The guide to upgrading an MRI scanner

Contents

Introduction

Managing a radiology department is complex, and keeping technology up to date can be one of your biggest challenges. When it comes to MRI scanners, it's critically important to stay current with hardware and software advances as they can signfcantly impact your bottom line. That's because many updates focus on increased efficiency, streamlined workflow and improvements that boost patient satisfaction.

Another challenge with imaging technology is anticipating your future needs. Because MRI scanners and upgrades are a significant investment, it's important to think of not just your needs today, but what your department will be needing down the road.

This guide focuses on key learnings to help you evaluate where your department is today, what you may be lacking in MRI technology, and what can be done to position your department for the future.

MRI priorities and healthcare market trends

Most MRI departments share similar priorities. These priorities are rooted in making the department safer, more efficient and more profitable. They include[1]:

• Improving patient satisfaction with their MRI experience

• Satisfying needs of referring physicians

• Improving MRI department workflow and productivity

• Improving implementation of MRI safety policies through staff training

• Expanding physician referral base for MRI procedures

• Managing an increased MRI procedure volume

When evaluating department needs, it's important to look at market trends and formulate needs that align with your priorities.

Trends in scanning volume

Current signs indicate the use of MRI scanning will increase in the future. This assumption is backed by a documented 31% increase in MRI scans from 2007 to 2018[1]. In addition, 62% of the MRI sites surveyed anticipated their 2019 MRI procedures would be be higher than their 2018 volume[1]. How many MRI scans will a facility conduct in a year? The average number of MRI procedures performed per site in 2018 was estimated to be 4,420, up 5% from 4,210 in 2017[1].
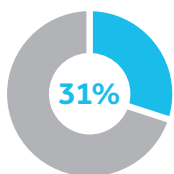
31%

Increase in MRI scans from 2007 to 2018[1]

62%
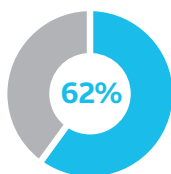
Anticipated their 2019 MRI procedures would be be higher than their 2018 volume[1]

Trends in patient population

Another trend that could influence MRI scan volume is our aging patient population. Not only is our population getting older, but their healthcare problems are complex with 69% of Medicare beneficiaries being 65 years and older with two or more chronic conditions[2]. Looking ahead, this means patient length of stay could increase as well as the need for MRI scans in this patient group. Bear in mind these scans most likely won't be simple as patients with chronic conditions are often difficult to scan due to breathold and positioning constraints.

And speaking of challenging patients! Data shows MRI departments must be prepared to handle scans for patients with unique needs. For example, 36% of MRI procedures performed in the US in 2018 were performed on obese patients, and 14% were performed on in-patients. In addition, 10% of MRI procedures performed in the US in 2018 were performed on pediatric patients. Is your department prepared to handle scans for these patient types?
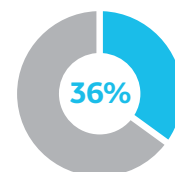
Trends in MRI procedures

Statistics show a decrease in scans using contrast agents in the USA.[1] Of the estimated 39.0 million MRI procedures performed in the U.S. in 2018, 36% (13.9 million) were performed using contrast agents and 64% (25.1 million) used no contrast agents. The average number of MRI procedures performed with contrast media in 2018 was 1,800 per site. This trend is further confirmed by data that shows from 2016 to 2018, the total number of MRI procedures using contrast agents appears to have decreased ~20% from 17.3 million to 13.9 million, whereas the number of MRI procedures with no contrast increased ~16% from 21.7 million to 25.1 million. What's the takeaway for an MRI department manager? Do you have applications that don't require contrast agents? If not, this may be something to look into.

Aging and complex populations
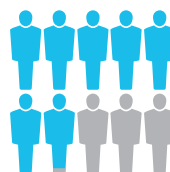
Medicare beneficiaries 65 years and older with 2 or more chronic conditions[6]

Invasive exams

36%

36% of MR procedures in 2018 used contrast[1]

Trends in reducing repeats

Improving workflow and productivity is on every department's priority list. Therefore, knowing trends in reducing repeats is important. Did you know that 30% of patients undergoing an MRI experience anxiety reactions[3] – leading to repeat scans and a longer overall exam? What's more is 20% of all MRI exams are repeated[4] and 10% additional time is required for repeat scans with an average of 4:10 minutes additional scan time needed to acquire repeat MRI sequences.[4] Knowing that repeatability is a challenge, ask yourself if your department could use technological advances that focus on reducing the likelihood of repeat scans.

