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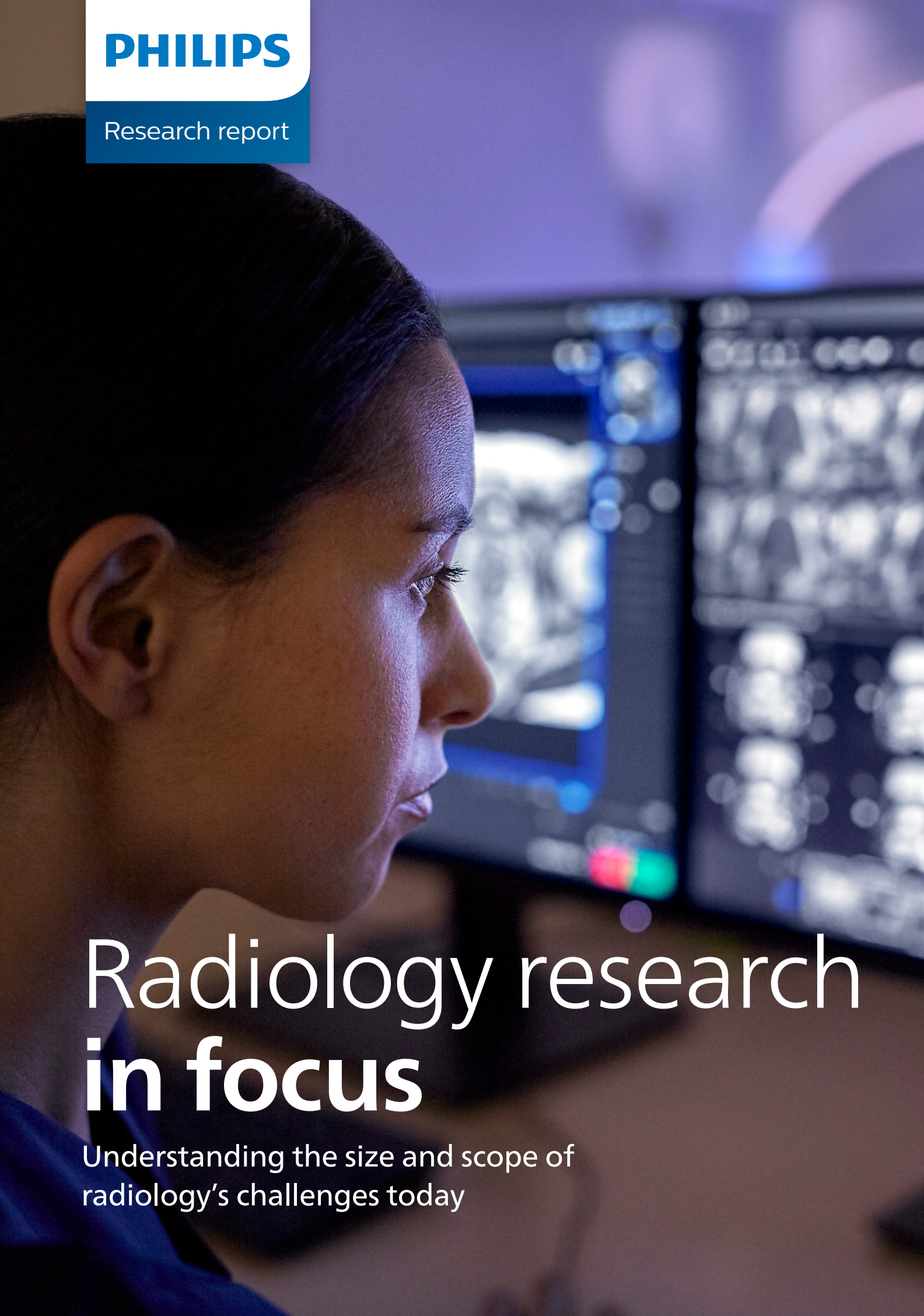
Research report



