



Analysis of scheduling efficiency by harmonizing RIS-HL7 and MR-DICOM data

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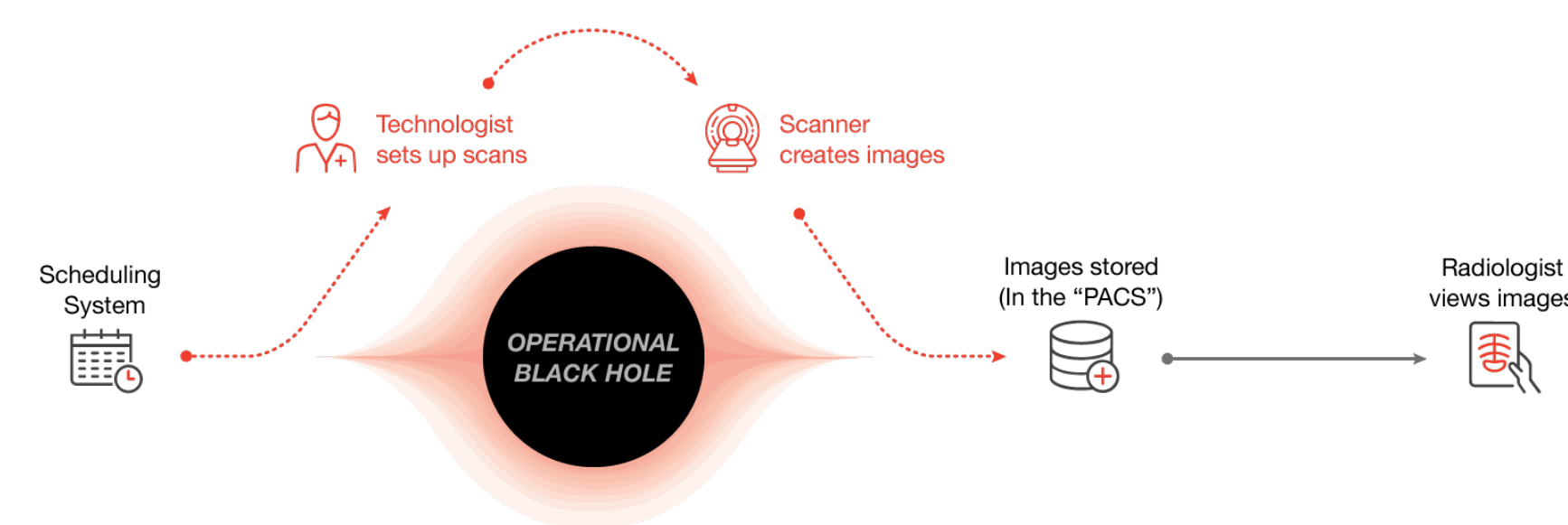


INTRODUCTION

Radiology scheduling is typically based on rules that assign a fixed slot size to all studies, or modify the slot size in 15 or 30 min increments based on ordered protocol.



This process is crude as it does not consider clinical, technical, or demographic factors that factor into real exam duration. The impact of these factors on exam duration is difficult to measure and predict due to the "operational black hole" in radiology operations



While the information for the scheduled slot size exists in the RIS (via HL7), the details of the performed exams and their true duration exist in DICOM metadata.



Unfortunately

- 1) It is **messy** and **siloed**
- 2) DICOM = basic standard for the exchange/description of images, but **does not capture well key concepts** for imaging operations

