



Healing Environments

Creating the optimal environment for patient treatment and recovery

There is growing scientific evidence that environmental factors such as light and sound affect our well-being. While we all know instinctively that sunshine makes us happier and certain noises relax or annoy us, research also suggests that environmental factors can help regulate our body clocks and stress levels. And that can have a noticeable impact on how we recover from illness and injury.

Philips work in Healing Environments dates back to the introduction of Ambient Experience, a people-focused solution for hospitals that improves the patient experience, while also improving staff satisfaction and workflow. Since then Philips has continued to develop further Healing Environments concepts with partners, to address clinical and patient needs in the hospital, and to bring new solutions to the market.

In the Hospital Area of the Philips ExperienceLab, the following Healing Environments concepts are currently being tested and developed:

- ▶ **Adaptive Healing Room** – the positive impact of lighting and staying connected
- ▶ **PET/CT Uptake Room** – helping to reduce anxiety before a cancer-related scan
- ▶ **Environmental Cockpit** – reducing delirium in Intensive Care Units
- ▶ **Patient engagement in cancer therapy** – supporting the decision-making process

PHILIPS

People-focused healthcare

Philips began its pioneering work in ambient healing environments with Ambient Experience room solutions which have now been installed in over 650 hospitals worldwide. Architecture, design and technology (such as lighting, sound and projection) are integrated to create a healthcare space designed around the needs of patients and staff.

Ambient Experience started with the aim of reducing patient stress during medical scans, improving throughput and patient satisfaction, while also focusing on the staff and family experience. This has expanded to Ambient Experience Consulting, where unique solutions can be created for a specific healthcare facility. **Healing Environments** takes the idea and the benefits even further, into more areas of the hospital where there is potential to improve the environment to promote healing while delivering a positive patient and staff experience.

Innovation approach

To explore these environments, Philips has developed an innovation approach that ensures the voice of the end user is included at every stage, and the clinical value of the concept is tested. This approach is split into three phases: Insight, Create and Validate.

In the **Insight** phase, researchers and designers go into hospitals, observing patients and staff over extended periods to map their experiences and identify the issues they face. Possible concepts are sketched out to address those issues, which are then discussed with relevant clinical focus groups and ranked, based on their expected healing potential.

In the **Create** phase, the highest ranked concepts are translated into experience prototypes that enable the

healing environments concepts to be assessed in a more realistic setting. Hospital representatives including specialists, nurses, department heads, therapists and ex-patients evaluate these prototypes, and help to refine the ideas and identify the most promising concepts.

These move to the **Validate** phase, where they are installed in hospitals for clinical trials that provide data to verify the innovation's effect and new insights for refining the concept further.

ExperienceLab

In the Create phase, if a concept is particularly challenging technically or would benefit from wider user feedback, Philips scientists can turn to the ExperienceLab in Eindhoven – a unique Philips facility for testing healing environments concepts in a realistic setting.

Here researchers can create full-scale demonstrators to evaluate and refine concepts for improving patient, staff, and family experiences. Stakeholders visit the Lab to try out concepts for themselves. This helps to give a better understanding of an idea's healing potential and impact on staff workflows, and helps minimize risks before starting costly clinical trials.

Healthcare Experience Consulting

As elements of Healing Environments concepts are validated they join the portfolio of solutions that Philips can offer in its expanding Healthcare Experience Consulting business, with the aim of delivering an even more holistic service to hospitals. Using the same methods of insight generation to identify workflow and needs, Philips consultants work with high level stakeholders to deliver solutions to improve experiences and hospital processes, as well as cultural and physical environments for whole hospitals or departments.



Philips will work with you to make the clinical experience more positive for patients, family and loved ones

Adaptive Healing Room

the positive impact of lighting and staying connected

The Adaptive Healing Room is designed to enhance the healing process by adapting the environment to the needs of the patient. The focus is initially on neurology patients, particularly those who have had a stroke. In the longer term it is likely that the principles can also be adapted for other specialist wards.

