

## SAILING IN THE WIND

Jersey Shore University Medical Center wins international recognition

**ALSO:**

**World Congress 2011 program launched**  
**International Academy Award Winners 2010**  
**Design & Health Europe 2010 preview**  
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## Contributors

**Nicola Bertrand**  
Stakeholder engagement was a key theme of the Design & Health Australasia 2010 International Symposium, says BVN architect Nicola Bertrand



**John Wells-Thorpe**  
As chair of the judging process, John Wells-Thorpe introduces the winners of the Design & Health International Academy Award Winners 2010



**Ray Pentecost**  
The stage is set for The Design & Health World Congress 2011, supported by the AIA Academy of Architecture for Health and president Dr Ray Pentecost



**Dr Debajyoti Pati**  
A study by HKS Architects and the University of Texas at Arlington, led by Dr Debajyoti Pati examines how same-handed patient rooms impact on workflow



**Christine Hancock**  
A new book that looks at the changing role of nursing and the role and impact of design is reviewed by Christine Hancock, nurse and founder of C3



**Cover Image**  
The Jersey Shore University Medical Center in the US, designed by WHR Architects (see pp24-25). Photo: Woodruff/Brown Architectural Photography



## Infectious

Health reform, it seems, is infectious. The present predisposition of Western governments towards overhauling not just the practice of delivering healthcare to modern society's increasingly demanding health consumer, but also the very principles upon which it is provided, is arguably more revolutionary than it is evolutionary. The new coalition Government's announcement in the UK this month of a £1.7 billion reform that will place purchasing power into the hands of 500 GP consortiums overseen by an independent board, is viewed by many as the beginning of the end of the NHS, with private providers widely expected to be the great beneficiaries. The UK reforms come fast on the heels of comprehensive health insurance reforms in the US that aim to make healthcare more affordable at the same time as expanding coverage to cover all US citizens. It seems these two countries may meet in the middle. But are we missing the point? Is our point of departure wrong? This month's launch of the preliminary programme for the 7th Design & Health World Congress in Boston, from 6-10 July, 2010 demonstrates a field of work that is focused on health promotion by design as a means of improving global population health more cost-effectively through prevention rather than cure. Up to 2,000 delegates and 100 exhibitors will be attending from more than 80 countries. Make sure you start planning your trip now!

**Marc Sansom**  
Editorial director



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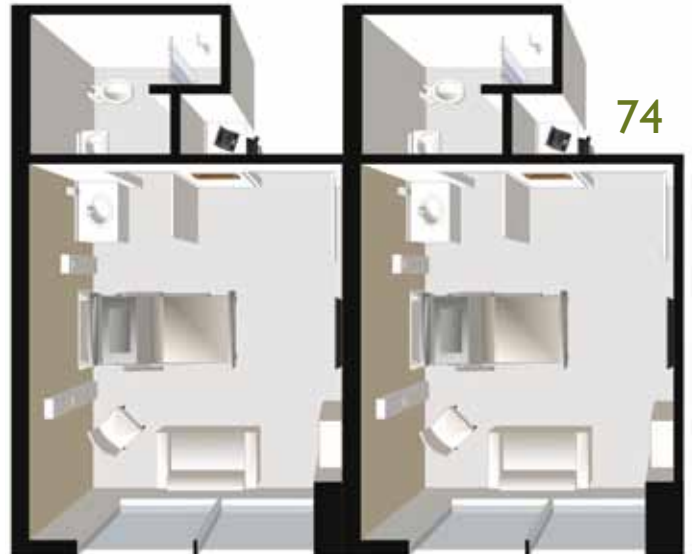
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# Briefing

## Four global visionaries take to the stage in Boston 2011

Four of the most preeminent global visionaries and leaders in the field of design and health are set to share the same platform during the opening session of next year's 7th Design & Health World Congress and Exhibition in Boston, USA.

Anticipation of the congress is already growing with a year still to go, following the news that Dr Julio Frenk, dean of the faculty at the Harvard School of Public Health, Mohsen Mostafavi, dean of the Harvard Graduate School of Design, and Richard Joseph Jackson, professor and chair of Environmental Health Sciences at the School of Public Health, University of California, are set to take to the stage in an opening session chaired by Lord Nigel Crisp, former CEO of the National Health Service in England and a member of the House of Lords.

The announcement follows the publication of the preliminary programme of the congress, which will be held at the Boston Marriott Copley Place Hotel, from 6-10 July 2011. With up to 2,000 delegates from 80 different countries worldwide expected to attend, supported by over 100 exhibitors, the event is set to have a significant political as well as professional impact on future infrastructure development in the USA and beyond.

Professor Alan Dilani comments: "At a time of rapid upheaval in healthcare systems in the USA, the UK, Australia and many other areas of the world, the commitment of four leaders of such outstanding pedigree demonstrates the importance that is being attached to the relationship between design, architecture and the health of our future society."