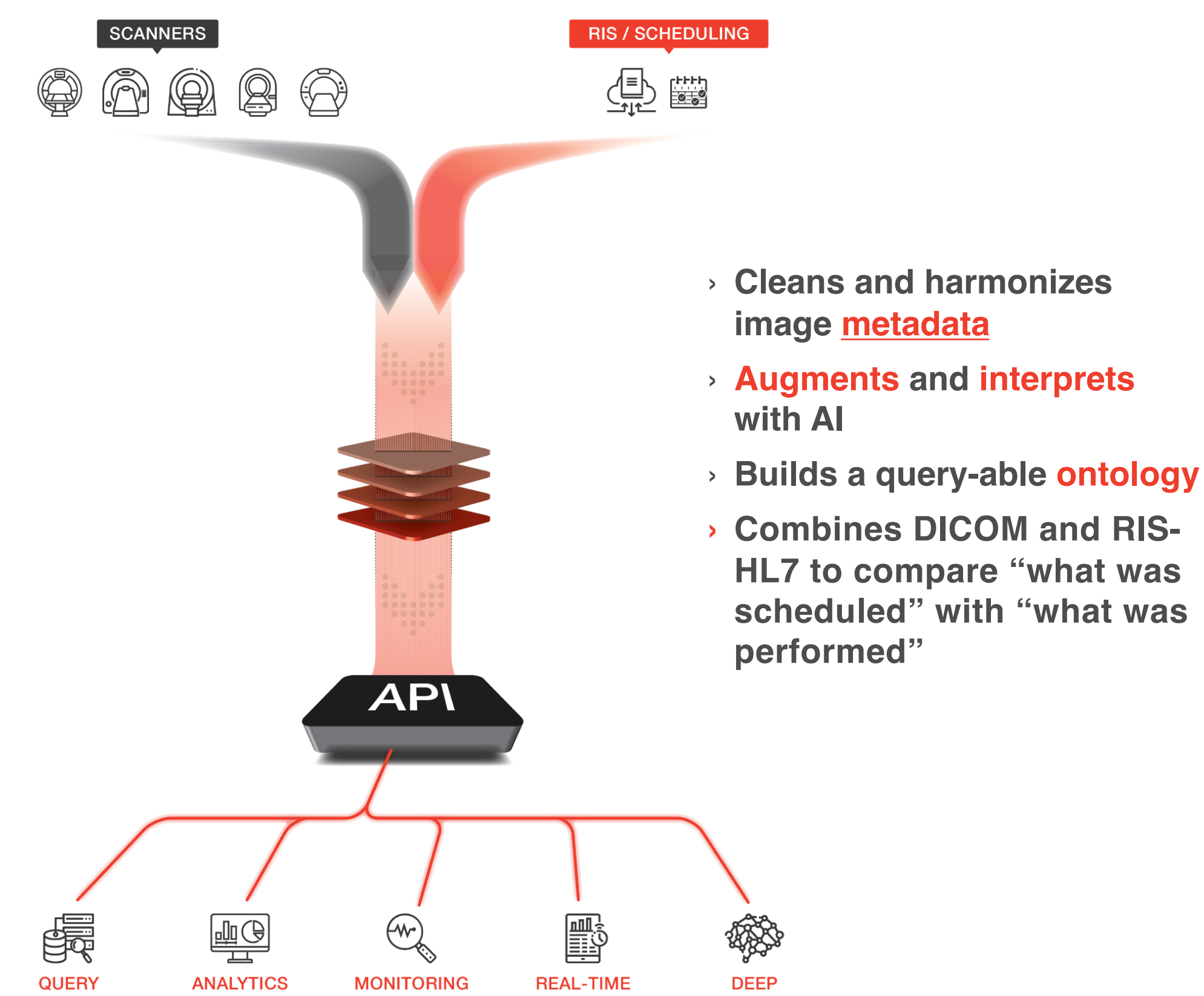
DICOM studies ≠ exam
 > DICOM studies can be "re-opened" and duplicated

DICOM series ≠ acquisition
 > DICOM "ImageType" poorly differentiates acquisition vs post-processed images
 > Most often the acquisition duration is not in public tags

METHOD

We used a commercially available software platform, Quantivly (Somerville, MA), that harmonizes radiology metadata (RIS-HL7 and DICOM) to provide a unified data layer describing imaging operations.

The platform analyzes DICOM images on-the-fly to develop a **new ontology** that starts from DICOM and **builds upon it** to construct the first **unified, highly-granular, vendor-agnostic** description of imaging exams in a relational database



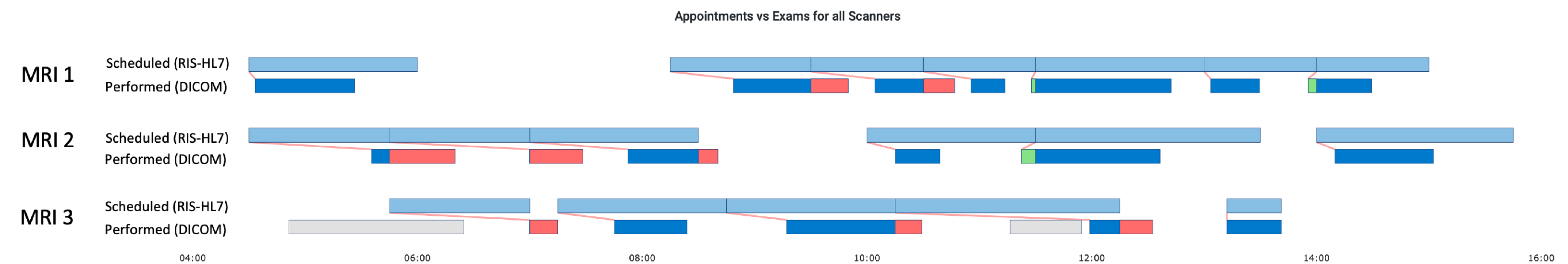
- > Cleans and harmonizes image **metadata**
- > **Augments and interprets** with AI
- > Builds a query-able **ontology**
- > Combines DICOM and RIS-HL7 to compare "what was scheduled" with "what was performed"