Patient anxiety

30%
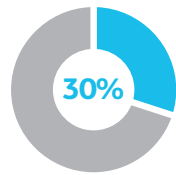
30% of patients undergoing MRI experience anxiety reactions[5]

Motion and breathing

20%
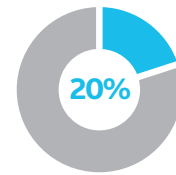
20% of all MRI exams require a repeated sequence[1]
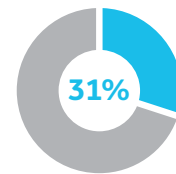
Trends in scanner lifecycle

As increased MRI scan volume seems to be a trend, it's important to assess the age of your scanner and if it will be able to handle increased usage. According to market data, in 2018 the median age of an installed base MRI system was seven years, and the average replacement cycle of an MRI scanner was 12.8 years[1].

Where is your scanner in the 12.8 year lifecyce? If it's newer, you may consider upgrading your system to the latest technology and advanced software to improve workflow and productivity. If it's older, it may be time to investigate new systems.

Aging technology

7 years

Median age of MR systems[1]

Increasing MRI demand

31%

Increase in MRI scans 2007-2018[1]

[1] 2018 MR Market Outlook Report, IMV, https://imvinfo.com/product/2018-mr-market-outlook-report/

[2] https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Chronic-Conditions/Chartbook_Charts.html

[3] Grey SJ et al Magn Reson Imaging (2000) 18: 351 – 5

[4] Andre et al JACR (2015) 12: 689

[5] Patient Throughput: A Critical Strategy for Success, 2007, The Chartis Group,http://www.chartis.com/resources/files/whitepapers/pre-2013/chartis_group_patient-throughput-critical-strategy-for-success.pdf, (accessed 23 Jul 2018)

[6] World Population Aging, 2017, United Nations Organization,http://www.un.org/en/development/desa/population/publications/pdf/ageing/WPA2017_Highlights.pdf,(accessed 22 Jul 2018)

Do you need to upgrade your scanner?

Upgrading your scanner is a big decision. In addition to evaluating the financial commitment, upgrades require finding the right time to make significant changes to day-to-day operations. But rest assured, upgrading can be well worth it. It can solve some of the challenges that occur with older systems and help you realize gains in efficiency and improved patient care.

There are five areas of operations most impacted by upgrades. Here are questions to consider when asking if an MRI upgrade is right for your organization. And of course, if you find you are answering yes to a majority of questions, the upgrade may be a sound move.

1. Improved clinical outcomes

- Will the upgrade lead to improvements in patient experience?

- Will the upgrade boost your ability to achieve the best possible clinical outcomes relative to benchmark?

- Will the upgrade lift hospital performance metrics/core measure targets?

- Will the upgrade improve physician alignment and consistency of practice?

2. Greater operational efficiency

- Will the upgrade help optimize clinical and non-clinical labor spend?

- Will the upgrade improve the efficiency of support functions?

- Will the upgrade help reduce supply spend and optimize utilization?

- Will the upgrade help cross-facility collaboration?

- Will the upgrade help ensure the efficient management of episodes of care?

- Will the upgrade help improve workflow and patient management?

3. Staff management and retention

- Will the upgrade improve staff and physician engagement?

- Will the upgrade drive staff and physician development?

- Will the upgrade improve staff and physician satisfaction?

4. Increased patient volume

- Will the upgrade facilitate resource allocation on priority services?

- Will the upgrade improve alignment with referring MDs?

- Will the upgrade improve capacity management?

- Will the upgrade help expand the number of payor contracts and improve the quality of portfolio contracts?

5. Better financial performance

- Will the upgrade help increase reimbursement fees, payor rates, and collections?

- Will the upgrade increase capital efficiency?

- Will the upgrade help increase contribution margin?

- Will the upgrade expand portfolio of revenue generating assets?

- Will the upgrade improve revenue cycle management?

How to evaluate an MRI scanner

The decision regarding the purchase of an MRI system upgrade is not to be taken lightly. First, cost is a big factor. New, state-of-the-art 3.0T scanners can reach a price tag of over $3 million. And there are other factors like downtime and retraining which come into play with new system installs and with upgrades. And then there are your overall goals for your department. Of course, they play a large role as well.

While each facility or imaging center has unique considerations that influence the evaluation of an aging MRI scanner, there are common key factors every facility should consider when making decisions about a system's future.