Radiology research **in focus**

Understanding the size and scope of radiology's challenges today


PHILIPS
MR 7700

Introduction

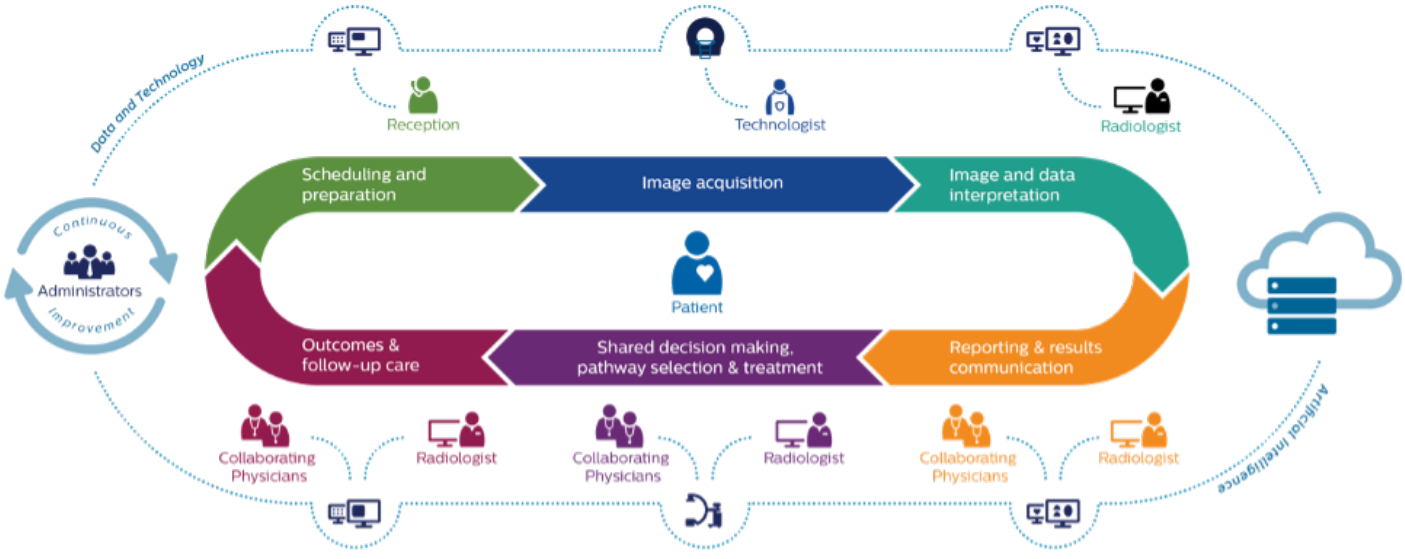
The global diagnostic imaging market is projected to reach USD 35.0 billion by 2026, from 26.6 billion in 2021. Among the factors driving this trend are a rapidly growing geriatric population with complex healthcare needs, as well as increasing demand for early disease diagnosis.[1]

In addition, the COVID-19 pandemic caused a temporary drop in volume for radiology departments, while also requiring dramatic changes in the measures that hospitals must take to protect patients and staff. As hospitals begin to refer more nonemergency cases for imaging and volumes recover, the effects of those changes linger. And continuing waves of COVID-19 may cause unpredictable volumes and future backlogs.[2]

Imaging departments are under tremendous pressure to respond to these conditions, all while dealing with shrinking budgets, system complexity, staff shortages, an explosion of data, and high levels of burnout. And because the radiology workflow is actually a complex web of separate workflows, every step of the imaging process is susceptible to delays, variability and gaps in communication.

As we consider how to respond to the challenges facing radiology today, it's important to understand the full scope of each challenge and its potential impact on operations, cost of care quality of care, data management, or staff. The effects can be felt at every step of the patient journey, from scheduling to image acquisition and diagnosis to treatment and follow-up.

In this article, we'll dive into each stage of the patient journey to identify and quantify the size of the problem that radiology departments face as they evolve to meet today's demands and prepare for the future.



Workflow Challenges

Scheduling and Preparation

The challenge in focus:

Imaging operations are interrupted by patients showing up underprepared, late, or not at all. This can lead to operational inefficiencies, as well as patient care issues that include delays in diagnosis and treatment, increased morbidity, and increased mortality.