ANALYSIS

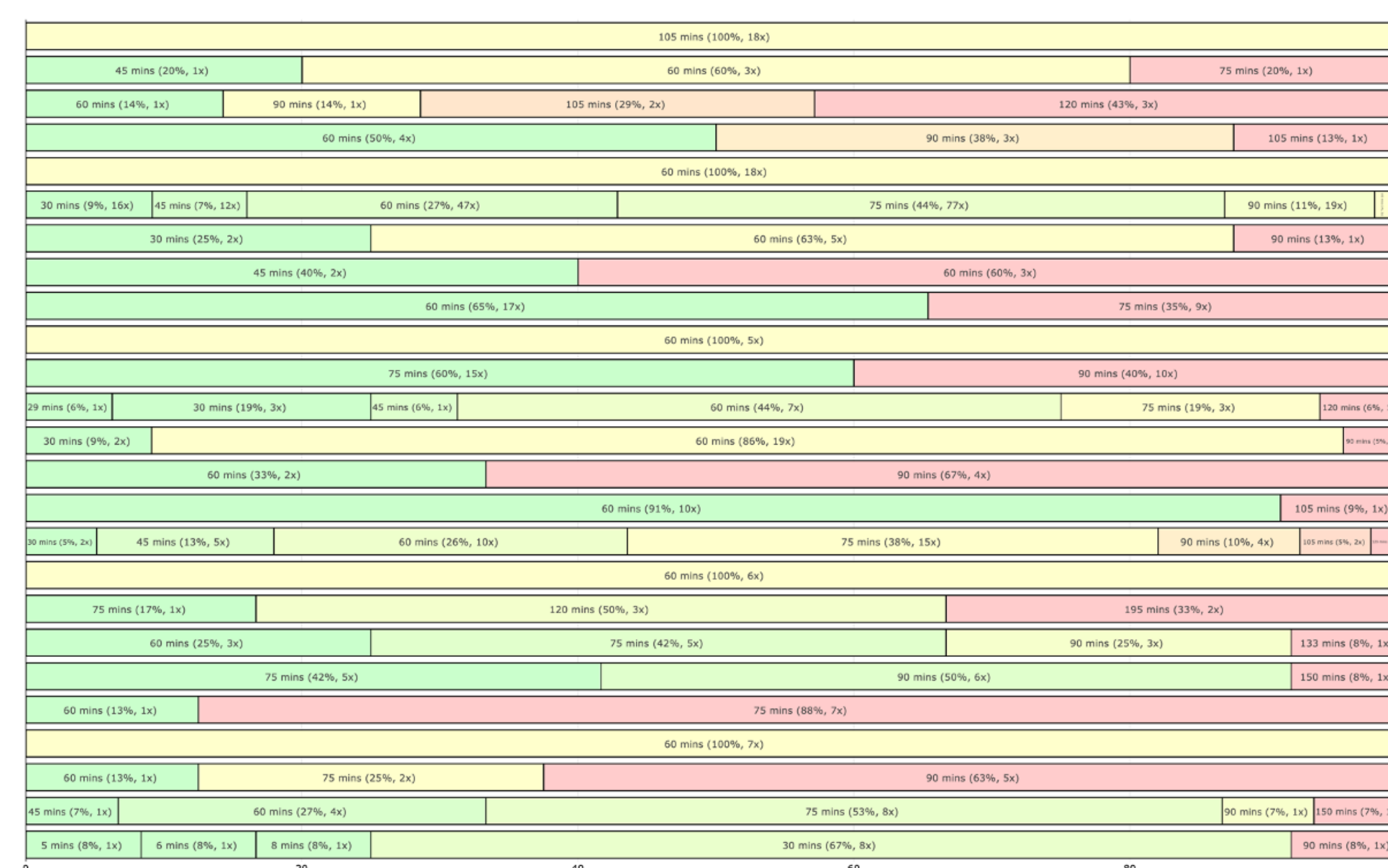
- > The distribution of slot size per protocol was calculated from RIS-HL7.
- > Performed exam duration was measured the time from the start of the first acquisition to the end of the last acquisition, and adding a 5 min buffer to the exam start/end to account for patient setup.
- > Slot utilization was quantified by taking the ratio of performed exam duration to the slot size (from RIS-HL7).
- > Exams were ranked by slot utilization over a one-month period