For more information, see pages 51 and 56. Copies of the preliminary programme are available with this issue of *World Health Design*, by visiting [www.designandhealth.com](http://www.designandhealth.com), or by e-mailing [info@designandhealth.com](mailto:info@designandhealth.com)



Keynote speakers at the congress will include (L-R): Lord Nigel Crisp (UK House of Lords), Dr Richard Jackson (UCLA), Dr Julio Frenk (Harvard University), Mohsen Mostafavi (Harvard University)

### UAE: Al Maktoum takes top award

The Al Maktoum Accident and Emergency Hospital in Dubai, UAE was awarded 'Best Hospital Design' at the Hospital Build Middle East 2010 Awards. Designed by Perkins Eastman for the Dubai Health Authority, it will be the Emirate's first dedicated A&E facility when completed in 2013. It shares the award with the Cleveland Clinic in Abu Dhabi.

### China: Super green

A new 36,000sqm 'super-green' urban design and masterplan scheme, developed by Woods Bagot in Hangzhou in China, is set to transform the city into an international eco-tourism centre.

### UK: Liverpool gets go-ahead

The new £451m development of the new Royal Liverpool University Hospital has been given the go-ahead, ending weeks of speculation following the announcement of a government spending review.

### Australia: Best public building

The Royal Women's Hospital has recently also been awarded Best Public Building in Australia for 2010.

### USA: Work starts on cancer centre

Perkins Eastman has begun work on the new Tisch Cancer Institute for Mount Sinai School of Medicine, a 60,000 sq ft state-of-the-art outpatient facility designed around Mount Sinai's multidisciplinary approach to cancer care coupled with translational research.

### USA: Reducing hospital energy use

A US\$1.2 million grant has been awarded to NBBJ and the University of Washington to invest in extending nationwide research into identifying strategies for reducing hospital energy use by 60% in seven regions outside the Pacific Northwest.

### USA: Firsts for LEED certification

The new Laguna Honda Hospital & Rehabilitation Center has become the first LEED-certified hospital in California, while the Women & Infants Hospital of Rhode Island has become the first LEED Gold-certified hospital in New England. Both hospitals are designed by Anshen + Allen.

### USA: LEED for Jersey Shore

The sustainable design of the award-winning Jersey Shore University Medical Center, designed by WHR Architects, has led it

to be awarded Leadership in Energy and Environment Design (LEED) certification (see pp52-57).

### China: Teaching hospital investment

Academy advisors, Mike Nightingale and Michael Paatela, were two of eight speakers at an international healthcare symposium organised by the Union Friendship Exchange Center of Architecture in Beijing, China. The Chinese government has begun a programme of investment which includes a commitment to build 800 teaching hospitals across China over the next 10 years.

### UK: Peterborough designers named

WSP and Devereux Architects have been appointed to design a masterplan and procurement strategy for Peterborough and Stamford Hospitals NHS Foundation Trust.

### UK: Greenery boosts self-esteem

Five minutes of exercise in a 'green space' such as a park can boost mental health, according to a study published in *Environmental Science and Technology*. UK scientists looked at evidence from 1,250 people in 10 studies and found fast improvements in mood and self-esteem.

# Global message goes local

The delivery of the International Academy for Design & Health's global message, that environmental design needs to be given wider recognition as a context for human health, wellbeing and quality of life, has this year successfully gone local.

The network's global reach has extended rapidly in 2010 as a new series of international symposiums, designed to promote understanding of the global issues of design and health within the local context of health infrastructure planning, finance, design, construction and management, have been launched to great acclaim all around the world.

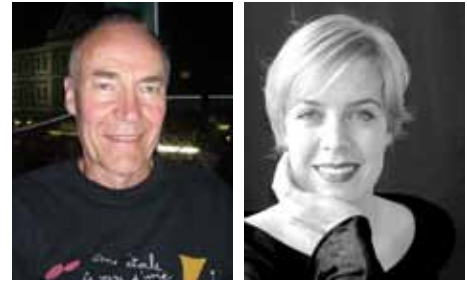
In late April, the Academy's network came together in Sydney at Design & Health Australasia 2010. And in early June, in Toronto, speakers and delegates gathered at Design & Health Canada 2010, which also hosted the 2010 Academy Awards and Gala Dinner.

At both events, speakers all over the world blended with experts from the local region, to debate a range of topics that examined new health perspectives and theories, such as salutogenesis, health planning models, patient environments and ward design, research and evidence-based design, as well as demonstrating case studies of some of the most influential healthcare projects recently completed.

Nicola Bertrand, an architect with BVN in Australia, who attended the event in Sydney, commented: "The conference clarified for me the importance for all stakeholders to work closely together right from the beginning of a project. There is a need for us as architects to work more closely with hospital administrators and health professionals both at a bureaucratic and a clinical level in order to achieve design excellence."

