Color Palette for the Radiology Suite

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The mechanisms of color perception have fascinated people for centuries, drawing the eye of researchers from Aristotle and Plato to Goethe. Based on more modern, psychological findings, color and light concepts are now also being used in radiology, making many examinations easier for patients and practitioners alike.

By Sonja Fischer, M.A.

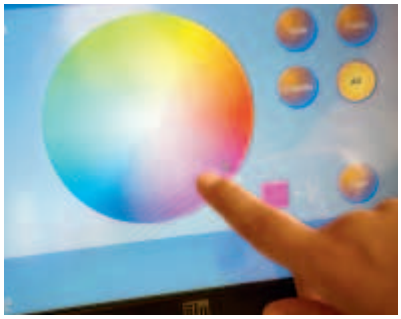
The room is small and cramped. It is cold, and glaring fluorescent tube lighting shines down from overhead. It is reflected by the pallid linoleum floor, up onto grayish white walls where a yellowed poster of human anatomy is the only touch of color. The radiology system in front of the patient seems oversized, filling the entire space with its loud, pulsating noise. The patient would like nothing better than to just turn around and walk away.
Of course, every patient and every member of the hospital staff knows very well that the radiology department is not meant to be a spa and that the main goal here is capable imaging. But a pleasant atmosphere and an efficient working environment do not have to be mutually exclusive – on the contrary, in most radiological exams, it is important for the patient to relax so that the image quality is not limited by motion artifacts. The effects of color and light can be decisive in this regard, having an impact that far exceeds purely aesthetic concerns.
Medical Solutions visited a diagnostic radiology center in the town of Butzbach, in the central German state of Hesse, and a breast screening center in Viborg, Denmark. These two facilities, working under vastly different conditions, have achieved the same positive experiences with the use of color and light installations.

Relaxation for Pain Patients

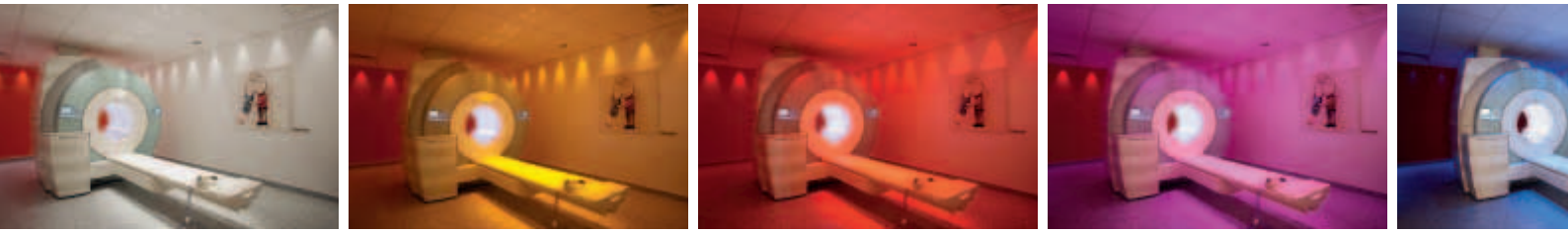
"We wanted to do something different, to bring patients out of this brutal examination situation," reports radiologist Farschad Tabesch, MD, talking about the development of the Center for Diagnostic Radiology Butzbach, which opened in December 2008. "We had opted for a computed tomography [CT] unit and a magnetic resonance imaging [MRI] unit from Siemens, and then we sat down with the Siemens team to consider how we could work with colors and light in our MRI and CT rooms." This collaboration led to a friendly, vividly colored setting instead of the typical bland clinical atmosphere. During every examination, Tabesch and his team use the "Healthcare Lighting" solution installed by Siemens Healthcare. With a special software program, they can choose from the full color spectrum at will and combine different tints. In the MRI room, the system works with a large number of small LED (light-emitting diode) lights mounted on the ceiling that light up the whole room in color. "We ask our patients what their favorite colors are. Most of them are surprised and quite excited, and then their perception of the system itself often fades into the background, especially with darker colors. To help counteract the loud noise, we give patients a choice of music, or they can bring their own," Tabesch explains.
In the CT room, a number of light tubes – also operated via computer – have been installed along one wall. A backlit motif on the ceiling simulates a real sky, providing additional distraction. "Distracting patients is especially important to us in CT scans," Tabesch says. "This is where we perform pain treatments using periradicular therapy [PRT] or facet blocks [FAB]. Patients come to us with a history of pain. Some of them are so tormented they can hardly get up the steps to the CT unit. And then, many of them are afraid to undergo the treatment. The light installation makes a huge contribution to helping these patients relax."

