

The Philips logo is displayed in a bold, blue, sans-serif font within a white rectangular box in the top left corner of the page. The background of the entire page is a photograph of a hospital hallway. An older woman in light blue hospital gowns is on the left, looking towards a younger woman in blue scrubs on the right. The younger woman has her hand on the older woman's arm, and they appear to be in a supportive conversation. The hallway is brightly lit with recessed ceiling lights, and the walls are a neutral color. The overall tone is professional and caring.

PHILIPS

Ambient Experience

The cost of fear and anxiety in radiology

What you can do to reduce it

Patient fear and anxiety impact radiology today

2020 brings uncertain times, fluctuating demand and economic pressure to your radiology department. Radiology departments are encountering even more patients who are feeling fearful and anxious, which can disrupt the diagnostic imaging process. Medical staff may also experience increased anxiety and unknowingly transfer those feelings to patients. It's therefore more important than ever to offer a better patient experience to improve first-time-right imaging and reduce operational costs.

When interviewed about their recent* diagnostic imaging experience, patients described experiencing both positive and negative feelings throughout the imaging process. While most expressed feelings of being well taken care of, respected and informed, many also cited feelings of nervousness, uncertainty and powerlessness.

[Read our paper on enhancing the patient experience in imaging.](#)

Research into fear and anxiety in radiology

Boris de Ruyter, a psychologist and Principal Scientist at Philips Research, has been studying the psychological impact that technology applications have on people for over 25 years. "It's not surprising that when patients are going into a hospital, they might be fearful and anxious. There are many reasons for this, including their fear of the outcome, the unfamiliar surroundings and procedures, not knowing what to expect, etc. Fear and anxiety are perfectly normal reactions that people may have when they enter a hospital environment." says de Ruyter. "It's important to note that we are not talking about pathological levels of anxiety that would be found in psychiatric settings. These are just common feelings that people may have."

"The terms 'fear' and 'anxiety' are often used interchangeably," says de Ruyter. "However, these terms have different meanings and different sources. Fear is more of an emotional reaction in response to some threatening stimuli in the environment, and the fear response is typically characterized by the flight or fight reaction. In contrast, anxiety is more of a cognitive process, where people are starting to worry about future situations that may involve some loss of control. The reaction to anxiety is more complex than simply fight and flight. It will lead to people's attention drifting and people having more negative thoughts. This makes them aware of threatening stimuli in the environment."

"Besides these reactions, there are quite a few additional effects that researchers have observed when people have high levels of anxiety. For example, the somatic effects of anxiety are muscle tension, trembling and dizziness. The physiological effects could also be rapid breathing, higher blood pressure, increased heart rate and lower galvanic skin

responses. An even more extreme reaction is panic. Panic is a very complex reaction because it has both cognitive and somatic symptoms, and it happens very quickly."

According to de Ruyter, it is important to distinguish between fear and anxiety because they both have a different origin and require different approaches to reduce them. "For example during an X-ray or MRI exam, patients can react to stimuli, such as medical equipment or tools, that could be perceived as threatening. When trying to reduce fear reactions, one important approach is to remove threatening stimuli from an environment. For anxiety, it is actually different. In the anxiety situation, it might be useful to introduce certain stimuli to guide the thinking or the cognitive process."



How does patient fear and anxiety affect radiology workflow?

"During an X-ray or MRI exam, the actual shape of medical equipment and the appearance of an imaging room can induce fear. The physical effects on a person's body may influence the quality of an X-ray or MRI image," says de Ruyter.

Research carried out by Lo Re and co-authors¹ found that high levels of anxiety were present in most (about 91%) of patients waiting to undergo a radiological exam. According to the study, this stress can have a physiological impact on some patient test results, which may lead to complications or discrepancies in diagnosis and, ultimately, in treatment. In a study by Grey and co-authors², anxiety reactions – including increased heart rate and blood pressure – were reported in up to 30% of patients undergoing MRI scans.

A survey on the impact of the patient on MRI efficiency⁴, performed by SuAzio Consulting and commissioned Philips, showed a link between patient anxiety and workflow efficiency. It reported that 28% of all patients undergoing MRI scans were said to suffer from anxiety, which caused patient motion almost twice as often as pain or claustrophobia. In all cases where there was patient motion, 74% showed a decrease in image quality and 70% of the exams had the possibility of not being suitable for diagnostic purposes.

"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.³"

Panic can cause a person to leave in the middle of an exam, which can affect the entire workflow.

The three main clinical consequences of patient motion reported, are:

74%

Decrease in image quality (cases in which there was patient motion)



70%

The possibility of an exam not being suitable for diagnostic purposes



55%

An increase in the time required to carry out the scan



Anxiety also plays an important role during PET/CT exams for oncology patients. Patient preparation for a PET/CT scan includes injection of a radiopharmaceutical agent, followed by 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 this period, there is an increased risk of unwanted uptake of the agent into healthy tissue, making it difficult to differentiate normal tissue from tumor tissue on the PET/CT images.

