



PHILIPS

Diagnostic Imaging

Position Paper

The patient factor:

Imaging beyond the scan

“As healthcare professionals, we have an obligation to look at the whole patient, not just the images. We must consider the entire experience, and **I believe every patient deserves a positive one.**”

Peter W. Curatolo, MD
Radiologist, Beverly Hospital,
a member of Lahey Health



A patient-centered approach for improved imaging

Health systems around the world are grappling with how to deliver an improved patient experience while at the same time providing efficient, effective care and reducing costly waste. While many institutions are challenged to achieve standard patient satisfaction metrics, the importance of an enhanced patient experience in imaging goes far beyond satisfaction scores, reimbursement rates and long-term cost savings.

Whether it be a routine or acute situation, a patient's level of comfort can impact the diagnostic imaging process, from the physiological effects of stress on image acquisition to stress-related movement that can impede high-value, completed scans, to the resultant effects on workflow and patient throughput.

With this in mind, Philips is focused on a research-based approach to innovation that prioritizes the people behind the images to reduce systemic, imaging-related anxiety at the source. Quite simply, we believe it's time to have the imaging process revolve around the patient and not the other way around.



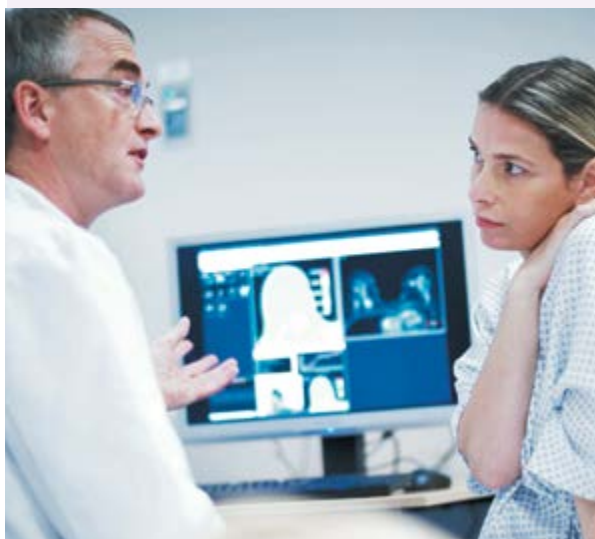
Reducing physiological stress to improve imaging outcomes

Stress is not just an emotional response to uncomfortable situations – it is a physical reaction with measurable consequences. Innovation that seeks to mitigate the manifestations of stress can help in the acquisition of more accurate images.

Many patients experience feelings of uncertainty and apprehension in the radiology suite. This stress can have a physiological impact on some patients' test results, which may lead to complications or discrepancies in diagnosis and, ultimately, in treatment.

One well-documented example of this phenomenon is “white-coat hypertension,” a condition in which patients experience an atypical rise in blood pressure while at the doctor's office. This type of situational anxiety can result in patients being prescribed inappropriate treatments with potentially adverse side effects, in addition to the cost of unnecessary drugs.¹

In radiology, patient anxiety over imaging procedures may impact the accuracy of diagnostic exams. The apprehension a patient experiences prior to an imaging study can impact results, skewing or delaying a diagnosis. In a study evaluating 172 patients undergoing diagnostic exams, 69% experienced high levels of anxiety, which can lead to hyperactivity of the autonomic nervous system and produce symptoms that can directly influence exam results.² In another study, anxiety reactions – including increased heart rate and blood pressure – were reported in up to 30% of patients undergoing MRI scans.³