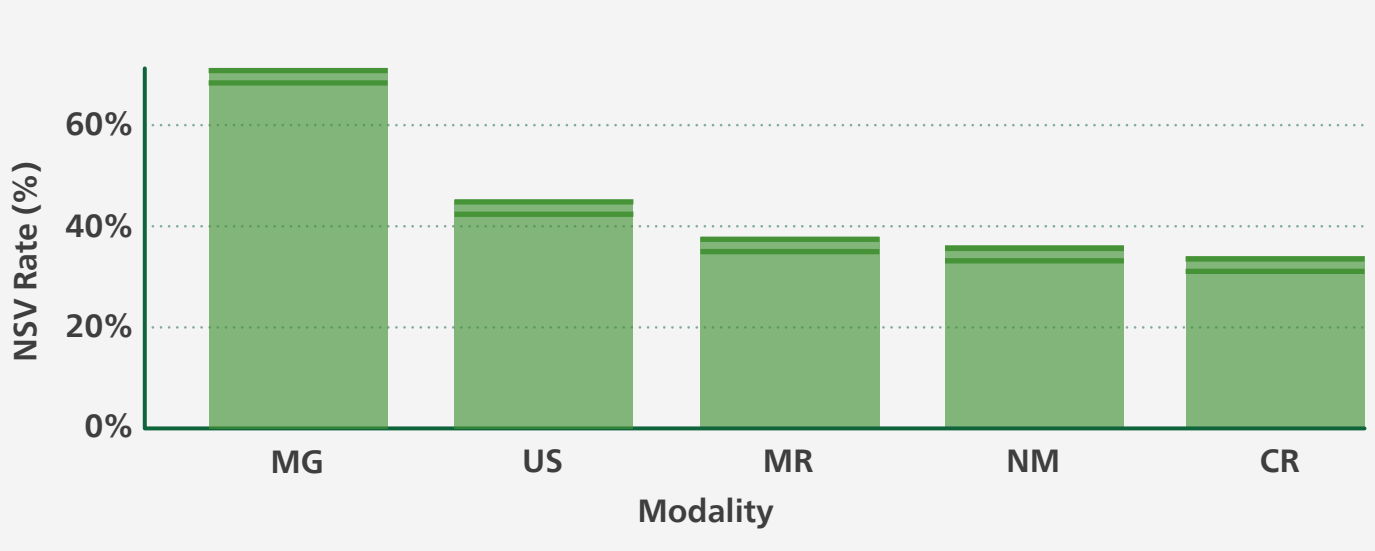
7%

of patients don't show up for their appointments in some imaging modalities, which can amount to up to $1,000,000 in lost revenue.[3]

According to a 16-year study observing 2.9 million outpatient imaging visits, including radiography, CT, mammography, MRI, ultrasound, and nuclear medicine examinations, up to seven percent of appointments are missed by patients, with variation across modalities.[3]

Common reasons identified for no-shows in other medical specialties likely differ from those in radiology because of differences in the reasons for visits, cost of care, patient anxiety, or misunderstanding about the nature of tests and required patient preparation.

The authors found that modality type and scheduling lead time were the most predictive factors of a no-show for a radiology appointment. Scheduling too far in advance paired with poor communication leads to no shows, but improvement is seen when communications give opportunities to cancel if the appointment is no longer necessary.