Although patients are asked to relax during this process, a study carried out by researchers from the Department of Nuclear Medicine at the Netherlands Cancer Institute Antoni van Leeuwenhoek (NKI-AVL) hospital and scientists from Philips Research Laboratories showed that the majority of patients cannot remain relaxed for a longer period of time. Instead, their physical and mental anxiety tends to increase with waiting⁴. The results of the PET/CT study indicate that many patients (59%) enter the PET uptake room with high anxiety and that many patients demonstrate unwanted uptake of the agent in normal tissues, emphasizing the need for a solution.

How does patient fear and anxiety impact radiology costs?

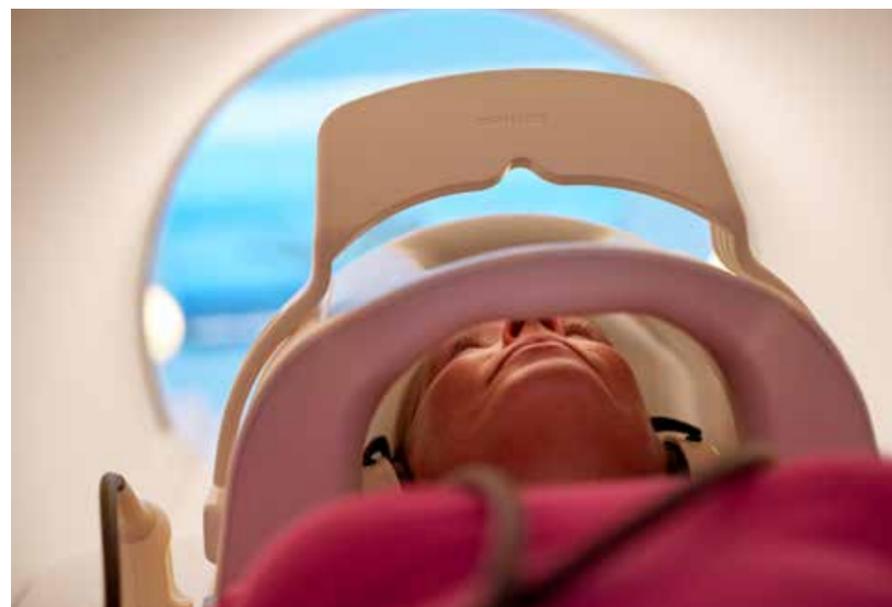
“Cost is always at the forefront of health care provider minds. In order to look at the cost of patient stress in imaging, there are a couple of different areas that need to be considered,” says Iris Timmers, Senior Product Manager of Philips Healthcare Experience Solutions team. “You have to keep in mind the stress that patients experience from anticipating going in for the examination. The patient’s experience of the service received at the radiology center certainly impacts their willingness to return to that facility or recommend it to family and friends. This can ultimately impact the radiology center’s brand and top line revenues. A radiology center that always has the patient’s experience top of mind, is much more likely to get a positive referral.”

On the other hand, patient stress has a direct impact on the radiology workflow, cost and bottomline. Patients who are feeling stressed may find it more difficult to understand or comply with commands given to them, so staff may have to take much longer to coach these patients through an exam. Finally, patients may become restless and make undesired movements or they may simply not show up at all, disrupting all scheduling efforts.”

“We were able to quantify this in the MRI efficiency study,³” says Timmers. “The study showed that in current radiology practice staff mention ‘no-shows’ and ‘patient motion’ among the top three challenges impacting MRI efficiency. These two factors alone heavily influence the cost to the health care provider and the patient is probably the highest factor of unpredictability in the modern highly efficient radiology workflow. The ability of the patient to actively participate in, rather than undergo the examination, will bring a next level of efficiency to radiology, while improving their overall experience of the radiology service.”

Another important study from 2015 by Dr. Andre and co-authors also look at patient motion in MRI⁵. In Andre’s study, artifacts from patient motion were identified as the cause of repeated sequences in about 20% of MRI exams. Recent institutional data were used to compute a cost estimate, which was correlated with sequence time and severity of motion artifacts. Andre 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.⁵

“Patients who feel comfortable and secure are less likely to engage in behaviors that compromise the quality of their imaging study⁶.”



Focus on performing scans without sedatives and anesthesia

“A comment that is often made is, ‘why wouldn’t you simply use sedation as a technique to reduce fear and anxiety?’ Well, sedation is not always desirable, of course, and it requires more preparation and follow-up of patients,” says de Ruyter. “And there are medical exams where the patient has to cooperate, like holding the breath or holding certain positions, and that could become difficult under sedation.”