Color Pioneers in Denmark

Mette Haaning, a radiographer at the breast screening center in Viborg, Den-



The user interface for Healthcare Lighting from Siemens Healthcare includes a touchscreen enabling convenient selection of colors from the entire color spectrum and many options to combine colors.



The MRI suite at the Center for Diagnostic Radiology in Butzbach, Germany, features a versatile lighting solution from Siemens Healthcare, thereby supporting an individual, patient-oriented adjustment of the examination situation.

mark, also worked with Siemens on the development of the light solution for the facility's mammography system. In 2007, the center bought the MAMMOMAT® Inspiration[1] digital mammography platform from Siemens. Haaning was able to put her ideas into practice when MoodLight™[2] was developed, a large-format light panel that can be affixed right to the system itself as an additional feature. It also offers users a choice of the entire color palette, allowing them to set the colors for the individual patient. The breast screening center in Viborg is one of the first facilities to work with MoodLight.

This puts the center squarely within a tradition of pioneering work in Denmark. The Copenhagen-based professor Niels Finsen, the father of rational light therapy, was first to prove that colors are clearly perceived as radiated energy by the human body and trigger clear responses within the body. Finsen was awarded the Nobel Prize in Medicine in 1903 for his work in this field.

The facility in Viborg, however, takes a rather practical approach to color theory. "We use MoodLight all day, with every patient. In most cases, we have the system set to alternating mode, so the color automatically changes every 30 seconds. That's because we would have a hard time doing something different for each patient," says Haaning's colleague Winnie Hedegaard, also a radiographer. And this is where the big difference between the Viborg facility and the diagnostic center in Butzbach comes in: While Tabesch examines between ten and 15 patients with the MRI unit and treats six to eight pain patients using the CT scanner each day, Haaning and Hedegaard scan every woman aged 50 to 69 in the entire region as part of the Danish mammography screening program. They perform more than 70 examinations a day.

"At the same time, we don't want the facility to feel like a train station," Haaning says. "And I think we're doing a good job of achieving that. I wouldn't go so far as to say that MoodLight is the main cause. It's just that we have established a friendly practice here; we talk to the patients and try to make the examination as pleasant as possible for them. When they come into the examining room and see the MoodLight shining out from behind the business-like system, it definitely contributes to the overall atmosphere."

Patient Orientation is Worthwhile

That means the general attitude and motivation levels of the staff are the key to greater patient orientation. Tabesch agrees: "The first step is to have the idea of addressing patients' concerns in this way. It's not enough to have a great light here and then treat the patients like numbers anyway. And nobody even thought about it in those terms earlier. Everybody just fixated on the results of the examination, on the pure image."

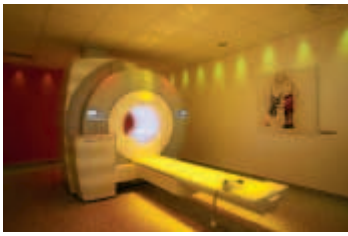
At the diagnostics center in Butzbach, hard facts also demonstrate the benefits of this kind of patient orientation. There, only about one percent of patients have to be sedated before undergoing an MRI scan. "I used to work at a 'normal' practice, where I always had two or three sedations each day. Here, almost all of our claustrophobic patients can make it through the procedure without sedation. Before, I often experienced cases where these kinds of patients just jumped right out of the unit – something that hasn't happened here," Tabesch reports. The distraction caused by the color system also works well with children, who usually have to be sedated for MRI scans. Plus, the images have fewer motion artifacts, meaning that fewer repetition sequences are needed.