The value of light

Light is known to have visual, biological and emotional effects that promote health. And by maintaining our circadian rhythm (or body clock), light helps regulate important processes in our bodies. Yet today's hospital rooms often receive limited sunlight, and rely on constant-brightness artificial light.

To address this, the Adaptive Healing Room includes an **Artificial Skylight** that mimics a blue sky, casting a bright sunny light on to the patient's bed. The brightness adapts to the time of day (to assist in waking and going to sleep), as well as to the hospital agenda, ensuring the light is appropriate when tests or procedures are being carried out.

Staying connected

During the first few days after a stroke, patients are often disorientated and confused. So Philips is seeking to offer a personalized environment that will aid recovery. Different patients are affected in different ways, so a hospital **interactive orientation screen** is being developed that displays the time and date in a way that individual patients can interpret. Using sensors, the system is designed to automatically detect who enters the room, so it can display the person's name and job function. The large screen, attached to the wall of the room is also personalized to the patient's social media, enabling them to have video calls and receive messages from friends and family.

Nature heals

Several studies have shown the positive effect of nature on healing. Access to nature views, even artificial ones, as well as indoor plants help to increase tolerance to pain, and can reduce the use of painkillers¹. It has also been found to aid short-term recovery from stress and mental fatigue, and accelerate recovery from illness². For this reason, the research prototype room also contains a screen that shows soothing nature scenes ranging from mountain views to the beach.

Next steps

Experts from hospitals, rehab centers and geriatric departments have provided positive feedback on these

concepts, and recognized the potential to help with both the healing of patients and the clinical workflow. This concept has progressed to the validation phase, when selected aspects will be evaluated in clinical trials in a real hospital environment.



Waking up

Helping the patient to gradually wake up in the morning.



Breakfast

The lighting profile and screen content is designed to support orientation in time and place.



Doctor's visit

The dedicated conditions are designed to support alertness and circadian rhythm, using an Artificial Skylight capable of providing sunny white light, yet a blue sky view.



Visiting hours

The patient can easily create a pleasant atmosphere for visitors.

Audiovisual imagery in the PET/CT Uptake Room

helping to reduce anxiety before a scan

PET/CT imaging helps oncologists identify and pinpoint tumors. However, stress can affect how the body absorbs the radioactive tracers used in these scans. Philips teamed up with the Netherlands Cancer Institute (NCI) - Antoni van Leeuwenhoek Hospital in Amsterdam to explore whether audiovisual imagery can help reduce patient anxiety in the PET/CT uptake room.

The challenge

Before a diagnostic PET/CT scan, patients are injected with a radioactive tracer. They are then left alone in an 'uptake room' while the tracer travels around the body, accumulating in tissues where there is a high rate of metabolism – such as cancerous tumors. After about an hour, the PET/CT scan can highlight and locate tumors.

This 'uptake period' is known to be a stressful experience for patients, particularly as many are waiting to find out whether or not they have cancer. But if a patient is anxious during this time, the tracer may also be absorbed in other parts of the body, making it more difficult to differentiate between normal tissue and tumors.

The Ambient Experience Uptake Room

Clearly, reducing the anxiety associated with PET/CT scans would be advantageous. To explore this, researchers adapted one of the Antoni van Leeuwenhoek Hospital's three PET/CT uptake rooms into an 'ambient room', creating a relaxing atmosphere through lighting, calming video images and soft ambient music.

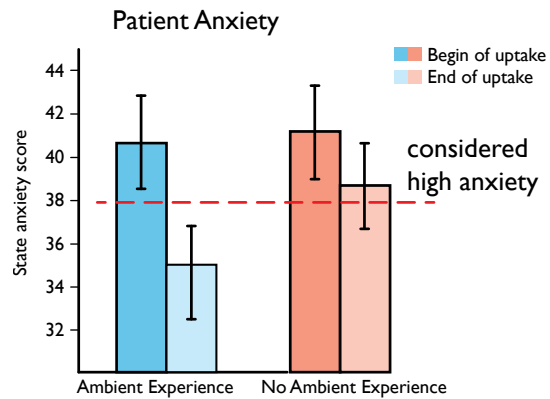
The 'active relaxation' video content created specifically for this context is designed to engage and distract the patient but not to over-stimulate. Before entering the room, patients may select one visual theme from among many. The act of choosing a theme they prefer instills a critical sense of control and may help to allay tension.

