GE Healthcare

Expanding MRI imaging capacity through data-driven workflow optimization at Houston Methodist Willowbrook Hospital.

Background

Houston Methodist Willowbrook Hospital is a not-for-profit, tertiary care hospital serving northern Houston. In 2014, the imaging department at the 251-bed hospital had two GE magnetic resonance imaging (MRI) scanners, a 3T and a 1.5T, and performed approximately 6,300 MRI exams a year.

A robust demand for outpatient MRI scans, combined with a high volume of inpatient studies, was causing operational bottlenecks in the imaging department. Often, scans were taking longer than anticipated, spilling over into the open slots being held for inpatients.

Challenge

With scheduling capacity pushed to the limit on its two MRI scanners, the hospital teamed up with GE Healthcare on a proof-of-concept[1] to analyze machine data and assess operational workflow to improve throughput and expand capacity.

Solution

By redesigning MRI workflow to shift non-imaging related duties to non-technologists, the hospital has the potential to reduce exam slots from 45 to 30 minutes. This would open capacity for two more outpatient MRI cases a day per scanner, creating the potential for:

- 500 additional exams per scanner each year
- $1.2 million in added revenue from both units

The department added a night shift, but the capacity issues persisted. On at least three days a week, capacity was at 90 percent and it was difficult to give outpatients the appointment times they wanted for their elective MRIs.

15 minute
reduction in time slots would open capacity for more outpatient MRI cases each day per scanner

An independent assessment suggested the hospital needed another scanner. The imaging director at the time, Angelic McDonald MSRS, CRA, RT, FAHRA, recommended an analysis of operational workflow.

"Just walking through the lab, we could see wasted time that could be applied to more procedures and help with volume capacity. But we didn't want to go with gut feelings. We needed data," says McDonald, who is now director of cardiovascular imaging at the DeBakey Heart and Vascular Center at Houston Methodist Hospital.

That data had to go deeper than what existed, says McDonald. "We had on/off data – it told you when the test started and ended but nothing in between," she says. "From an operational standpoint we wanted to know what was happening at every point in the exam. How much time were techs spending doing IVs? Were there time gaps between sequences because they were tweaking parameters? Could we hardwire the parameters in the protocol to avoid that? Did techs need help getting the patient on the table?"

The hospital engaged GE Healthcare to analyze operational data from the two MRI systems and evaluate departmental workflow with the goal of improving MRI throughput, utilization, efficiency and productivity.

The GE team analyzed machine data from 2,623 exams performed between January 1 and April 30, 2014, looking at a range of metrics including:

- Exam time and volume by exam type
- Gap time between MRI series within the highest-volume exams

- Comparison of number of MRI series to identify protocol variations
- Asset utilization and volume over time

In addition, GE team members observed the workflow, including technologist, transport, and nursing activities, and helped the staff develop flow charts of each step in the MRI exam process.

Following the assessment, the GE team made a number of recommendations to help Houston Methodist Willowbrook improve the efficiency of MRI exams.

More hands – more open time slots

A key finding was that the eight MRI technologists had too many responsibilities. With the exception of transporting the patient, they were responsible for the entire MRI exam experience once the order was placed. This included paperwork, fielding care-related phone calls, getting inpatients onto the schedule, and preparing patients. Recommendations included:

- Identifying activities that could be assigned to an imaging assistant
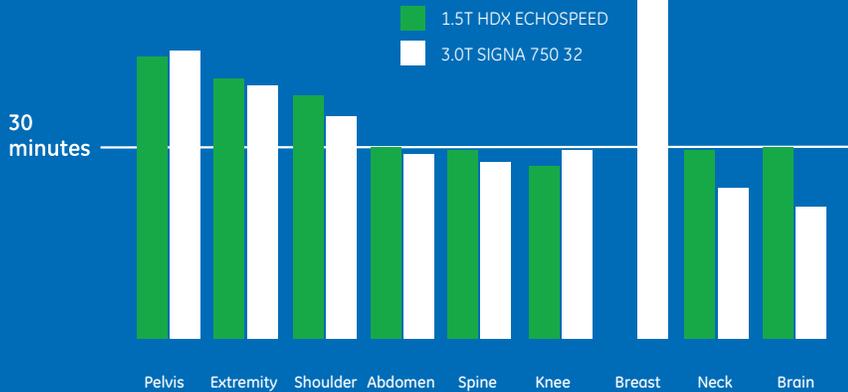- Aligning the new duties based on historic schedule demands

"When the technologist has to get out of the chair and do something else, the MRI scanner becomes useless,"

Dennis Indiero, MHA, BSRS, CNMT.