The light installation is also an important marketing tool for the private diagnostic center. Many patients who are not directly referred to the center hear about it through word of mouth and then stop by to see it for themselves. Most of them are very pleased and register there. Tabesch is also visited by other radiologists who want to see how Healthcare Lighting works: "All of my fellow radiologists who have come to see us were truly inspired to see how much can be achieved with this kind of unique feature. Some of them now want to put the concept into practice themselves."

Positive Working Atmosphere

At the breast screening center in Viborg as well, the techs are convinced that MoodLight can contribute to improving the results of screenings. "One of the critical factors in obtaining good images in mammography is ensuring that patients

[1] Not available for sale in the U.S.
[2] Optional



CT-guided pain therapy is conducted in a room where a simulated sky and colored wall modules help to distract and calm patients before and during their treatment.

Summary

Challenge:

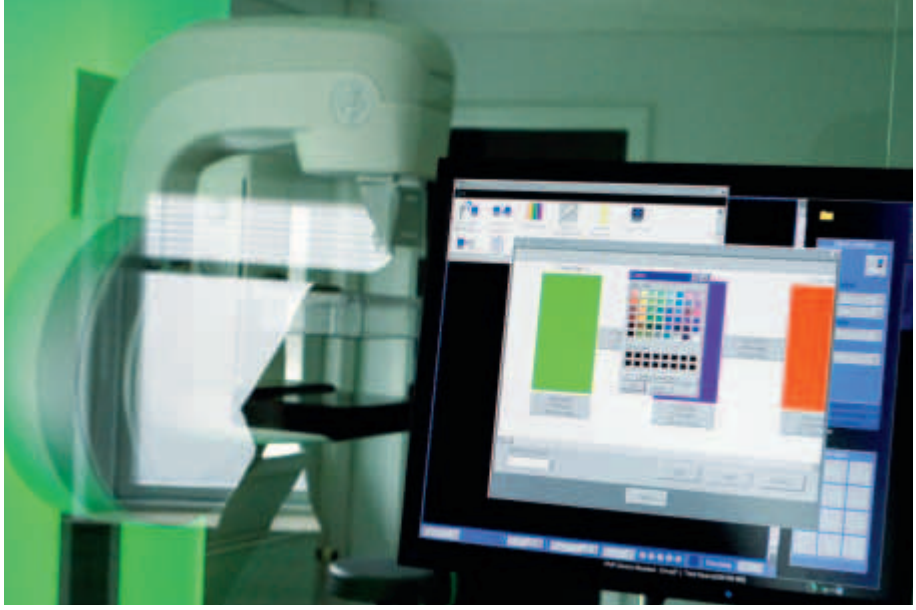
- Overcome cold, intimidating hospital atmosphere
- Look beyond mere results to accomplish both imaging excellence and supportive surroundings
- Positively distract patients from their suspected disease
- Cope with anxious, claustrophobic patients
- Additional strains for patients due to sedation in MRI
- Market private radiology centers

Solution:

- Create pleasant surroundings to reflect patient-centered care
- Respond to patients' psychological predispositions
- Reasonable and effective application of color and light
- MoodLight panel for digital mammography platform MAMMOMAT Inspiration
- Healthcare Lighting for radiology suites

Result:

- Colorful, appealing surroundings while imaging competence is maintained
- Content, relaxed patients contribute to achieving maximum imaging quality
- Reduction of sedation down to one percent in total
- Achievement of a competitive edge for private radiology centers
- Good working atmosphere and motivated staff



In the breast screening center in Viborg, Denmark, a MoodLight panel lights up the mammography system to support a good working atmosphere and to make the scanning situation appear less intimidating for the patient.

relax. That is just what our approach accomplishes," Haaning says. And Hedegaard points out another important aspect: "Working in these surroundings is also more pleasant for us. I stand here in this room all day long, and MoodLight has a positive effect on me, too. I like it best when the light comes on in my favorite color – purple."

Tabesch and his team can no longer even imagine working in a different environment. Here as well, everyone has his or her favorite color. The whole team plays around with the colors, trying out various effects. The radiologist feels his employees are more motivated thanks to the creative opportunities the light system offers and to the center's friendly, open environment. All of them previously worked in different, conventional structures and feel that there is a major difference here. As Tabesch himself describes it: "Nowadays, when I walk into a normal hospital, where everything is just white and cold, and where I don't see any colors, but only bright light, I am really put off by it."