One of the highlights of the Sydney symposium was a pro-con debate on single versus multi-bed rooms. Mike Nightingale, who chaired the debate, said that patient needs were evolving so fast that ways needed to be found to design new and refurbished environments that were able to change from between 50% and 100% single rooms, or create the advantages of single rooms in other ways.

Later in the year, the Academy will launch Design & Health Europe in Brussels, from 7-8 October (see p11), to be followed by Design & Health Middle East 2010 in Abu Dhabi in December.



Left to right: Mike Nightingale, founder, Nightingale Associates and Nicola Bertrand, architect, BVN



## A lifetime of leadership

Eb Zeidler (pictured above right) has been awarded the Lifetime Leadership Award by the International Academy for Design & Health at a prestigious ceremony held at the University of Toronto in Canada.

Awarded for the first time to a visionary individual who has demonstrated an ongoing, lifelong commitment to enhancing the health, wellbeing and quality of people's lives through their dedication to healthcare design, the award recognises Zeidler's inspirational career, which has influenced many of today's architects who are shaping the next generation of hospitals. For more information, see pp18-19.

## Academy Award winners set new benchmarks

A diverse set of winners from across the globe, including an arts, culture and heritage centre in South Africa, a children's rehabilitation unit in Mexico, a mixed-gender inpatient facility for adults with acute mental illness in the UK, a digital arts programme and a commode, led the celebrations at the prestigious Design & Health International Academy Awards in Toronto, Canada on 9 June.

Presented by Dr Ray Pentecost, president of the American Institute of Architects, Academy of Architecture for Health on the final evening of the Design & Health Canada 2010 International Symposium, 22 awards were made across 12 categories to winning projects and teams.

Chaired by John Wells-Thorpe, an architectural writer and historian and former chair of an NHS Trust, the awards were judged by some of the leading researchers and practitioners in the field.

Prof Alan Dilani, director general of the International Academy for Design & Health, commented: "We have been honoured this year with a remarkable set of winners, providing inspiration to future generations and demonstrating the importance of design as a tool for improving human health, wellbeing and quality of life."

For full details of the award winning schemes, see pp17-41



Prof Alan Dilani introducing the awards



# Design & Health Europe 2010

7-8th  
October  
2010

Global Perspectives. Local Identities.  
An International Symposium & Gala Dinner

**Brussels, Belgium**

[www.designandhealth.com](http://www.designandhealth.com)

Ravelo Medical Clinic (Spain), by gpy arquitectos



Altnagelvin Area Hospital (Northern Ireland), by HLM Architects





## PPP awarded for New Karolinska Solna hospital

A joint Swedish-British consortium has been awarded the public-private partnership (PPP) contract to build the New Karolinska Solna University Hospital (NKS) in Stockholm. The

consortium is comprised of Swedish construction company Skanska, British investment firm Innisfree and Coor Service Management which is based in Solna and will be responsible for facilities management. The PPP project includes facilities management until 2040, with the option of extending it for a further 15 years.

The controversial SEK 14.5bn building was designed by Tengbom architects, based on a design concept created by White architects (see image above). Construction is due to start this summer with the first patient expected to be admitted in December 2015. The new hospital will provide healthcare, research and education in collaboration with the Karolinska Institutet and other universities and life science organisations in Sweden and internationally.

"This is truly a great day," said Catharina Elmsäter-Svärd, finance commissioner for Stockholm County Council. "We have signed a long-term agreement minimising the risk of delays and rising costs for taxpayers. The New Karolinska Solna, university hospital will catapult us into the future of healthcare."

"Now we can start to create one of the world's most modern university hospitals for healthcare, research and education," added Stig Nyman, assistant County Council finance commissioner.



## Oxford research facility topped out

The completion of the main construction stage for the new £23m, 5,750sqm Oxford Molecular Pathology Institute (OMPI), adjoining the Sir William Dunn School of Pathology at University of Oxford in the UK, was marked by a topping out ceremony in May.

The research facility, which was jointly designed by Nightingale Associates and Make Architects, will provide much-needed flexible laboratory spaces and new computer services to the university.

Head of the Sir William Dunn School of Pathology, Herman Waldmann, says the OMPI will offer "fantastic facilities for carrying out frontline research into the causes of diseases such as cancer, HIV, flu, Alzheimer's and heart disease".

The design of the new facility aims to provide a calm and respectful counterpoint to the William-and-Mary style of the school with a modern interpretation of external detailing, such as cornices and plinths, while the horizontal expression on the facades, the windows and the materials will echo the details of the original building.

"The building will complement and respond to its setting yet still provide a modern and contemporary structure benefitting a high-tech interior," says Justin Nicholls, architect and partner at Make.