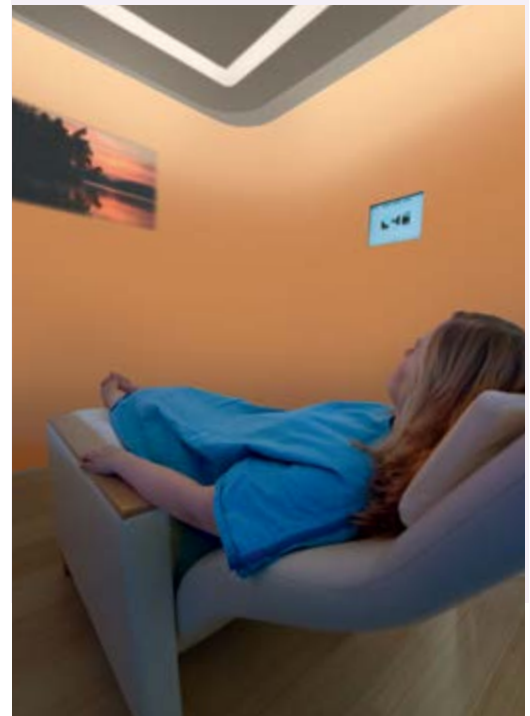
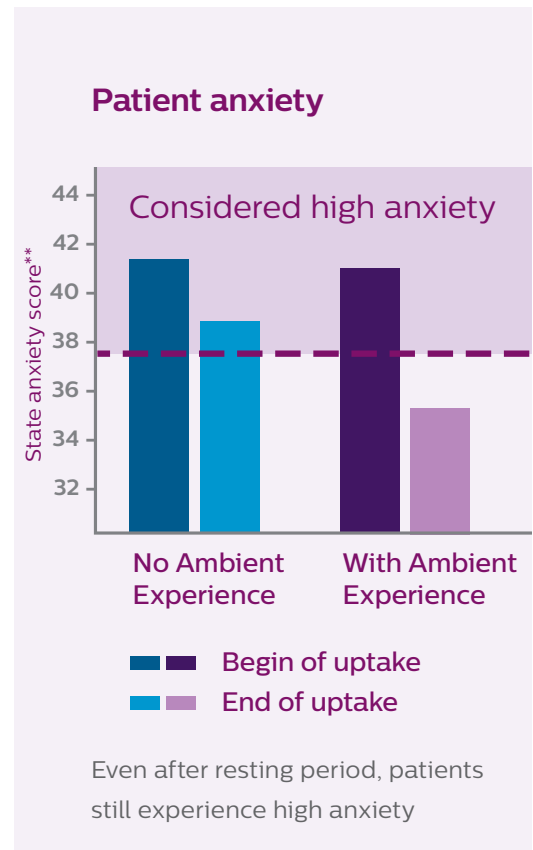
Impact of stress in PET/CT exams

In an effort to determine the extent of this stress-related phenomenon in the PET/CT uptake phase preceding CT exams used to stage the extent of disease in oncology patients, researchers from the Department of Nuclear Medicine at the Netherlands Cancer Institute Antoni van Leeuwenhoek (NKI-AVL) hospital teamed up with scientists from Philips Research Laboratories to conduct a first-hand qualitative study⁴ to evaluate patients' state of mind during the procedure. Patient preparation for a PET/CT scan includes injection of a radiopharmaceutical agent such as F-18 FDG*, then a waiting period prior to the exam during which the agent is taken up by metabolically active tissue.

Because patients often become anxious and tense during the course of the procedure, there is an increased risk of unwanted FDG uptake into healthy tissue, making it difficult to differentiate normal tissue from tumor tissue in the CT images. Although patients are asked to relax during this process, the study showed that the majority of patients cannot do so for long. Instead, their physical and mental anxiety tends to increase with waiting.

A total of 101 outpatients were selected for the study. The 51 patients in the experimental group underwent the procedure in the then-investigational Philips' Ambient Experience uptake room, which provides a positive distraction in the form of calming imagery and soft music. The 50 in the control group were provided no audiovisual intervention during uptake.

The results of a self-assessment questionnaire, measured using a shortened State-Trait Anxiety Inventory (STAI) measure at the beginning and end of the uptake period, showed a significant reduction in patient anxiety when using the experimental uptake room. Moreover, the intervention group also showed significantly lower FDG uptake in brown adipose tissue (BAT)⁵, but not in muscles (as interpreted by radiologists).⁴