Studying the effect

The effects of the ambient room was measured in a study³ on 101 outpatients. 51 patients were assigned to the ambient room where they were exposed to the calming images, audio and lighting for the last 30 minutes before their scan. The remaining patients were the control group, assigned to one of the unadapted rooms with no audiovisual intervention during uptake.

Patient anxiety was measured at the start and end of the uptake period using the shortened, eight-item State-Trait Anxiety Inventory (STAI). Before the uptake,

similar numbers of patients from both groups were 'highly' anxious – around 60%. But there was a significant reduction in patient anxiety in the ambient uptake room by the end of the uptake.



The road to a product

Insights obtained from this study have been further developed and are now part of the Ambient Experience Uptake Room designed to help calm patients during the preparation stages of a PET/CT investigation.



Philips Ambient Experience Uptake Room

Helping create a feeling of calm and sense of control.

Environmental Cockpit

reducing delirium in Intensive Care Units

Delirium is a disturbance of consciousness and cognition that develops quickly (over hours or days) and fluctuates over time. It's a significant problem in Intensive Care Units (ICUs), with an estimated prevalence of up to 80%⁴. Patients who suffer from delirium are twice⁵ as likely to die in the ICU and three times⁶ more likely to die in the following six months than those who don't. The financial impact is also enormous. Delirium can increase ICU-associated costs by 30% to 60%⁷ through longer stays.

Currently, there is no treatment for delirium. So monitoring and prevention are essential for improving the healing process in ICUs.

Analyzing the soundscape

Hospital ICUs are generally very noisy places, which can affect a patient's quality of sleep. Moreover, there is often no difference in sound levels between day and night. A noisy environment and disrupted sleep can contribute to the onset of delirium.

Philips researchers analyzed the 'soundscape' of a typical ICU room over several days. From this data, they built a computer model to categorize different sounds and predict their disturbance rating. The computer model identifies dominant noises and their possible contribution to delirium. Based on this and other information, hospital staff receive visual cues whenever the predicted impact of avoidable noise exceeds a defined threshold. Testing

of sophisticated noise-cancelling techniques to counter potentially harmful noise sources, such as air conditioning systems, is also now underway.

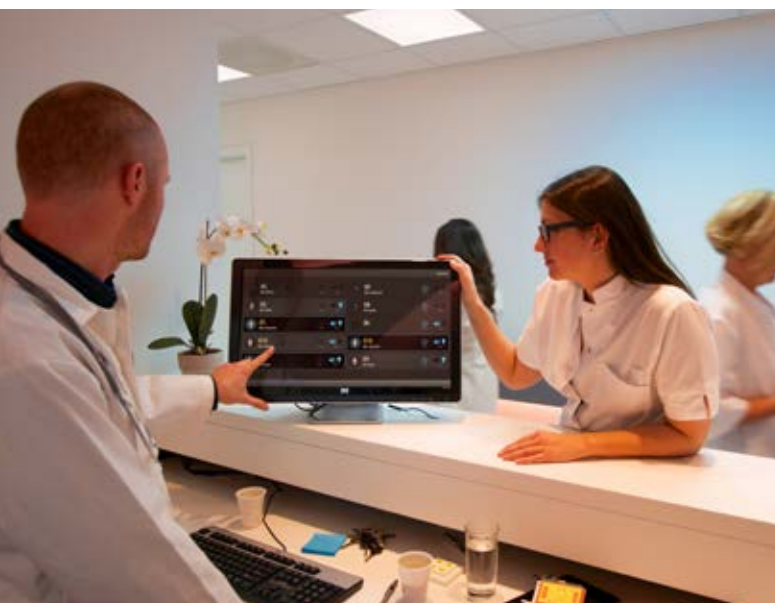
The effects of lighting

Light conditions can also affect the onset of delirium in ICU. Armed with the knowledge that daylight helps lower delirium rates, Philips researchers set about creating ways to deliver adequate lighting to patients in rooms without access to daylight. They realized that a lighting system which recreates a natural environment could potentially reduce stress and anxiety, two mental states that may hasten or worsen delirium.