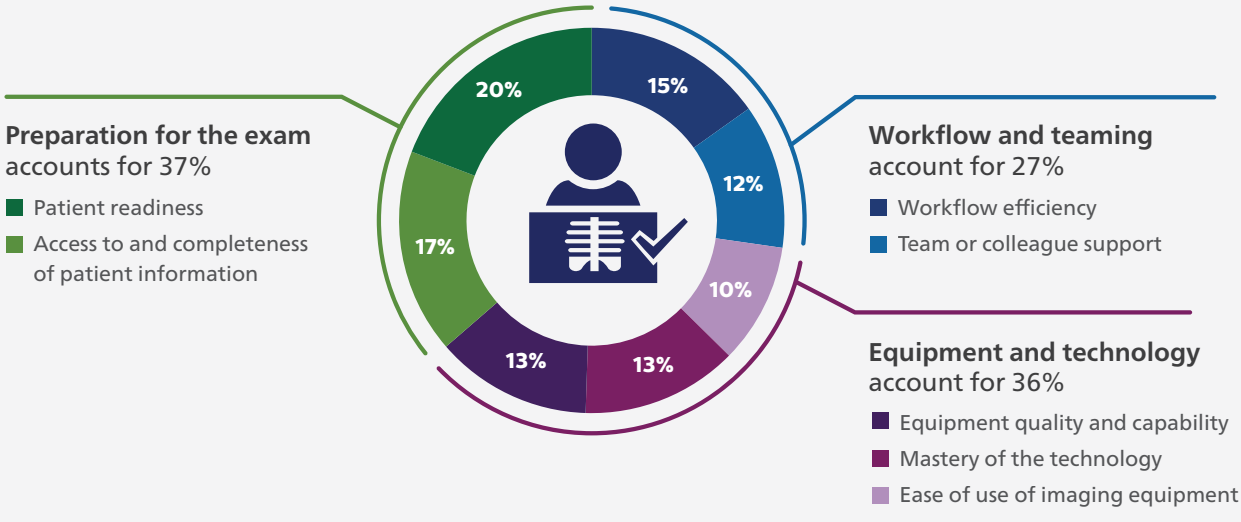


Data insight: NSV rates by imaging modality. Mammography exhibits significantly higher highest rates of no-show visits than other modalities, and radiography shows fewest no-show visits. Bands indicate 95% confidence intervals calculated for binomial proportions. MG = mammography, US = ultrasound, MR = magnetic resonance, NM = nuclear medicine, CR = radiography.

A Philips research study conducted in 2019 surveyed more than 250 radiology technologists and imaging directors across the US, France, Germany, and the United Kingdom to understand the state of the radiology staff experience.[4] The survey found that patient readiness was a significant factor in the outcome of a diagnostic exam. When technologists can't get the image right the first time, it's largely because the patient hasn't been properly prepared—or because of missing or inadequate patient information. With workload already a critical problem, technologists are having to repeat exams because they're missing critical clinical information or patients are unprepared—all of which is mostly out of their control.

37% of radiology technicians cited patient readiness combined with access to and completeness of patient information as the greatest reason (37%) for not getting the image right the first time.[4]

Q (RTs + IDs): How much does each of the following contribute to getting the imaging study done right the first time?



Data insight: Patient readiness combined with access to and completeness of patient information are deemed to be the greatest reason (37%) for not getting the image right the first time. Both factors were notably higher in Germany, where they are thought to contribute 60% towards not achieving a first-time-right image, compared to FR (28%), US (29%), and UK (30%). (Data not shown here).

Technology factors (equipment quality and capability, mastery of the technology, and ease of use of imaging equipment) combined are the second highest factor overall (36%) in not achieving a first-time-right image.

Image Acquisition

The challenge in focus:

Efficiency in an imaging department is dependent on staff's ability to acquire the right image in the first exam. But increased workload, coupled with patient-driven factors that may necessitate repeat exams, creates a difficult environment in which job stress, burnout, and turnover are high—which can negatively affect both outcomes and efficiency.