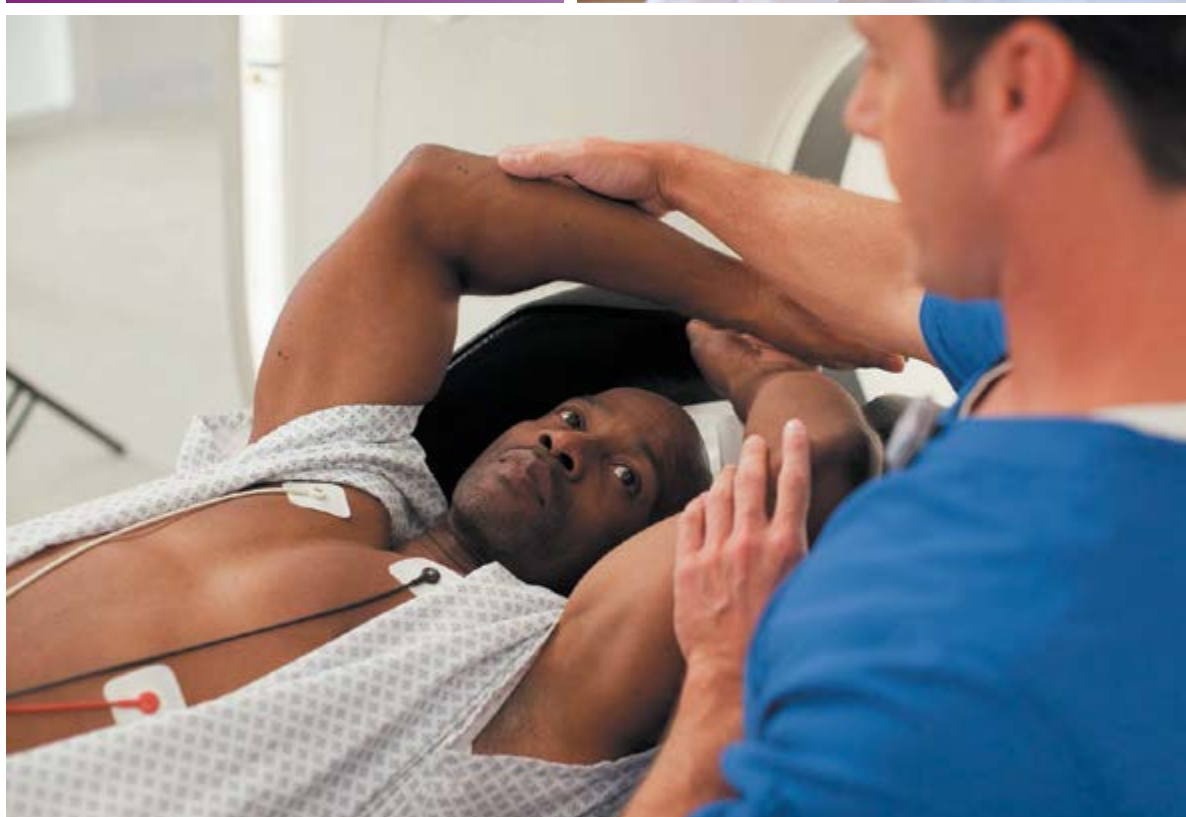
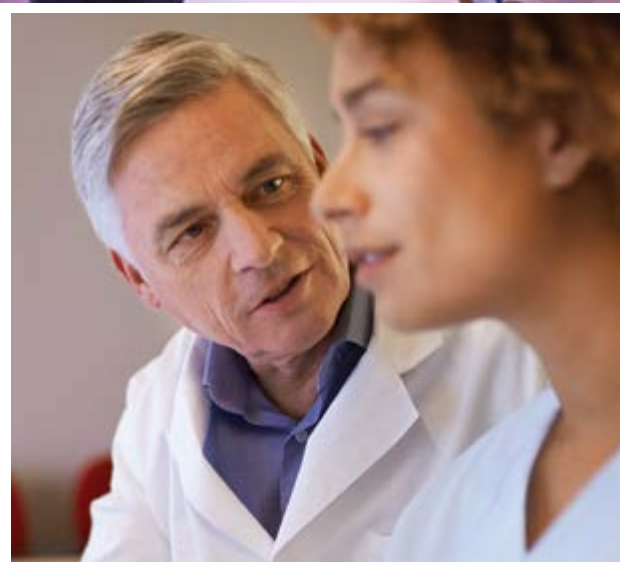


* FDG: Fluorodeoxyglucose is a radiopharmaceutical agent used in the medical imaging modality positron emission tomography (PET).