The research focuses on two aspects: how such lighting helps patients keep track of the time of day and so reduces confusion, and the impact of lighting dynamics on circadian rhythms. The Environmental Cockpit system also monitors and visualizes light levels.

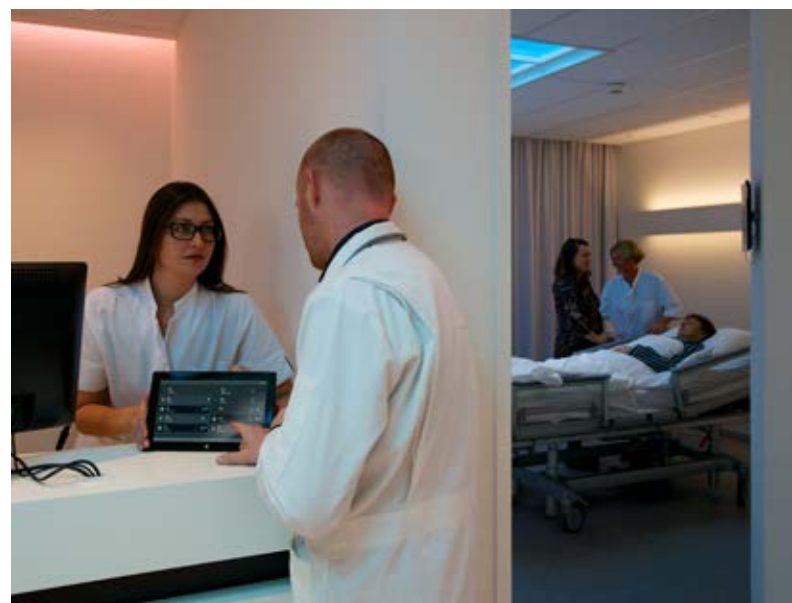
Delirium detection

Delirium can be difficult to diagnose. Patients can become hyperactive, inactive or switch between the two. Philips is studying whole-body motion capture using video-based actigraphy for continuous monitoring as a way to analyze the complex movements associated with delirium. Philips is developing advanced image processing techniques designed to detect a delirious episode, with the goal to be able to alert clinical staff quickly.



Environmental Cockpit

Analyzing the soundscape and light levels of the Intensive Care Unit



Patient engagement in cancer therapy

supporting the decision-making process

Learning that you have cancer is shocking and overwhelming, and current hospital environments can add to the stress. Furthermore, patients have to deal with lots of complex information and make decisions about treatment options soon after diagnosis. Philips is exploring consultation lounge concepts to help patients cope and play a more-informed role in their therapy choices during this difficult time, with the aim of achieving better outcomes and quality of life.

Helping patients cope

Starting from evidence that environmental conditions affect people's emotional state and ability to absorb information^{8,9,10}, Philips is developing a **dynamic lighting system** that creates a relaxing environment to prepare patients for their diagnosis. It transforms the room into a warm and soothing private space, giving the patient time to digest the news. When it is time to share information and discuss treatment options, the room transforms again, using a cooler, brighter light to enhance concentration.

In lab tests carried out by Philips researchers, people exposed to standard anxiety-inducing stimuli perceived emotions less negatively in the dynamic lighting system's warm and 'soothing' environment than in normal office lighting. Similarly, people used less mental effort to complete standardized cognitive performance tests in the cool, bright environment. These lab tests provide the first scientific evidence that a lighting atmosphere can offer important benefits to people in terms of influencing emotional coping and lowering the burden involved in information processing.