Dennis Indiero is the current director of diagnostic imaging services at the hospital. "Having an extra pair of hands to work with patients and do set-up could help us reduce lag time."

By enabling technologists to focus on exams with fewer interruptions, the data suggested that some appointment slots could be reduced from 45 minutes to 30 minutes.

Average Exam Time by Anatomy

| | 1.5T HDX ECHOSPEED |
| | 3.0T SIGNA 750 32 |

30 minutes —

Pelvis Extremity Shoulder Abdomen Spine Knee Breast Neck Brain

Anatomy	1.5T	3.0T	Total Exams
Brain	246	701	947
Spine	371	368	739
Extremity	106	152	258
Knee	104	119	223
Abdomen	118	55	173
Neck	19	58	77
Shoulder	27	50	77
Pelvis	30	41	44
Breast	–	23	23

This would enable:

- More same-day and next-day scheduling of outpatient exams

- Greater flexibility to add Emergency Department and inpatient exam requests

- More exam slots each workday

Adding just two outpatient MRI slots/day would enable the hospital to perform 500 additional exams per scanner each year, creating the potential opportunity for $1.2 million in added revenue from both units.

In terms of return on investment, one month of operation on one scanner could offset the cost of adding a lower-credentialed full time employee (FTE) to assist in the department.[2]

High marks on patient care

Both observational and data analysis revealed that MRI patients at Houston Methodist Willowbrook were receiving exceptional care. Safety procedures, such as confirming were being followed by all technologists on all shifts and patients were routinely kept informed and comfortable.

Protocol standardization – eating the elephant

In addition to tackling productivity issues, McDonald wanted to harness the data analysis to support a system-wide effort at Houston Methodist to standardize imaging protocols. "MRI is extremely complex to protocol since imaging departments at different hospitals have different coil combinations and software levels," she says. "So, how do you eat an elephant? One bite at a time. In doing this project we could at least evaluate our own lab: were we providing the same level of service to every person who comes through our doors?"

Data analysis revealed that exam time and number of series were fairly close on both scanners and there was little variation regardless of shift or day of week. The three studies with the highest number of series and greatest variation were abdomen, pelvis, and extremity exams.

"The analysis validated the protocols we had targeted for standardization," says McDonald. "Having this data enabled us to dig deeper and drill down to the exact person or exact protocol to figure out why we were having problems achieving standardization."

Tighter coordination with nursing

One problem identified during charting of the workflow processes was a disconnect between the nursing staff on inpatient floors and the MRI department in terms of readying patients for exams. A key issue was timely completion of safety questionnaires so the MRI staff knew in advance of potential imaging problems, such as stents. Exacerbating the problem was that nursing and MRI documentation notes were captured in two different IT systems and not easily accessed – necessitating multiple phone calls. "We were aware of some of these problems but we hadn't quantified it before," says Indiero. "Seeing the process on a graph took it from being anecdotal or a gut feeling to something we could quantify and work on to help the nursing staff be more proactive in preparing MRI patients."

About GE Healthcare

GE Healthcare provides transformational medical technologies and services that are shaping a new age of patient care. Our broad expertise in medical imaging and information technologies, medical diagnostics, patient monitoring systems, drug discovery, biopharmaceutical manufacturing technologies, performance improvement and performance solutions services help our customers to deliver better care to more people around the world at a lower cost. In addition, we partner with healthcare leaders, striving to leverage the global policy change necessary to implement a successful shift to sustainable healthcare systems.

Our "healthymagination" vision for the future invites the world to join us on our journey as we continuously develop innovations focused on reducing costs, increasing access and improving quality and efficiency around the world.

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[1] The proof-of-concept was conducted at no cost to Houston Methodist Willowbrook Hospital

[2] Assumes $48,000 or less in annual salary