**Results are obtained by self-assessment questionnaire (STAI) for regular uptake room. Sample size: 50 patients. Source NKI-AVL, June 2012.



It's time to have the imaging process **revolve around the patient** and not the other way around.

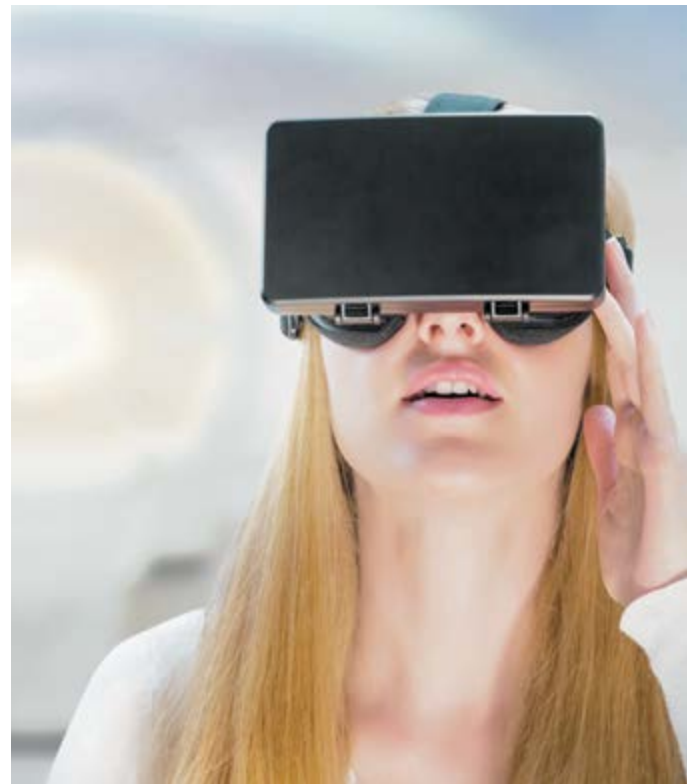


Improving patient comfort can **reduce stress-induced behaviors**

A range of stress-induced behaviors related to both patients and staff can affect the clarity and quality of images. Some of these factors, such as the capability of the equipment and the technologist's ability to operate it effectively, are within the control of the care team. However, patients' behaviors – such as their ability to lie still, to hold their breath for the required time, or to cope with being in a small, enclosed space – may also have significant impact on image quality.

Technology and services that prioritize the patient experience are central to supporting radiology's primary function of acquiring images that lead to a confident diagnosis and treatment plan. Studies have shown that a positive patient experience is associated with clinical effectiveness and patient safety.⁶ Patients who feel comfortable and secure are less likely to engage in behaviors that compromise the quality of their imaging study, making it easier for staff to acquire high-quality images and radiologists to accurately analyze them. This is particularly relevant in MR, where patient anxiety is most likely to disrupt the exam.

Innovations such as Philips' portfolio of Ambient Experience multimedia room solutions are designed to provide a calming distraction to patients facing various types of imaging studies. The interactive element of these design interventions provides patients a sense of control and the opportunity to actively participate in their care environment.



The MR virtual reality application helps give patients an idea of what their scan will be like.



With the Philips Ambient Experience patient in-bore solution for MR, engaging visuals are displayed on the back wall and can be seen via a mirror on the head coil, while patients can listen to music/sound through the headphone.

Modality-specific patient support innovations, such as the Philips Ambient Experience patient in-bore solution for MR, have been shown to help reduce the number of rescans.⁷ From the moment a patient is moved into the scanner (the point at which people report the most stress) through completion of the scan, this solution helps patients to relax, follow directions and minimize motion. The latest iteration of this in-bore patient solution, Philips Ambient Experience In-bore Connect, supports patients during an MRI examination by visually counting down how long they need to hold their breath and displaying a progress bar.