What variables lead to the overall cost?

One important factor in assessing the health of your scanner is the overall cost of the project you're considering. Understanding what options you have and what questions to ask can help determine your best choice.

While the list will be dependent on variables like a new system vs. upgrade, some of the common questions to be considered with a project will include:

MRI scanner considerations

- Do I replace my current system with a new system or upgrade?
- What upgrade options are available to me?
- Does the upgrade encompass technology/hardware updates as well as software?

Installation

- What are the updgrade installation costs vs. the installation costs of a new scanner?
- What is the timeline of an upgrade option for my scanner vs. the timeline for obtaining a new MRI?

Training

- What additional staff training will be needed if I upgrade my current scanner? (e.g. new clinical capabilities, etc.)
- How long is the training for an upgrade compared to the training for a new MRI system?

Mobile rental

- Will I need to invest in a mobile rental during my installation period of either a new system or an upgrade to my existing scanner?

Energy consumption

- What is the energy consumption cost of a new scanner and how does that compare to the energy consumption cost of my scanner after an upgrade?

MRI suite packages

- Do I want to consider adding an MRI suite?

Downtime

- What will be the downtime and associated costs of replacing my scanner compared to the downtime and associated costs of upgrading my current system?

Service packages

- What service packages are available to me and what are their costs?

Clinical outcomes

- What are the most important clinical offerings I need for my facility?
- What clinical advancements could I obtain through an upgrade to my existing scanner and how does that compare to the advancements I can get with a new system?
- What option is best for helping extend overall clinical offerings to patients?

Further evaluating a system – the site visit

Site visits can be very useful when deciding which MRI system is right for you. But successful visits require preparation. On the next page, you'll find five areas you should consider to make your visit more impactful.

Selecting the right location

Clinical site: Do you want to see technologists conducting exams in a typical clinical environment? If so, you may be able to arrange a visit to a clinical site close to your location. Some of the benefits of this type of environment are the ability to observe a "normal" interaction and to ask objective users questions.

Headquarter demonstration: If you want to interact with additional company functions such as Product Development, and Service, then a headquarter demo is a great option. Most vendors will have the ability to show you the system of interest and the types of scanning you would need to accomplish. Additionally, many of the resources who are best suited to answer questions will be on site.

Selecting stakeholders

Determining who is best suited to evaluate a system during an onsite visit is important. Not only will it help maintain efficiency in your decision-making process, it can also facilitate consistent message transfer if key personnel making the selection and working with the system are involved.

Start at the finish

Successful visits start with a detailed understanding of what is important to you and why. Making a list of the critical items you want to leave the experience understanding can be helpful.

Establishing visit duration

Knowing how much time you need for discussion and questions can be difficult to predict. Barring the business critical interruptions, the most successful site visits start with managing the allocated time. While there can always be follow up, setting a duration will help the host site plan the scanning time vs. presentations, etc.

Topic weighting

Prioritizing your discussion topics will ensure the right people and processes are in place for your visit. For example, if understanding how silent scanning can increase patient satisfaction is really important to you, let it be known so the visit planner can make sure it is addressed appropriately.

Additional questions to ask

The best way to determine if you are selecting the right MRI scanner is to ask your vendors and your internal stakeholders specific questions about a system's capabilities.

Asking the right questions can help provide clarity to your buying process so that you feel informed and confident.

The following questions regarding outcomes and financial aspects should help direct your investigation.

Clinical excellence

- How will system "X" help me achieve an improvement in my diagnostic capabilities?

- Will I notice a positive change in my diagnostic confidence? How?

- Is it possible to realize both quantity and quality improvements with system "X?"

Patient satisfaction

- Will system "X" help me attain my current and future patient satisfaction goals?

- Will I be able to better serve patients unhappy with MRI exams?

- How does this system enable me to provide better patient comfort and care than my existing system?

Operational efficiency

- Can this system provide a path to overcome variation amongst technologists?

- Will I be able to increase patient throughput? How?

- Am I currently optimizing the capacity of existing assets? How can system "X" help?

Strategic growth

- Will system "X" allow me to develop new diagnostic services?

- Can I expect to see an increase in my patient and physician attraction/retention rates?

- Is it possible for system "X" to enable maximum reimbursement? How will it help with this?

Capital planning

- What do we anticipate our total cost of ownership to be and how does that fit our needs?

- How long do I expect to retain system "X" and how will it impact our evolving patients and imaging?

- Can I reduce my cost of capital with system "X" acquisition?

