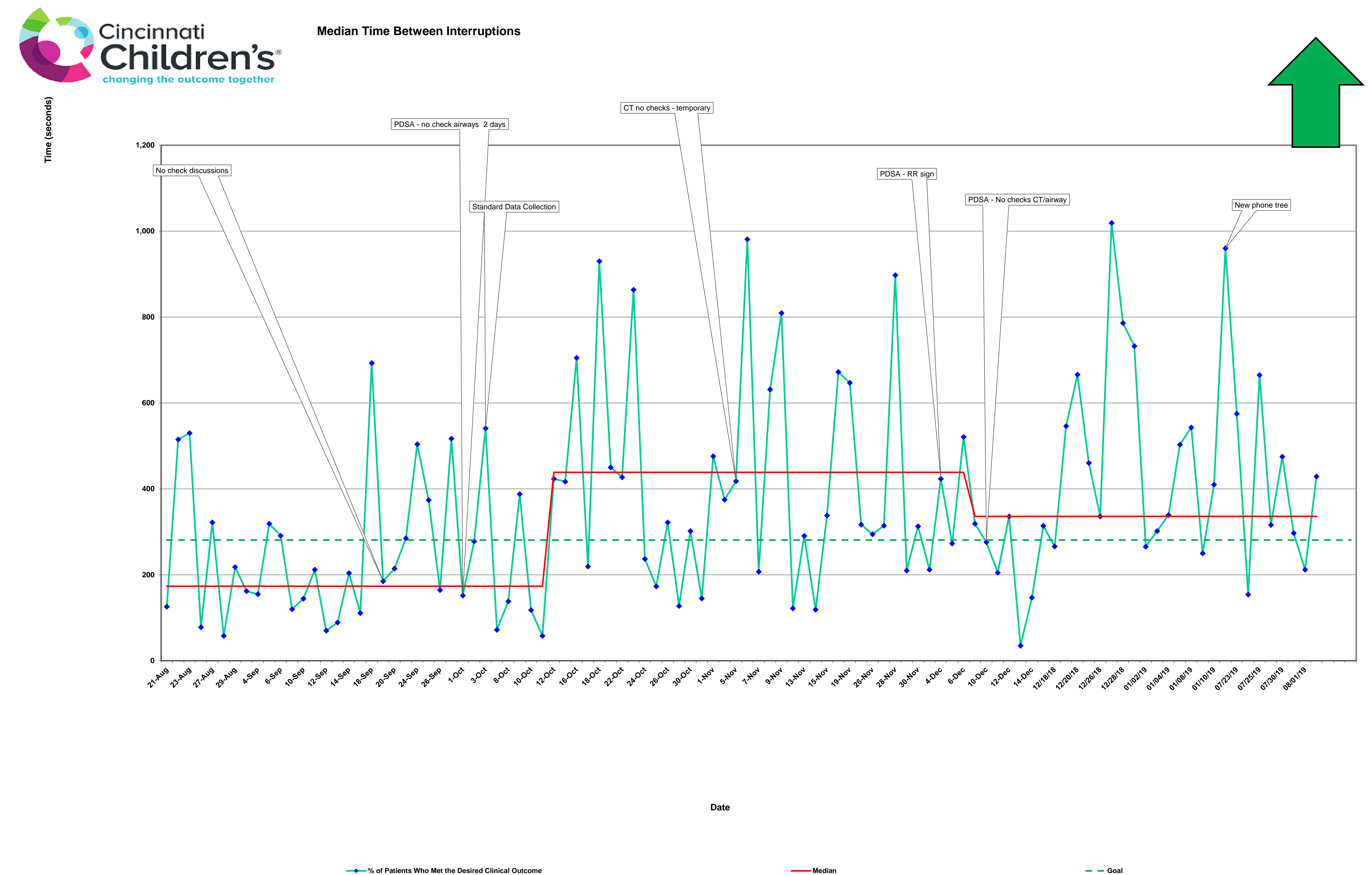

Fig 4. Run chart showing daily median time between interruptions over the study period.

CONCLUSION

Using quality improvement methodology and a team approach, we were able to increase the time between interruptions in our busiest reading room by 77%. Although we met our initial project goal, we plan to continue our work to optimize the number of interruptions and to further increase the time between interruptions, thus decreasing radiologist stress levels and increasing efficiency.

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