Supporting shared decisions

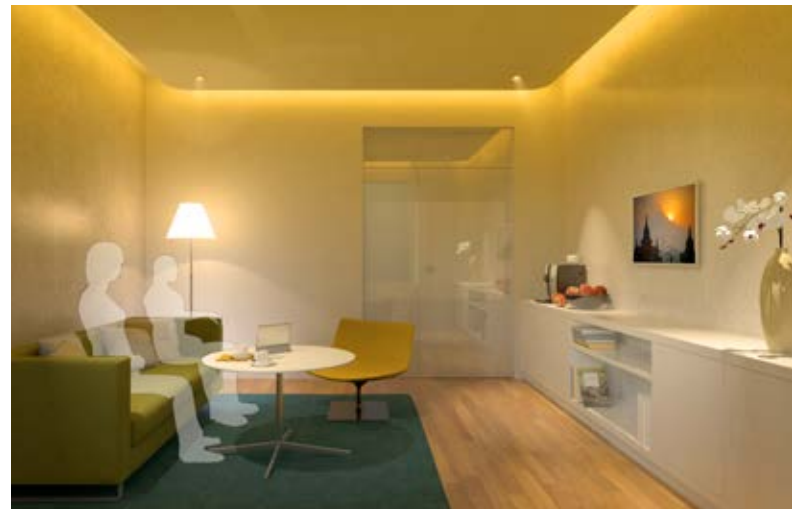
Most cancers have many possible treatments, each with its own potential benefits and side effects. For example, early-stage prostate cancer can be treated in different ways, and while each may have similar long-term survival rates, surgery and radiotherapy may increase the risk of impotence while active surveillance has a higher rate of disease progression. Balancing these issues depends on what the patient considers important for a good quality of life, as much as their personal and clinical situation.

With such difficult decisions to be made, Philips is initially focusing on the development of a web-based tool to support the decision-making process for prostate cancer. Clear, tailored information on the patient's diagnosis and options are offered, and the tool uses interactive questionnaires to identify the patient's quality of life

preferences. It then creates a shortlist of the most suitable therapies for that patient, with a patient-friendly user interface showing the risk of side effects, long-term survival rates, and popularity among 'people like me'.

A prototype of this **Prostaid** system received very positive feedback from doctors, nurses and patients at the European Prostate Awareness Day in September 2013.

A similar system for breast cancer is in the early stages of development and the concept could also be extended to other cancer domains.



Consultancy room – a private, warm space

A private, warm space to help the patient digest diagnostic news and cope with emotions.



Consultancy room – making decisions

The consultancy room transforms into an environment that aims to help patients be alert and prepared to make decisions about their treatment.

**Visit the Press Center
for images and videos of
Healing Environments**



References

- ¹ Ulrich, R. (1984). View through a window may influence recovery from surgery. *Science* 224, 420-421.
- ² Bringslimark, T., Hartig, T., & Patil, G. (2009). The psychological benefits of indoor plants: a critical review of the experimental literature. *Journal of Environmental Psychology*, 29(4), 422-433.
- ³ Intervention to Lower Anxiety of 18F-FDG PET/CT Patients by Use of Audiovisual Imagery During the Uptake Phase Before Imaging J. Nucl. Med. Technol. 2012 40:92-98
- ⁴ JAMA. 2004;291(14):1753-1762. DOI: 10.1001/jama.291.14.1753
- ⁵ Intensive Care Med (2007) 33:66–73 DOI 10.1007/s00134-006-0399-8
- ⁶ JAMA,2004;291:1753-1762
- ⁷ Crit Care Med. 2004 Apr;32(4):955-62
- ⁸ Steidle, A., Werth, L. & Hanke, E.-V. (2011). You Can't See Much in the Dark. *Social Psychology*, 42(3), 174–184
- ⁹ Fleischer, S. & Schierz, C. (2001). Effect of brightness distribution and light colours on office staff. The 9th European Lighting Conference 'Lux Europa 2001', Reykjavik, 76-80
- ¹⁰ Manav, B. (2007). An experimental study on the appraisal of the visual environment at offices in relation to colour temperature and illuminance. *Building and Environment*, 42 (2), 979-983



©2013 Koninklijke Philips Electronics N.V.
All rights reserved.
—
ININ1311

For further information contact:

Matthew Harris
Philips Design & Innovation Communications
Tel: +31 (0) 6 31699310
matthew.harris@philips.com