Why you need the latest in MRI technology

Innovation in medical imaging technology continues to bring solutions and services to market that can expand the breadth and capabilities of your radiology department.

Sometimes the advances provide major breakthroughs (think silent scanning) and sometimes they bring incremental gains. Nevertheless, they drive the technology forward to deliver unprecedented visual and functional information. These faster, more intelligent diagnostic imaging systems support decision making, reduce complexity, and increase productivity.

Since advances in technology are often incremental, the industry offers upgrades that can help extend the life of equipment over a defined period of time. However, as technologies become obsolete a variety of technical incompatibilities, e.g. equipment controls and redesign of components, render continued updating of equipment uneconomical, if not impossible.

Older equipment also involves a higher risk of failure or breakdown. This could lead to considerable delays for essential medical interventions while the equipment is out of service.

Although this situation can partially be avoided through timely and regular maintenance, the operating cost of older equipment tends to be higher than that of up-to-date electro-medical equipment, leading to higher net costs for the provision of similar medical services using older equipment.

The expected lifetime of an MRI system

Different needs, use levels and settings lead to variability in asset retention. However, there are some trends that help when asking yourself if your MRI scanner is in the "window" of a replacement.

The average replacement cycle for sites planning to replace MRI units is 12.8 years. About 50% of the installed MRI base units are likely to be replaced when they are 13-21+ years old.[1]

While manufacturers release upgrades that can help extend the life of equipment over a designated period of time, only you can determine if that is suitable for your practice environment's quality and quantity demands.

[1] 2018 MR Market Outlook Report, IMV, https://imvinfo.com/product/2018-mr-market-outlook-report/

MRI upgrades and application advancements

System upgrades often include new applications and enhancements to existing applications. If you've determined that an upgrade is the best fit for your practice, it's important to make sure your upgrade includes applications that address the specific needs of your practice area. Across the industry, available applications include:

Neuro imaging

- Motion-free 2D/3D imaging
- Isotropic 3D volumetric imaging
- Increased tissue contrast sensitivity
- Improved diffusion-weighted imaging
- Non-contrast perfusion imaging
- Acoustic noise reduction imaging
- Imaging multiple contrasts with single acquisition

Body imaging

- Motion-free imaging
- Free-breathing sequences
- Fat and water separation techniques for improved fat/sat
- Improved diffusion-weighted imaging
- Quantitative imaging techniques
- Advances in permeability imaging

Breast imaging

- Improved speed and resolution of dynamic contrast imaging
- Fat saturation techniques
- Medial and lateral biopsy capability

Cardiac imaging

- Viability imaging
- Free-breathing imaging
- 4D flow imaging
- Quantitative mapping

Vascular imaging

- Non-contrast imaging
- Accelerated table movement for run-off imaging
- Eliminated timing bolus imaging

Orthopedic imaging

- Improved cartilage delineation
- Motion-free imaging
- Isotropic 3D volumetric imaging
- Improved MR-Conditional metal implant imaging
- Acoustic noise reduction imaging

Pediatric imaging

- Motion-free imaging
- Free-breathing sequences
- Non-contrast techniques
- Acoustic noise reduction imaging

Reset the life of your scanner

Whether you are an individual or a large organization, when making any large investment you want to make sure you've done your research and that you are making the most of your assets. For clinics, imaging facilities and hospitals – investing in an MRI scanner is no different.

This is why when looking at MRI scanner options, it's important to investigate a solution that some manufacturers are now offering. It's an innovative way to improve the life of your scanner and upgrade the system you already have in place, rather than replace the entire machine.

This solution is based on the premise that while technology has advanced dramatically in recent years, one thing hasn't changed, and it's the strength and quality of the scanner's magnet. So, why trade in your magnet when you can build upon it and enhance your machine beyond its current capabilities?

How does the latest technology benefit everyone?

As the life of an MRI scanner starts to fade, many clinicians become concerned about the potential for image quality loss. When faced with the option to replace the machine or upgrade, some are skeptical about the benefits a cost-effective and quick upgrade to their machine can deliver. It's important to know some manufacturers may have scanner reset offers that deliver image quality equivalent to a newer scanner due to the upgrade's technological improvements.