Studies have shown that simply displaying a countdown of the length of time patients are required to hold their breath makes it significantly easier for them to do so. Additionally, with the progress bar in Philips Ambient Experience In-bore Connect technology, 84% of patients claimed they felt calmer

during their MRI examination, and patients were overall more likely to recommend the examination to a friend.⁸

Much like the importance design plays in our consumer user experience, it has a critical role in that of patients as well. Imaging providers can improve the patient experience through environmental interventions that aim to reduce stress-induced behaviors. Some institutions take this into account when designing their imaging suites to ease patient apprehension and improve the overall functionality of the radiology department – which in turn reduces stress for the care team. Imaging environments that effectively integrate technology with patient-centered design, ambient lighting and multimedia solutions, and patient- and family-centered workflows create service environments that are at once calming and efficient.



Lewis Golden, AU Health's chief radiographer, shows a young patient how "CAT" scans work by using the Philips KittenScanner.

“ Working with the Philips team and our patient advisors has given us an end product that I’m very proud of. **Radiology can be a scary place. We’ve tried to replace the ‘scary’ with ‘soothing,’** and I’m excited to share that with our patients.”

Layne Mitchell, Administrative Director,
General Radiology, Augusta University Health

When the Children’s Hospital of Georgia (CHOG) at Augusta University Health redesigned its Pediatric Radiology suite using a family- and patient-centered approach – which included an irresistible interactive video wall in the waiting room, a Philips KittenScanner that allows young patients to simulate CT scanning with toy patients, and Philips Ambient Experience lighting and music schemes

in the high-tech imaging suites – staff found they were able to increase their high-tech imaging volumes by up to 39%.⁹

Regarding patient satisfaction, the success of the award-winning redesign has created its own problems, jokes chief radiographer Lewis Golden: “Now kids cry when they have to leave!”

Improving staff experience

promotes increased efficiency and a better patient experience

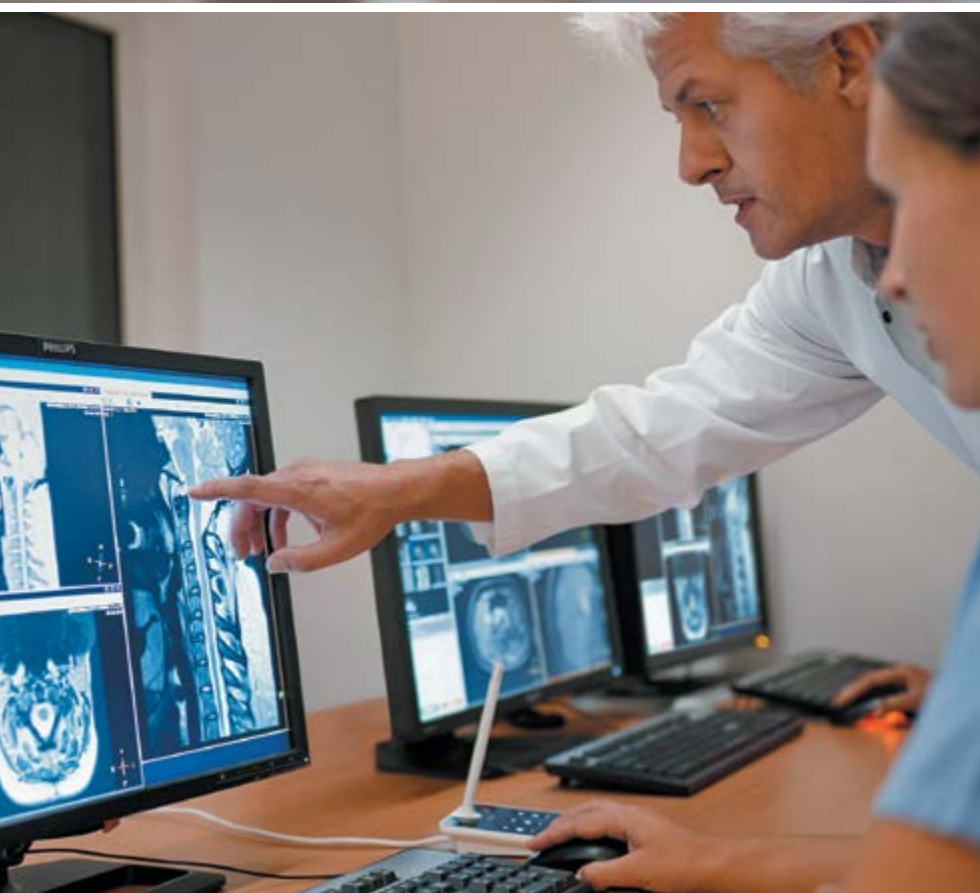
Radiology technologists are often the sole element of human support standing between patients and the imaging equipment. As a result, it is to them that the responsibility of upholding a personalized standard of care typically falls. For this reason, improving the radiology staff's experience and supporting their overall efficiency is a critical piece of the patient experience puzzle.