RESULTS

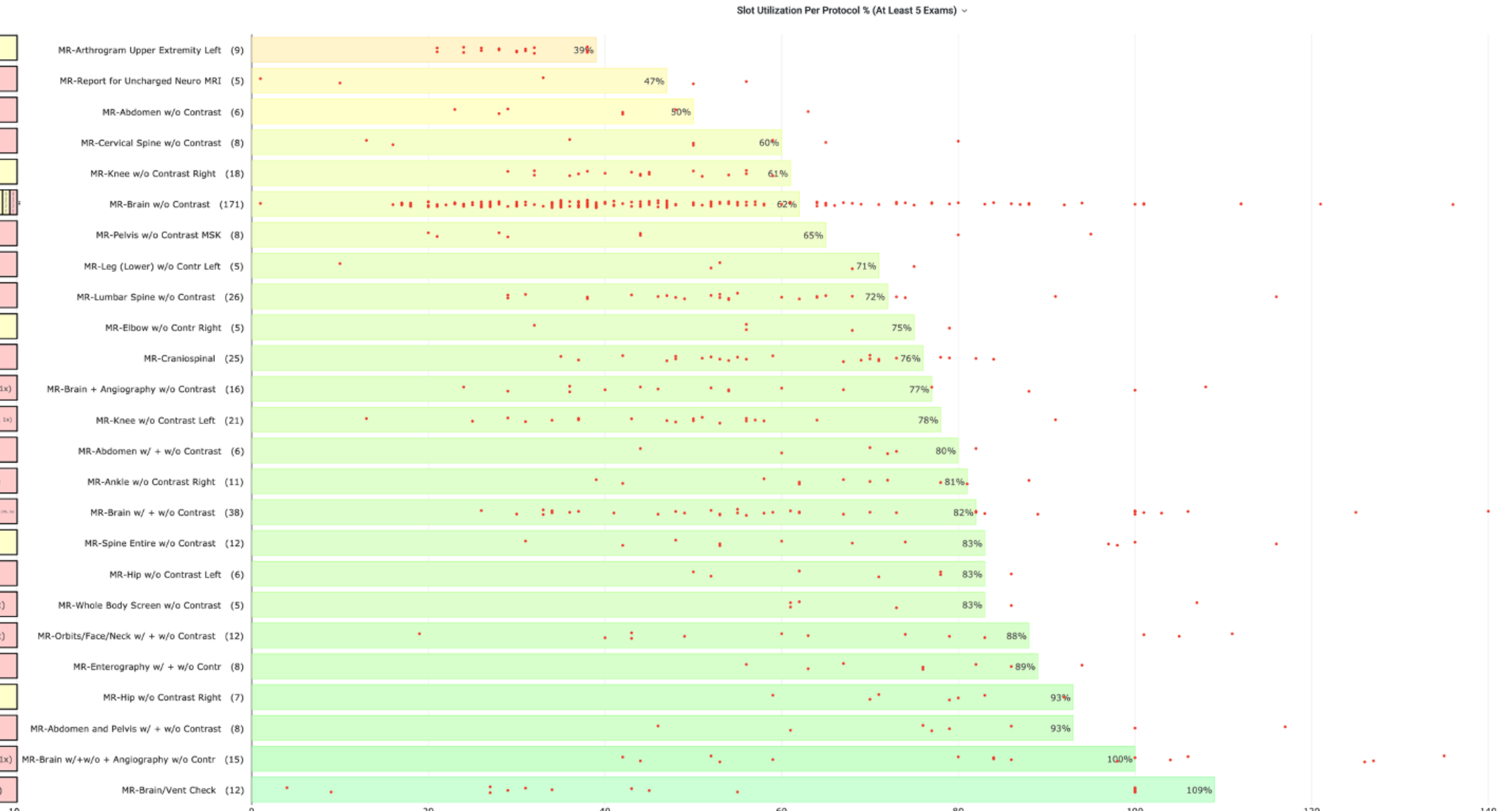
- > The scheduled and performed exam duration were displayed together in a single daily view to quickly visualize delays and device utilization.
- > The distribution of scheduled slot size and slot utilization was displayed for each exam type with the mean ranging from 39% (MR-Arthrogram Upper Extremity) to 100% (MR-Brain/Vent Check).