There are additional benefits to scanner resets which include:

• The cost can be significantly less expensive, sometimes reduced as much as 50%

• Less down time- the system can be upgraded in half the time it would take to install a new machine

• Reduced construction related costs in comparison to new installations

• Less disruption to the building and services

• Advancements in clinical capabilities from new software applications

The option to reset a machine rather than completely replace it has given many institutions the ability to improve upon their equipment. Imaging sites that might not be able to afford a new machine can now offer the same quality of care with an upgraded unit. These upgrades are also very economical for the clinic as the scans offer improved image quality, they take less time, and more scans can be performed in a day.

Resetting a scanner also benefits patients who will spend less time in the scanner due to quicker scan times. These patients should also receive the results of their scan sooner due to processing improvements. Also, the patient can trust their physician's diagnosis and treatment plan, knowing that their clinic uses the latest technology and consistently creates highly detailed images. In addition, as clinicians reset their machine and extend the life of their scanners, they may be able to extend those cost saving efforts to patients.

While deciding to reset an MRI scanner is a challenging decision, many physicians are deciding it is right for them. They are excited about the new technology, the exceptional image quality, and the high level of care they can now offer patients, while taking a cost-effective path to keeping equipment current.

Patient throughput and scan speed

The world's elderly population is projected to double by 2050 to nearly 2 billion,[6] Due to the growth of this high-healthcare-use segment, patient throughput (meaning the flow and cycling of patients in health settings) is expected to increase.[5] This increased demand for healthcare could quickly trigger a healthcare delivery crisis if certain long-standing issues are not tackled.

One of the long-standing issues relates specically to MRI scanning. Although MRI scanners have come a long way in terms of technology and image resolution, the time it takes to conduct an exam hasn't changed much. The lack of improvement to scanning speed is causing concern for imaging providers, in terms of low patient inflow. This is true even in cases where healthcare providers have upgraded to more advanced 3.0T systems.[7]

So, this brings us to a pertinent question — can faster MRI technology solve the issue of patient throughput in hospital radiology departments?

Current challenges in MRI scanning

In today's healthcare system, all stakeholders are looking for progress. For example, patients are demanding better outcomes, and healthcare providers are looking for more efficient and less expensive processes. Additionally, state governments are striving for improvements that lead to more cost-effective methods of healthcare delivery. A paper by O'Brien et al. has delved into this subject and found that a smoother integration of these stakeholders naturally comes with a price, whether in the form of quality, productivity, or costs.[8]

As technology has continued to advance, MRI systems and processes have continually been revamped to address patient value rather than increasing the scanner's ability to handle larger patient volumes. This has caused radiology professionals to concentrate on improving operational efficiency and value delivery[8,9], along with processing time.

But volume is clearly a concern. MRI technologists at the Howard County General Hospital, a subsidiary of John's Hopkins, said they saw issues with patient throughput every day. On one hand, doctors and nurses claimed to refer a certain number of patients for MRI scans, but on the other end, scanning tables were, surprisingly, empty. This indicated there was a either problem in streamlining workflow between different departments or that patients were opting out of the exam. The technologists also observed that, in some cases, many (more than 20) patients were given wait times of up to 9 hours![10]

Overcoming MRI time-related challenges

MRI examinations have a complex workflow with respect to scheduling, monitoring, and performing the scan. A solid operations strategy is critical in hospital environments in order to manage the growing demand for medical imaging. Some studies suggest MRI process improvements that simultaneously reduce patient wait times and increase the volume of daily completed scans.[11]

A 2017 study identified a gap between the time allotted for an MRI scan and the time required to complete it. With the help of a multidisciplinary team who used lean principles to refine the scanning process, costs-per-scan decreased and throughput was optimized. This method also improved patient experiences.[8,12]

In addition, participants in a brainstorming session at John's Hopkins identified early patient screening as a priority for boosting MRI throughput. The group hypothesized that if screening was performed by units other than radiology, it could ease the burden of techs and streamline flow. Accordingly, a pilot study implementing this workflow revealed a 35% decrease in throughput times along with increased patient satisfaction.[10]

35%
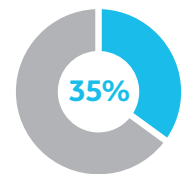
Decrease in throughput times along with increased patient satisfaction[10]

Furthermore, a commentary published online in Imaging Technology News (ITN), described improved waiting room facilities and proper staffing in exam rooms as two factors that could bolster throughput. ITN stated that even the fastest MRI scanners could not improve patient throughput if there were operational issues in the waiting room and examination room. For example, if an MRI system could complete a scan in 15 minutes, but the next patient was not prepped, then there were more challenges to overcome than just incorporating a technologically enhanced MRI system.[7]