The technical demands of operating today's imaging equipment can increase workplace stress for staff. Furthermore, in a value-driven environment, technologists are increasingly pressured – and monitored – to adhere to tight service schedules and throughput demands.

A study published in the British Medical Journal showed that patients are more likely to follow treatment plans if they don't feel intimidated – or even worse, ignored – by healthcare providers.¹⁰ Having to operate highly complex equipment can detract from the technologist's ability to provide personalized care, and may even result in decreased workflow or costly mistakes. Patients are intuitive enough to sense stressful influences on the imaging staff – and these influences may increase their own sense of anxiety or apprehension.

Providing technologists with a supportive and sustaining work environment may decrease burnout, increase workflow and patient throughput, and enhance patient satisfaction, all of which bolster the status and value of imaging within healthcare systems.



Staff-centered technology solutions, such as the standard iPatient interfaces on Philips CT, MR and nuclear medicine equipment or the ExamCards for CT that let staff share protocols to allow for scan-to-scan consistency, aim to help imaging staff spend less time navigating machinery and more time promoting a meaningful relationship with patients.



“**Having a confident technologist can help calm the patient.** When a technologist is nervous, this can negatively affect the patient.”

Amber Pokorney, Lead for Advanced Clinical Imaging
Phoenix Children's Hospital



Mitigating occupational risk

In an environment so highly dependent on the efforts of its staff, innovation that prioritizes their needs and safety is paramount. As an occupational risk, the importance and need for accurate radiation dose monitoring and tracking cannot be overstated. Comprehensive dose management solutions such as Philips DoseWise, which tracks exposure for both patients and staff, not only manages patient and staff safety parameters but helps institutions comply with the often onerous demands of radiation safety regulations mandated by the FDA (in the US) and EURATOM (in the EU).¹¹