Sonja Fischer *is an editor at* Medical Solutions *magazine.*

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How Color Affects Us

Mrs. Wright, why are colors so important for human existence?
WRIGHT: Color means light. It is the source of life; it touches and expresses the soul of mankind. We are constantly under its influence, whether conscious or unconscious. People tend to take color for granted and see it only as a matter of appearance, as mere visual delight. But color is far more than that. It has a biological relevance that was developed over many million years of evolution. Nature uses color as a communication system, and it was not too long ago that our survival essentially relied on this system. For instance, the color of food told us whether it was edible; the color of an animal whether it was dangerous or poisonous. So, it is hardly surprising that we have innate and intense responses to color and that these are often difficult to verbalize.

In your approach, you make an attempt to verbalize the psychological effects of color. What are the basics?
WRIGHT: When light strikes the eye, each wavelength does so slightly differently. In the retina, these impulses of light are converted into electrical impulses that pass to the brain, where the secretion of hormones is stimulated. In simple terms, each color or each wavelength focuses on a particular part of the body, evoking a specific physiological response – for instance, a relaxed pulse – which in turn produces a psychological reaction – a feeling of ease, for example.

You are suggesting that there is a standardized, universal pattern of response to each color. Doesn't each individual feel different about the same color?
WRIGHT: Well, the unconscious, psychological effect – which makes 80 percent of the whole impact – is the same for everyone. Red, for instance, is physically stimulating because it is the longest wavelength and requires the most adjustment in the eye. It is often said that surrounding people with red will raise their blood pressure, but there is actually little academic record of any experiments confirming this. Blue is the color of the intellect, and is deemed to lower the blood pressure. Certainly, it is a soothing, calming color and encourages reflection. However, the conscious sensations about colors, that is, the preference for certain colors, very well vary from person to person. But when one person likes blue and another doesn't, this doesn't mean that the color affects them in different ways, but that they perceive the same effect differently on the level of consciousness. That is, one likes the soothing effect of the blue, and another prefers the animating effect of a yellow hue.

***Angela Wright** studied psychological psychotherapy in the UK and began researching color psychology in the 1970s. Establishing links between patterns of color and patterns of behavior, she developed the "Colour Affects System" to apply color psychology objectively. The system was subjected to analysis at world-class academic institutions, such as the University College of London, and found to hold consistency. Wright's 1995 book,* The Beginner's Guide to Colour Psychology, *continues to sell steadily across the world. In her London-based consultancy, Colour Affects, Wright applies her system to major international companies, government institutions, and individuals.*

So, when we want to work with color in radiology, would it be necessary to assess the preferences of each patient first, or can you recommend hues that are good to use for particular situations?
WRIGHT: I understand that assessing each patient is probably not feasible due to the time pressure, and I also don't think it is necessary when color is applied carefully. However, I am generally reluctant to recommend colors in an absolute sense. There are only relative perceptions and no such thing as good colors and bad colors. As green is the most reassuring color, it is effective in situations where we are talking about a suspected life-threatening illness, as I would assume is often the case in radiology. But used in the wrong shade or in odd combinations with other hues, green can also communicate its negative perceptions and make you feel physically ill. So the effect of a color isn't only a matter of its wavelength, but a matter of its intensity. Soft colors are soothing, strong shades rather stimulating.
You also want to make sure that the colors are combined harmoniously. Humans always respond to all the colors presented. A good way to balance colors is combining complementary colors, like yellow and violet.

Then using a lighting solution where hues and shades can be selected and combined freely, as some of our customers do, appears to be a good approach to attain balance and harmony.
WRIGHT: Certainly, and also for another reason – a lot of research shows that a color only keeps its positive effect as long as people are not surrounded only by this color and not longer than about 20 minutes. However, if you don't have that lighting option, you should still think about good color combinations, for instance, with wall paint. And it's wrong to believe that leaving the room plain white doesn't have an effect relating to color psychology. Used solely, white is demanding for the eye and can be very harsh. It is uncompromising and too clinical, with no fine nuances.

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