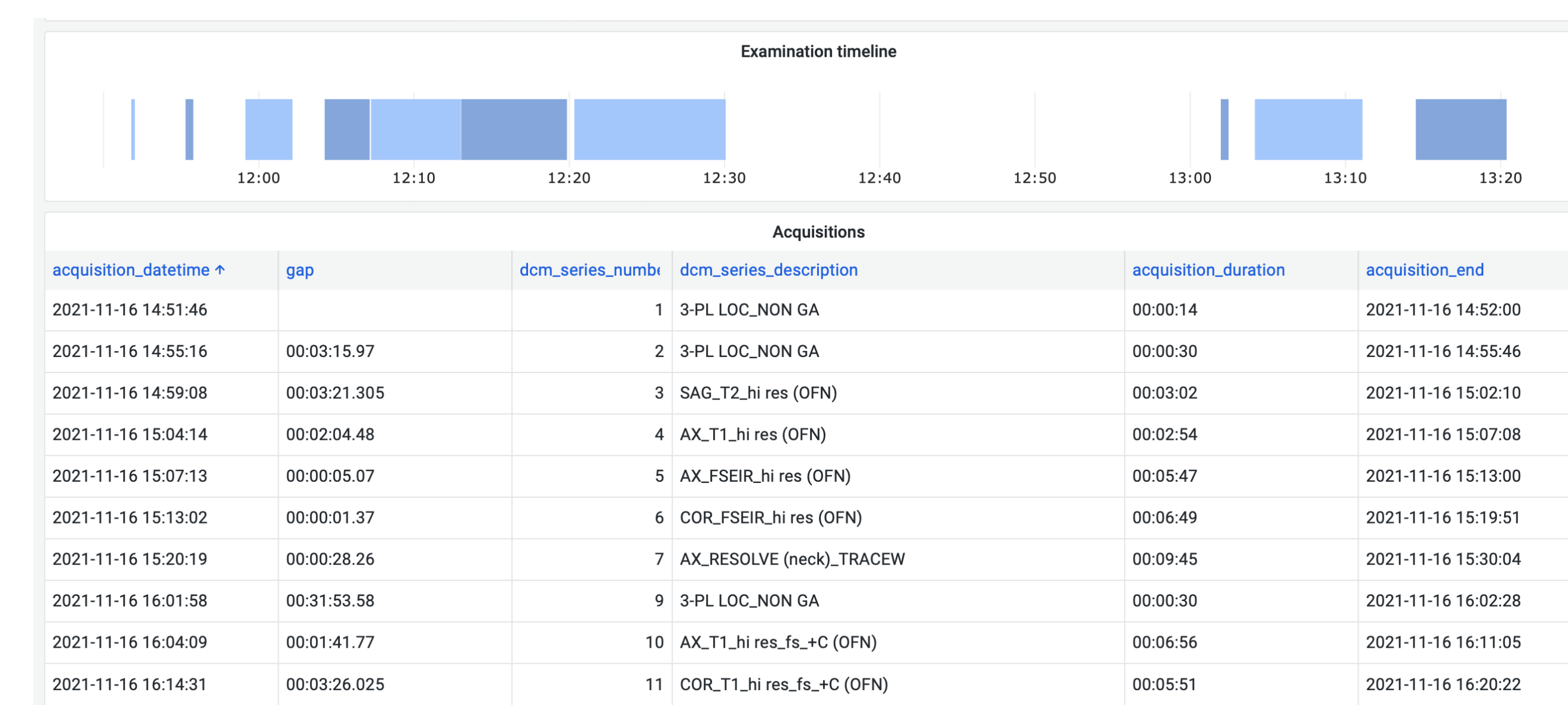
Scheduled Duration by Protocol (At Least 5 Exams)



Slot Utilization Per Protocol % (At Least 5 Exams)



- > Individual exam details were reviewed to identify for causes of poor slot utilization



CONCLUSION

- > Using a fixed slot size based on ordered protocol leads to inefficient and highly variable slot utilization.
- > Instead, the slot size should account for clinical, demographic, and technical factors to increase scanner utilization without incurring new delays, thereby increasing patient access and patient satisfaction.
- > For future work, we aim to generate a predicted scheduled slot size based on historical data of performed exam duration