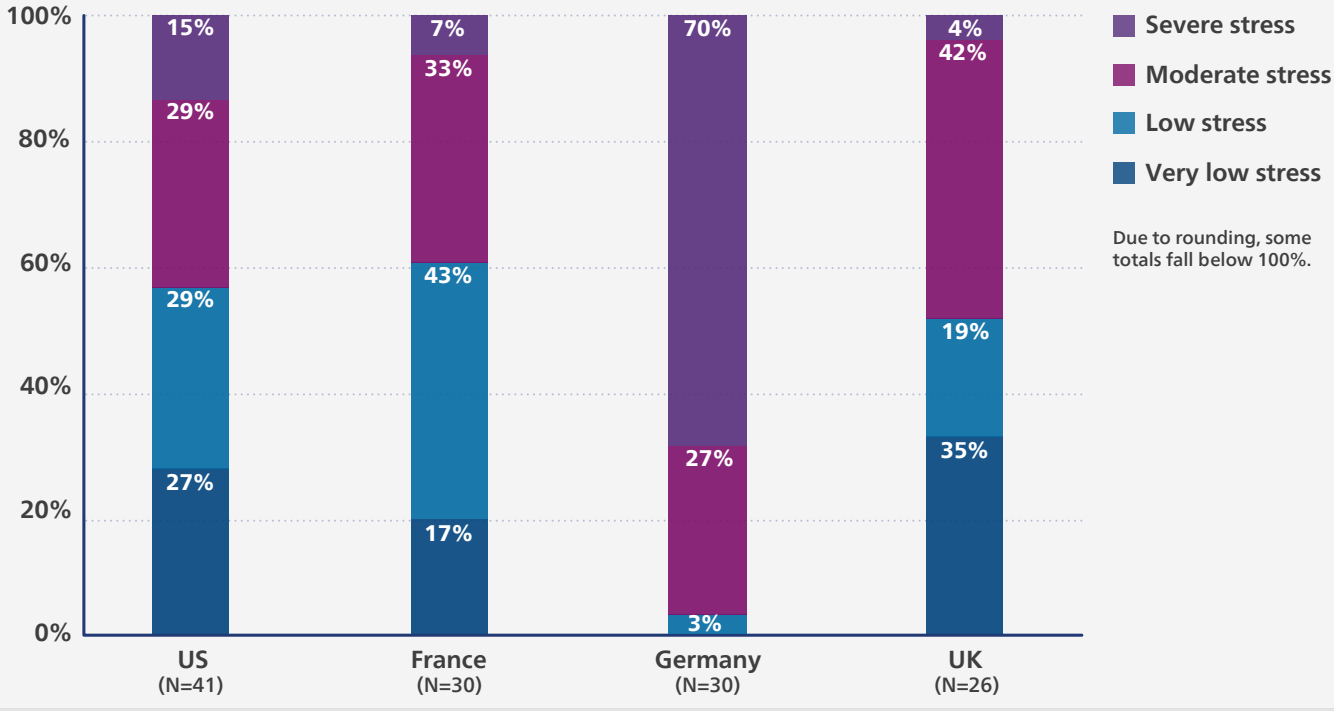
44%

of technologists in the US report moderate or severe levels of job stress.[4]
(FR=40%; UK=54%;GER=97%)

In the same Philips study of radiology services impact and satisfaction, radiology technologists were asked to rate their stress level for a series of eights statements—with alarming numbers of technologists reporting moderate or severe stress levels. The study also found that workload is, by far, the greatest source of stress and burnout for imaging staff.

Sustained levels of moderate to extreme stress are a threat to imaging staff, patient experience, and the operations of radiology departments. High levels of stress can make conditions unsafe, decrease staff's control over work duties, and ultimately disrupt the wellbeing of staff members. Such conditions lead to burnout and staff turnover and, in turn, they can decrease positive patient care experiences.

Q (RTs): Thinking about your current job, how often does each of the following statements describe how you feel?



Data insight: In Germany, the number of techs reporting severe stress – 70% – is truly alarming and a clear outlier from the other geographies: 4% (UK), 7% (FR) and 15% (US).

1 in 5 MRI scans need to be re-done completely.[5]

Another study commissioned by Philips explored the efficiency of MRI suites.[5] Survey respondents reported considerable issues, with 20% of all MRI scans needing to be repeated due to patient motion, which has a major impact on departmental efficiency.

60% of aborted scans are due to patient motion, especially head-first scans which are also the most commonly performed type. Patients often experience anxiety or claustrophobia, resulting in movement or even requests to conclude the scan before it is complete.

When information is missing or inadequate at the point imaging staff needs it, it hinders the ability to get the image right the first time and deliver patient-centered imaging care. Having to redo an MRI leads to increased wait times, scheduling challenges, and a negative impact on revenue.

53%
of interviewees said that waiting times increased as a result of these retakes and rescans

35%
said that patient throughput decreased

50%
said that revenue was negatively impacted

Image and data interpretation

The challenge in focus:

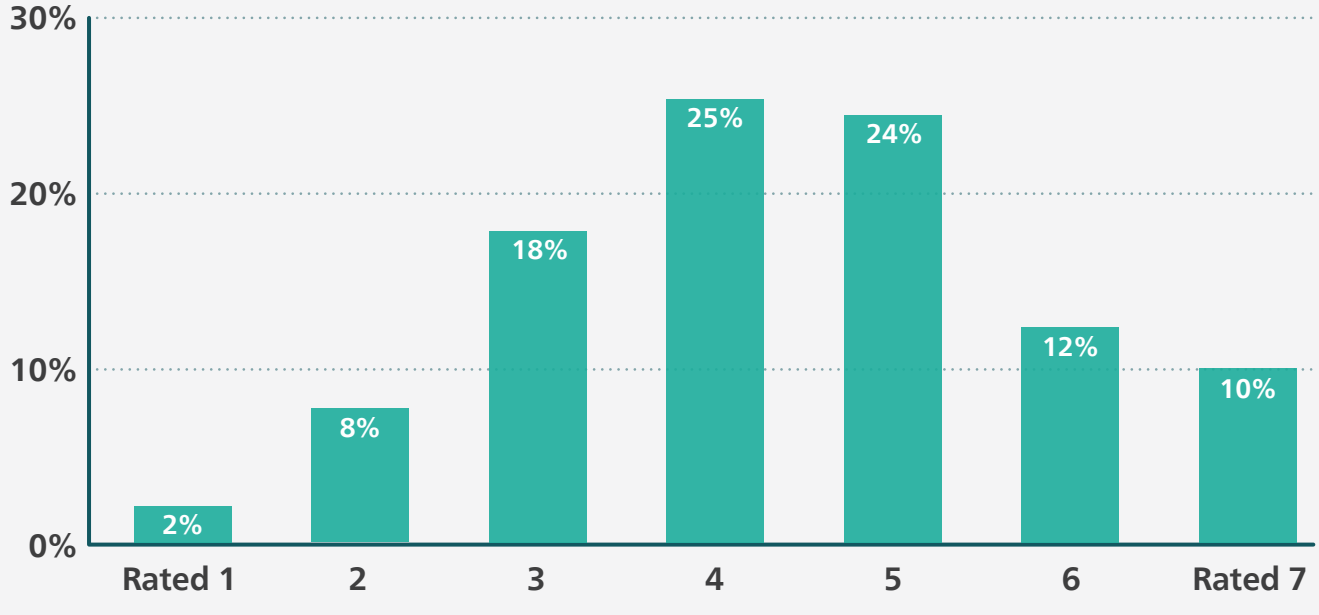
Due to high patient numbers and massive workloads, severe fatigue is a rapidly increasing issue among radiologists—which negatively affects their job performance and satisfaction. Radiologists are being asked to read more images, more quickly than ever before, but stress and fatigue can affect their ability to deliver a confident interpretation in a timely manner.