Pediatric imaging also presents time challenges as MRI scans are lengthy procedures that require patience and tolerance from children. A few years ago, radiologist Shreyas Vasanawala and his team at Stanford University developed a state-of-the-art MRI system, designed specifically for pediatric use. This system used a method called compressed sensing to reduce the time required for a child to undergo a scan. Compressed sensing relies on quick collection of only a small amount of data from the patient. The data is then reconstructed into a complete MR image at a later time.[13]

The Department of Radiology at Brigham Health in Boston has also recently made small alterations by way of updating their MRI systems instead of changing the entire unit or the magnets involved. These adjustments helped shorten protocols and resulted in better image quality, faster scan times, and thus, happier patients. The entire program was labeled as a success.[14]

A question posed by a manager at one of the health centers in the United States, was, "If you or one of your family members were going through treatment, how would you feel about waiting 9 hours for an MRI exam?".[10] This certainly drives home a very important sentiment for hospitals, patients, and their families.

With the release of new technologies, powerful imaging modalities such as MRI are making waves and diagnosing health and disease more effectively and accurately. In the last decade, many faster and smarter MRI scanners have been cleared by the FDA for use in healthcare settings. Perhaps in the future, these faster scanners could play a more prominent role in delivering quality care to patients while maintaining an ideal throughput at the same time.

[5] Patient Throughput: A Critical Strategy for Success, 2007, The Chartis Group,http://www.chartis.com/resources/files/whitepapers/pre-2013/chartis_group_patient-throughput-critical-strategy-for-success.pdf, (accessed 23 Jul 2018)

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Get The Works with GE Healthcare upgrade options

To match the life of your magnet and to ensure your new technology best fits your equipment, Get The Works upgrade options are flexible and customizable. The three upgrade options are actually impactful solutions, designed to bring you the latest in MRI technology so you can elevate the level of your patient care.

Get The Works upgrades are:

• Flexible and customizable

• Capable of increasing your procedures by 30%[15]

• Developed to help you gain advanced clinical capabilities

• Tailored to deliver today's technology at up to half the cost[16]

• Based on the fact that your GE magnet is clinically strong for up to 30 years

• Designed to provide up to 50% savings in construction costs[17]
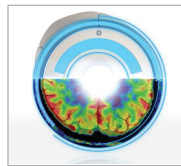

GET THE WORKS
Fueled by SIGNA™Works

The three Get The Works options

Get The Works upgrade options give you the power of choice in upgrading just your software, upgrading your software and hardware or upgrading to a completely new system built around your existing magnet. Depending on which scanner you have, there may be a couple options for you. With Get The Works, it is all about making the right equipment upgrade decision easy for your organization.
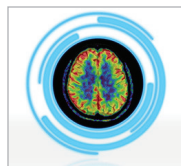
Applications with SIGNA™Works

This state-of-the-art software package includes MRI advancements in imaging performance and productivity that can enhance your clinical capabilities.

Applications and hardware with SIGNA™ Continuum™

Get a selection of innovative applications, electronics and hardware that best optimizes the performance and productivity of your system

The Works with SIGNA™ Lift

Reset the life of your scanner when you get a next generation system built around your existing magnet. This option helps you lift your imaging performance and clinical capabilities to the highest level of care.

[15] With the SIGNA Explorer Lift, the system may be able to scan 2-3 more patients per day due to new capabilities and productivity.

[16] Compared to a new GE 1.5T MR system - upfront cost includes equipment, construction required for the equipment install and potential mobile cost during downtime. Actual costs will vary depending upon your site's specific circumstances.

[17] Total upfront cost includes equipment, downtime and siting. Actual results may vary. Based on average estimate construction costs to upgrade a 1.5T 60 cm to SIGNA Explorer Lift versus replacing with a new wide bore.

Explore your upgrade options and check your
GE Healthcare MRI system's upgrde eligibility when you visit:
www.gehealthcare.com/products/magnetic-resonance-imaging/upgrades.

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[15] With the SIGNA Explorer Lift, the system may be able to scan 2-3 more patients per day due to new capabilities and productivity.

[16] Compared to a new GE 1.5T MR system - upfront cost includes equipment, construction required for the equipment install and potential mobile cost during downtime. Actual costs will vary depending upon your site's specific circumstances.

[17] Total upfront cost includes equipment, downtime and siting. Actual results may vary. Based on average estimate construction costs to upgrade a 1.5T 60 cm to SIGNA Explorer Lift versus replacing with a new wide bore.