Some studies have demonstrated that sedation can actually be avoided by changing stimuli in the environment. For example, there was a study by Dr. Anastos in which it was found that if you introduce visual stimuli in an imaging environment, that you can actually reduce the need for sedation by as much as 28%⁷.

In a recent prospective study, Lillebaelt Hospital Kolding (DK) evaluated a multi-faceted children centered care (CCC) concept for MRI in children aged 4–6 without general anesthesia, compared to a standard set-up. The CCC included an interactive app, a trained pediatric team, a toy-scanner, and a child-friendly multimedia environment in the MRI room. This study evaluated the use of general anesthesia, assessed image quality and did a cost-benefit analysis. It showed that with the multi-faceted concept CCC, the use of general anesthesia for MRI in children aged 4–6 was markedly reduced from 57% to 5%, image quality was maintained and the setup showed a net savings of 1030 EUR per child using CCC instead of general anesthesia⁸.

Administering general anesthesia also has an impact on costs and workflow. It requires a large setup involving anesthetics staff, is costly and causes longer waiting times^{9,10}. Another important consideration is that general anesthesia itself is often unpleasant and anxiety provoking for children and may involve forceful restraint during induction.^{11,12,13}

Recommendations

Continue to invest in the patient experience to benefit both patients and staff

Since 2005, Philips has combined a research-based approach and people-centric design thinking to develop positive distractions and a calming environment for the patient and an improved work environment for the staff. By helping facilities uncover new opportunities to improve the patient, family and staff experience, care-related anxiety can be reduced at the source.

The following recommendations can be helpful to reduce both fear and anxiety during imaging examinations:

- Reduce fear by restructuring the environment and removing some of the potentially fearful stimuli in the environment. To do this Philips 'declutters' and (re-) designs the appearance of the imaging room and its equipment. This can be done by using rounded corners and soft lighting tones in the room, but also by simply hiding cables.
- Reduce fear using light atmospheres. Internal Philips studies show that specific light atmospheres can influence the level of fearfulness of stimuli. When comparing different lighting settings, Philips researchers found that compared to a standard office lighting setting, the same fearful stimuli were perceived as significantly less fearful under dimmed warm light conditions. We have been incorporating ambient lighting solutions in our imaging environments to create environments that are at once calming and efficient.
- Reduce anxiety by introducing distractions in the environment, drawing the attention away from thoughts that worry people. These distractive stimuli should not pose extra mental demands on people.
- Reduce anxiety by providing a degree of control. Introducing control for the patient, even if it's only the perception of control, can have a positive effect on reducing anxiety.

- Make improving the staff experience a priority. A study from de Beryl institute¹⁴, has shown that this has the biggest impact on improving the patient experience. Since social distancing rules will almost certainly have a negative impact on the empathy level that patients will experience from staff, making the staff experience a priority and giving them tools to support patient's in other ways will be beneficial.
- Reduce anxiety by providing clarity to patients upfront of what they can expect during an examination. Provide them with pre-procedure information and make sure they qualify for particular examinations beforehand.

Improving the patient experience can improve clinical, operational and financial outcomes

There's growing evidence that not only focusing on the experience of the patients but also the work environment and needs of the staff can provide a positive impact across the board to improve clinical, operational and financial outcomes. In this case, what you don't know about the importance of providing a calming and comforting imaging environment for patients could be holding your radiology department back. Now more than ever, it's worth your while to put patients first and address their experiences, anxieties and fears to meet your goals.

“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



Prof. Boris de Ruyter
Principal Scientist, Philips Research Europe

Boris de Ruyter graduated as an Experimental Psychologist from the University of Ghent in Belgium, and then worked as a Research Assistant at the University of Antwerp. In 1995 he joined Philips Research in Eindhoven, The Netherlands, working first as a Senior Scientist and since 2006 as Principal Scientist. Outside his position at Philips Research, Boris is a Professor, by special appointment, of Human Interactions with Intelligent Systems at the Radboud University in Nijmegen, The Netherlands. His research focuses on the psychological impact of technological applications on people.



Iris Timmers
Sr. Product Manager Philips Healthcare Experience Solutions

Iris Timmers has 20 years of experience in the medical industry, from research and design to manufacturing to marketing – always with the patient in mind. With a Master's of Science in industrial design engineering from the Technical University Delft, Iris makes connections between patient experience and psychology, environment design and technology to invent and create multi-sensory environments. In projects ranging from R&D of equipment for the blind and visually impaired to patient-centered solutions for MRI, she has pursued her passion and advocacy for people-centered care.

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* Results from case studies are not predictive of results in other cases. Results in other cases may vary.