45%

of radiologists report symptoms of burnout.[6]

According to the 2019 *Medscape Radiologist Lifestyle, Happiness, & Burnout Report,* almost half of all surveyed radiologists reported feelings of burnout. Contributing factors included spending too many hours at work, lack of respect from colleagues, feelings of insignificance, and lack of control.[6] Additionally, 10% of physicians who reported feeling burnt out, depressed, or both—acknowledged experiencing thoughts of suicide.

How severe is your burnout?



1= "It does not interfere with my life" and 7= "It is so severe that I am thinking of leaving medicine"

In a retrospective study that reviewed all CT and MRI exams performed at a single institution between over a 20-year period, McDonald, et al. observed that imaging volumes have grown disproportionately to imaging utilization. The authors observed a twofold increase in radiologist workload, noting that clinicians must now interpret one image every three to four seconds for the length of their entire shift in order to meet current workload demands.[7]

Adjusting for staffing changes, the number of images requiring interpretation per minute of every workday per staff radiologist increased from 2.9 to 16.1 (Q = 1.7/year, Z = 4.3, P < .0001). The number of annual departmental cross-sectional images interpreted increased tenfold, from 9.2 million to 94.2 million.

Radiologists must
interpret one image every

3-4 seconds

to meet workload demands.[7]

Reporting & results communication

The challenge in focus:

As demand for imaging increases, radiology departments face resource limitations that affect their ability to deliver accurate findings quickly and efficiently—which can increase the chances of diagnostic errors that impact the quality of patient care and increase costs to institutions. Options for relieving the pressure of a reporting backlog are limited and often require compromise.

97%

of radiology departments are unable to meet reporting requirements[8]

A national review of radiology reporting in the United Kingdom conducted by the Care Quality Commission, revealed that almost every institution lacks the necessary support to meet reporting benchmarks—and that benchmarks can vary widely from institution to institution.[8] These issues are exacerbated by inefficient communication flows, technology limitations, and staffing vacancies. Open positions in radiology departments averaged at 14%, with some departments reaching 65% vacant. High demands and unfilled staff positions can delay readings, impacting the ability to support patients during their most defining moments.

Outsourcing interpretations to independent parties offers a partial solution, but outsourcing companies may experience some of the same issues related to capacity and turnaround times that internal radiology departments experience. Additionally, issues with RIS and/or PACS may prevent some organizations from using outsourcing to reduce reporting backlogs.

Auto-reporting can provide fast readings that are appropriate for certain circumstances. However, it is inadequate for cases such as chest or abdomen X-rays where smaller, more subtle pathologies may be present. In these cases, a radiologist or reporting radiographer may be able to catch a smaller pathology early—providing the opportunity for earlier treatment and a better patient outcome.