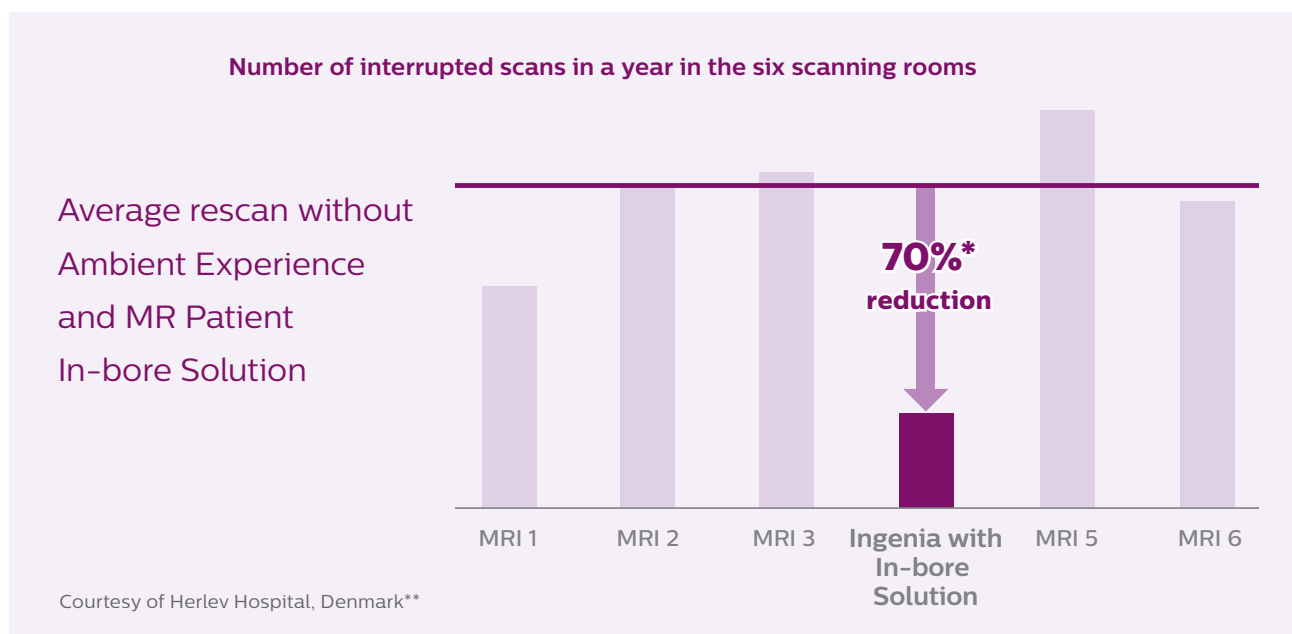
Likewise, advances such as Philips' SkyFlow gridless X-ray technology eliminates the ergonomic burden for staff of positioning and cleaning a heavy grid in addition to reducing associated patient discomfort from the same grid. In a study involving experienced radiographers, results found that bedside chest imaging using SkyFlow technology in a gridless workflow resulted in up to 50 seconds of time savings per examination when compared to workflow with a heavy grid.¹² Such win-win innovations mark important progress in creating a people-centered imaging culture.

The financial impact of patient discomfort

As global healthcare spending continues to rise, cost containment in imaging will remain a major concern for health systems.^{13,14} The prevalence of low-value imaging – and efforts to reduce it by targeting imaging appropriateness, acquisition and quality parameters – will be in high relief, especially in high-cost modalities.

In an investigation by Dr. Jalal B. Andre at the University of Washington School of Medicine, motion artifacts were identified as the cause of repeated sequences in about 20 percent of MRI exams.¹⁵ In the study, recent institutional data were used to compute a cost estimate, which was correlated with sequence time and severity of motion artifacts. “We calculated the financial consequence of repeat sequences due to motion artifacts to be about \$115,000 US dollars of lost potential revenue per scanner per year,” said Dr. Andre. Moreover, the repeated sequences can also create a cascade effect, resulting in increasing delays throughout the day and decreased patient throughput.

On the other hand, consider the case study of Herlev Getofte University Hospital in Denmark. Under the direction of Michel Christian Nèmery, MD, chairman of the Department of Radiology, Herlev added the Philips MR Patient In-bore Solution to its Ingenia 3.0T system. The audiovisual in-bore experience measurably improved their patients’ MRI experience, helping them reduce patient motion and increase efficiency. Based on patient survey reported by Dr. Nèmery, 90 percent of patients reported having a ‘better’ or ‘much better’ level of comfort with the patient in-bore solution.¹⁶ Herlev also reported a 70 percent reduction in rescans as a result of implementing this patient-centric technology*.¹⁷



*Results from this facility are not predictive of results in other facilities. Results in other facilities may vary

** Compared to the average of the other 5 MR scanners without ambient and in-bore experience. Results from case studies are not predictive of results in other cases. Results in other cases may vary.

As a leader in imaging innovation, our pursuit of new ways to improve imaging outcomes has led us to prioritize the patient and staff experience as a critical source of insights. By probing the connections among patient care, staff experience, imaging quality and radiology service metrics, we believe **we can serve the imaging community with innovation that delivers a better experience and more value for all.**



Enhance
the patient and
staff experience



Simplify
data and insight
gathering



Support imaging
appropriateness



Reduce costs



Visit **Philips.com/radiology** to learn more on our people-driven approach to innovation in imaging.

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[Full article.](#)
17. Courtesy of Herlev Hospital, Denmark.
[Full article.](#)

