Implementation of AI-Assisted Technology to Enhance Service Quality and Productivity in Outpatient Diagnostic Centers

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Introduction

- Houston Medical Imaging (HMI) operates 7 MRI scanners at 6 sites, working 6 days a week, 14 hours a day.
- Due to an increased demand for MRI scans, HMI initiated a productivity and service quality improvement project in 2019.
- The project aimed to streamline the MRI service, enhance productivity and improve patient care.

Project overview

- After weighing alternatives, HMI selected iQMR®, an add-on AI-assisted system that facilitates the use of short MRI protocols.
- The system was implemented to all of the groups' MRI scanners: Siemens Skyra 3T, Siemens Avanto 1.5T, GE Pioneer 3T, and Hitachi Oasis 1.2T.
- HMI radiologists mandated that reducing scan time would not impair image quality.

iQMR® overview

- AI-assisted centralized network-based system that connects to all MRI scanners on HMI’s DICOM network.
- It receives short-scans' low-quality images from the scanners, automatically processes them and sends high-quality images to PACS in real time.
- iQMR’s image enhancement allows the use of short protocols while maintaining and even enhancing image quality compared to routine ("long") protocols.
- iQMR is FDA approved since 2018 for all body parts, scanners and models.

Implementation Process

The workflow and scanning protocols of the groups' scanners were modified and optimized to achieve the shortest scan time possible, while maintaining image quality.

The groups' radiologists performed a thorough image review, comparing image quality of the short protocols processed by iQMR to the routine ("long") scans.

The radiologists reviewed a total of 250 exams, acquired on all scanners, comparing images before and after the AI-assisted system implementation. Short protocols were approved for routine use after passing at least 3 consecutive image quality tests.

Implementation was performed during the weekend and off-hours, in order not to disturb HMI's routine work.

Results:

Scan time reduction

31% reduction in scan time (average, all scanners) after the implementation, without degradation of image quality.

Body part	Average AT: Routine protocol [min]	Average AT: Short iQMR protocol [min]	Average scan time reduction
Brain	21:31	15:08	30%
C-spine	17:44	11:22	36%
T-spine	22:27	16:03	29%
L-spine	17:20	10:48	38%
Knee	16:07	11:27	29%
Prostate	26:41	22:02	17%
Shoulder	15:35	08:22	46%
Average (all)	**19:38**	**13:36**	**31%**

Results:

Image Quality

Knee, GE pioneer 3T: Sag T2

Routine scan (AT=1:46)

Processed fast scan (AT=1:20; 25% faster)

C-Spine, Hitachi Oasis 1.2T: Sag T2

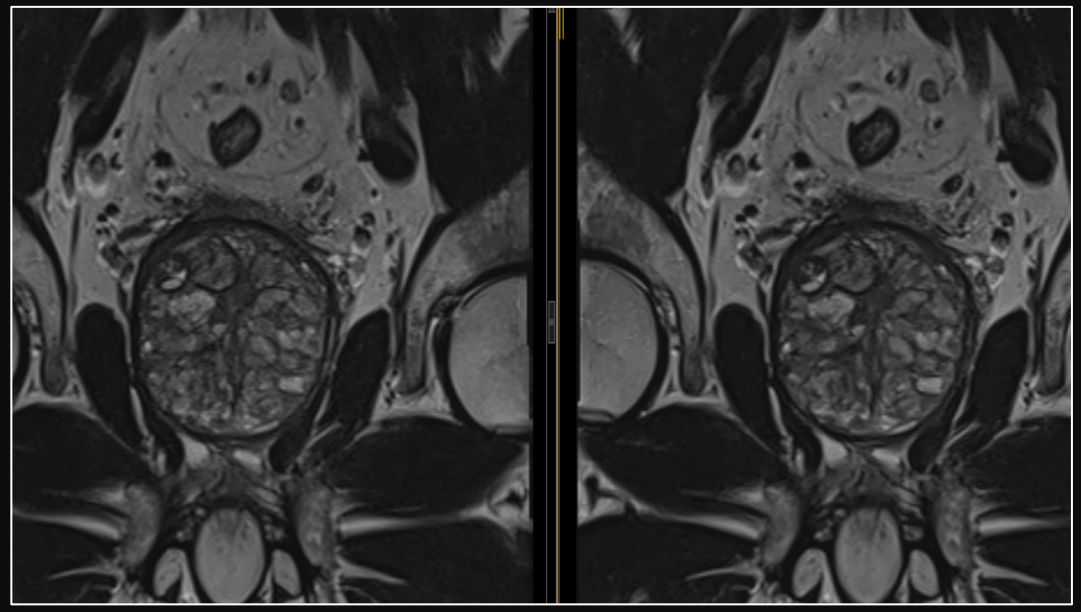
Routine scan (AT=3:23)

Processed fast scan (AT=1:44; 48% faster)

Results:

Image Quality

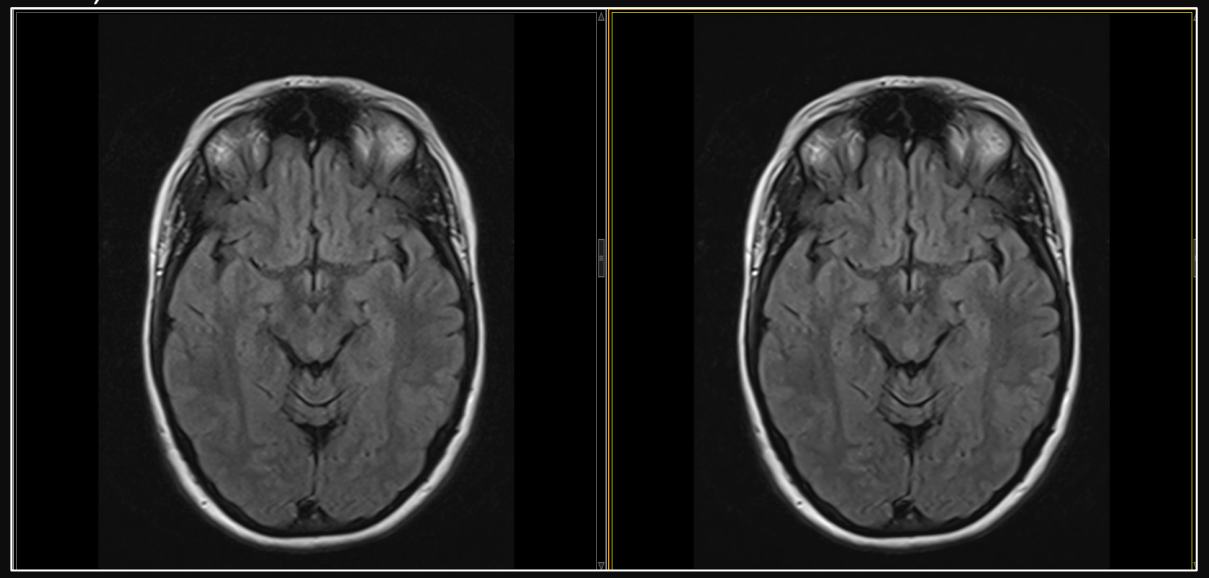
Prostate, Siemens Skyra 3T: T2 COR



Routine scan (AT=3:27)

Processed fast scan (AT=2:21; 32% faster)

Brain, Siemens Avanto 1.5 T : AXIAL FLAIR



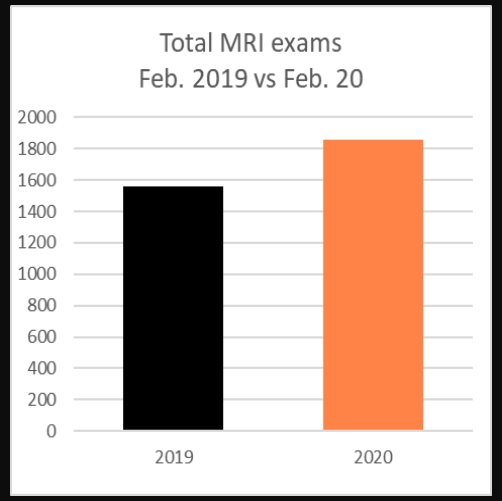
Routine scan (AT=2:26)

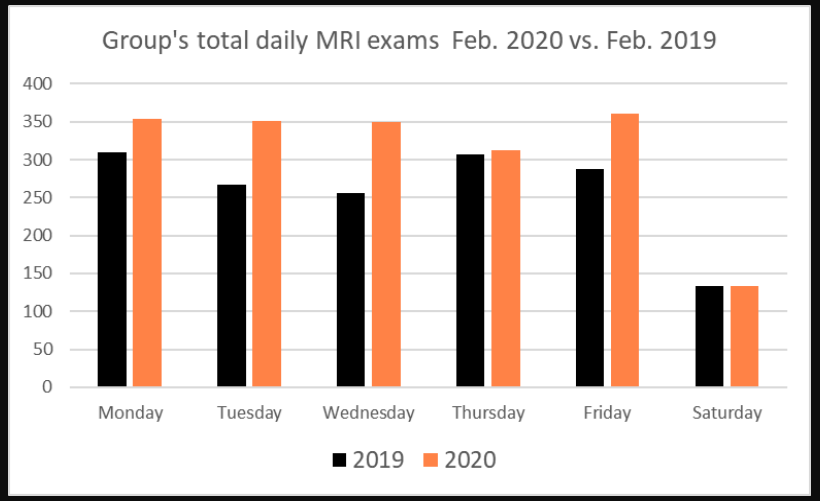
Processed fast scan (AT=1:50; 25% faster)

Results:

Productivity improvement

- Productivity increased by 20%: from 1560 to 1860 patients/month.
- Increased productivity allowed more flexibility for urgent cases & walk-ins.





* To avoid seasonal effects, data from the same month in previous year was compared (Feb. 2019 vs Feb. 2020).

Conclusions and summary

- Implementing an AI-assisted system for faster MRI scan-time, allowed HMI to significantly improve quality of service and productivity.
- Reducing MRI scan-time resulted in increased number of monthly exams and adding slots for urgent referring scans without falling behind schedule.
- Patients' experience and satisfaction improved - Google review grade rose 8%: from 4.48 prior to implementation to 4.85 in Jan.-March 2020.