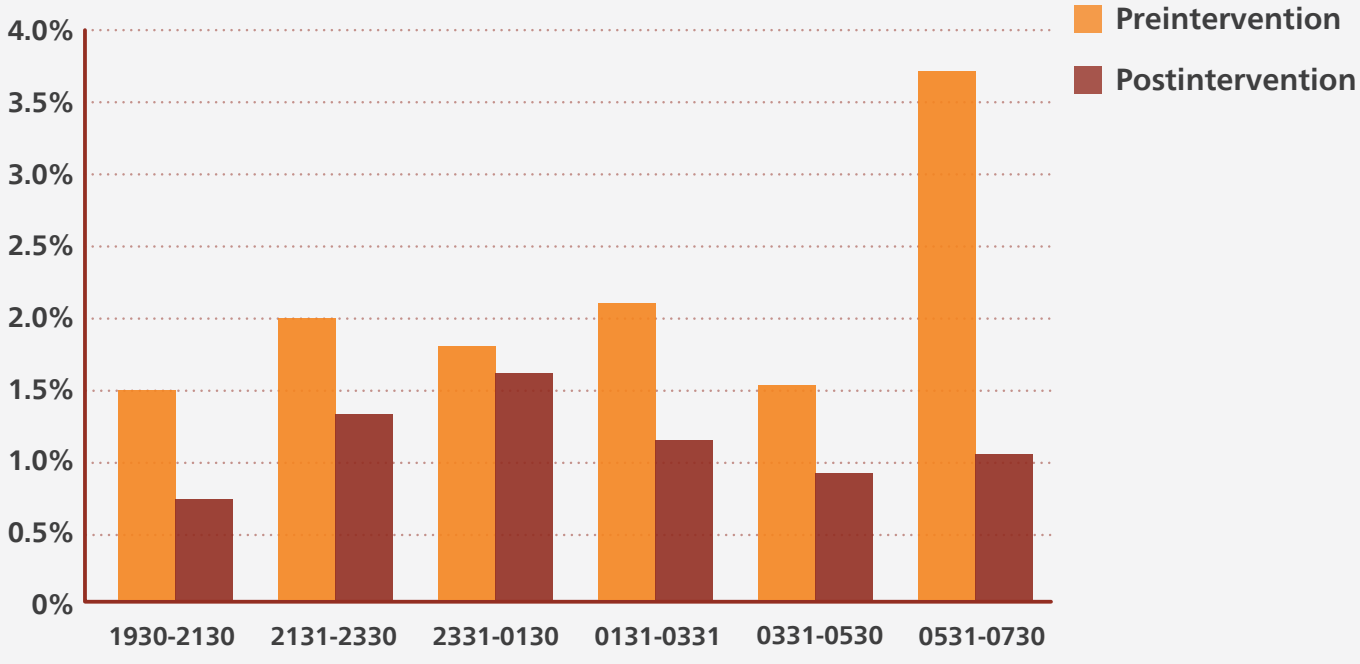
Itri et al. highlighted the prevalence—and the significant cost—of diagnostic errors in imaging. These errors contribute to 10% of deaths annually, and 17% of adverse hospital events—costing hospitals $17 to $29 billion every year.[9] The authors characterize diagnostic errors as predictable events with readily identifiable contributing factors that include both cognitive biases and systematic factors.

Up to
40 million
diagnostic errors in imaging occur worldwide annually.[9]

The systematic factors that can result in diagnostic error include increased workload and understaffing, lack of teamwork, workplace distractions and interruptions, inefficient processes, technical errors, PACS or software failure, lack of access to patient information, and visual or mental fatigue.

For example, the authors highlighted one study that evaluated the relationship between error rates among trainees during overnight call shifts and shift length. The study identified a statistically significant increase in major discrepancies (errors) during the last two hours of twelve-hour shifts, as indicated by the light orange bars in the table. By starting call shifts two hours later, major discrepancies were significantly reduced, as shown by the dark orange bars.

CT major discrepancy rates after reduction in night float shift length



Data insight: Graph shows a statistically significant increase in major discrepancies for residents working overnight call shifts during the final 2 hours of the shift (light orange). Starting the call shift 2 hours later, effectively shortening the call shift by 2 hours, resulted in a statistically significant decrease in major discrepancies for CT with a peak no longer observed during the last 2 hours (dark orange).

Nagy P, Warnock M, Daly M, Rehm J, Ehlers K. Radtracker: a web-based open-source issue tracking tool. J Digit Imaging 2002;15 (suppl 1):114–119.

Shared decision making, pathway selection & treatment

The challenge in focus:

Each individual patient generates a significant volume of data that must be considered by the care team to make appropriate decisions—but they may lack the right tools to access and interpret the data quickly and easily.

When data is not connected in meaningful ways, it can be difficult for clinicians to recognize patterns and make confident decisions—which may lead to delays or errors that impact patient outcomes, staff satisfaction, and the cost of care.

A single patient generates nearly

80 megabytes

of data each year in imaging and EMR data[10]

A recent Forbes article highlighted the strategic decisions hospitals must face as they manage and optimize the use of this high volume of patient data:

"To tap into the insights that patient data holds, hospitals must make strategic investment in analytics that use artificial intelligence and automation to audit access to patient data and that alert compliance professionals to the most suspicious events with high accuracy. This kind of advanced technology strategy can help mitigate risks associated with mass quantities of patient data, while also helping organizations leverage it in a way that improves operational efficiency and financial stability."[10]


ImageView - mD-Quant FAT SENSE
ImageView - IN/OUT SENSE
PHILIPS

Outcomes and follow-up care

The challenge in focus:

Diagnostic imaging represents a pivotal moment in each patient's care journey, one which can determine the course of their treatment and potential outcomes. However, losing patients in follow-up is common, and many factors can influence patient compliance.

50%

of patients don't adhere to imaging follow-up recommendations.[11]

Imaging plays a central role in managing patients who enter through the emergency department (ED). In a retrospective study of 20,000 ED patients, Shuaib, et al. found that up to 50% of patients do not adhere to recommendations for follow-up imaging.[11] Significant factors in noncompliance included the following: increasing age, no primary care physician, lack of insurance, primary language other than English, increased distance from hospital, and extended follow-up interval.

"Many initial imaging studies performed in the ED serve as a first-line screening exam rather than a gold-standard diagnostic study, as the clinical picture is more likely to be undifferentiated than in an outpatient clinic follow-up or inpatient setting. Due to the slightly different role that imaging plays in the ED setting than in other settings, it is arguably even more important that the recommendations for additional imaging, laboratory evaluation, or procedures be adhered to in order to completely characterize acute findings or potentially serious nonacute lesions."[11]

The estimated total annual waste within diagnostic imaging in the US is

$25 billion[12]

Newman-Toker, et al. explore the question, "How much diagnostic safety can we afford?" to assess the role of economic analysis and suggest opportunities for further research related to better value and safety in diagnosis.[12]

The costs of healthcare now exceed $2.7 trillion, with diagnostic testing accounting for more than 10% of that cost—a figure that is rising rapidly over time. Advanced diagnostic imaging leads the way, with diagnostic laboratory testing a close second. At the same time, diagnostic errors are prevalent, and it remains challenging to determine whether diagnostic tests are being overused or underused and when 'more' diagnosis is not 'better' diagnosis.

Using a case example of acute dizziness, the authors explore how economic analysis might be used to guide quality improvement approaches. The authors suggest that as diagnostic techniques evolve, it will be critical to study not only diagnostic test properties, but the impact of different diagnostic strategies on health outcomes.

Current and projected ED and hospital resource utilization with routine VOG use

Resource usage (imaging, admission)	(2013 US national)	Projection with ED VOG use
All ED dizziness CT rate	41.2%	10.3%
All ED dizziness MRI rate	2.4%	3.0%
All ED dizziness admission rate	18.8%	17.2%
Total ED/hospital workup costs	$9,242,624,941	$8,198,729,820
Projected annual US healthcare savings	–	$1,043,895,121

Newman-Toker, unpublished. See online supplement for parameters and sources. These numbers are purely resource-use based, and do not consider the societal and personal benefits from lives saved due to early stroke interventions, or reduced morbidity from improved treatment of inner ear disorders. ED, emergency department; VOG, video-oculography

Conclusion

There is no denying the immense pressures that radiology departments face because they operate at a critical juncture in a patient's care journey. As more patients with more complex needs require care—and as radiologists use more advanced technologies to support diagnosis—massive volumes of data are generated in imaging and beyond. At the same time, radiology teams have less capacity and fewer resources with which to obtain imaging data, interpret it and provide findings to clinical care teams.

At Philips, we understand the role we can play to connect data and technologies in ways that ease the burdens weighing heavily on radiology departments today, while empowering radiologists—and all the members of a patient's care team—with insights that help them make confident care decisions. We're actively innovating to help you solve some of your greatest daily challenges and support your future growth.

We like to visualize healthcare as a continuum, as it reflects the very real concept of continuous care. And we are ideally positioned to provide both patients and caregivers with solutions that support the right intervention, at the right place, at the right time.

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