"This new building for Oxford University will add a vital research facility to the university and help it to remain at the top of the tree in terms of scientific research provision," adds Adrian Gainer, Nightingale Associates' practice science lead.

The OMPI is due to be completed in early 2011.



## Six shortlisted for London Cancer Treatment Centre design

Six consortia have been shortlisted for the opportunity to design and construct the new Guy's and St Thomas' Hospital Cancer Treatment Centre in London, UK. The £90m centre is the first phase in the broader development of the Guy's Hospital site.

"The building will be required to lift the spirits for those who use it and achieve the highest standards of sustainability," the trust says. "The successful team will recognise the need to strike a balance that considers cost, long-term value and architecture."

The six consortia shortlisted for the project are:

- Woods Bagot / BDP / Brookfield;
- Anshen & Allen Associates / Rogers Stirk Harbour & Partners / Laing O'Rourke;
- Hopkins Architects / Skanska Construction UK;
- Grimshaw / Jonathan Bailey Associates / Bovis Lend Lease;

- Allies & Morrison / Devereux Architects / Kier Regional; and
- Make / Mace.

Mark Kelly, director of Australia-based Woods Bagot, sees the emergence of 'translational research' as a key plank in the design of cancer facilities around the globe. "Translational research involves the integration of basic science discoveries arising from the laboratory, clinical and or population studies into clinical applications – and hence the functional design of the facility to support this integration becomes paramount," he says.

"Our experience from our recent international study tour of 16 world-leading cancer centres further supports this as the future direction for all major healthcare facilities."

The winning bid is expected to be announced in September 2010, following an extensive consultation process.



O.L.V. HOSPITAL, in Aalst, Belgium



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# Shaping the future

A new international symposium in Brussels will explore global 'salutogenic' perspectives on the planning, procurement, finance, design, construction and operation of health facilities in Europe, writes *Professor Alan Dilani*

As Europe struggles to address a trio of economic challenges in the shape of debt, demographic decline and lower growth, the potential for political crises similar to the problems faced recently by Greece grows, as Europeans fear for their jobs and savings, banks continue to fail, companies forecast lower investment levels, and governments across the continent promote savage 'austerity' cuts to public spending.

Faced with these contextual challenges after many years of capital investment in healthcare infrastructure, there has never been a better time for a new paradigm in understanding how to improve the health status of Europeans and recognising that health and wellbeing are the foundation for a productive society, economic development and social and political harmony.

In 1997, the World Health Organization stated that the 'health arena' should be a priority. It said frequently used spaces, such as workplaces, schools, hospitals, correctional institutions, commercial offices, public spaces within our towns and cities – and, indeed, our homes – should be at the centre of health promotion activities in the 21st century.

From a research perspective, health can be divided into a pathogenic and salutogenic starting point. Pathogenic research focuses

on explaining why certain etiological factors cause disease and how they are developed in the physiological organism. The primary aim of pathogenic research is often to find medical treatments. Salutogenic research is based on identifying wellness factors that maintain and promote health, rather than investigating factors that cause disease. Together, salutogenic and pathogenic approaches offer a deeper knowledge and understanding of health and disease.

A new paradigm that recognises that human health is significantly related to the designed environment is needed. A 'salutogenic approach' to health infrastructure development, embedded at the core of a public health strategy focused on preventative care, changes the focus from risk factors and the treatment of disease to wellness factors and a more holistic understanding of healthy environments.

A focus on health promotion by design in European countries can be used to inspire innovative design and infrastructure solutions that facilitate an active lifestyle and enable the successful management of physical, psychological and emotional stress in our daily lives.

Design & Health Europe 2010 is being developed with the support of the Ministry of Health in Flanders and VK Group. International speakers from across Europe, but also from Canada and Australia will participate in an exploration of how to provide Europe with a more cost-effective context for enhancing human health, wellbeing and quality of life.

To register, visit [www.designandhealth.com](http://www.designandhealth.com)



## Design & Health Europe 2010: Global Perspectives. Local Identities. An International Symposium and Gala Dinner

Brussels, 7-8 October 2010

Design & Health Europe 2010 is an international symposium organised by the International Academy for Design & Health that aims to bring a global perspective to health infrastructure development in the region by:

- Evaluating different international models of care, health theories and perspectives
- Reflecting on the socio-economic factors impacting on European health infrastructure
- Learning about regional service models delivering real and measurable benefits
- Assessing the design of specialist care services such as mental health and elderly care
- Identifying the socio-economic drivers for the development of healthy communities
- Recommending actions and initiatives to improve design quality and operations
- Exploring how to create a sustainable infrastructure that supports human health, wellbeing and quality of life and meets the region's social, environmental and economic goals

Speakers will include (top to bottom): John Cole, European Health Property Network, UK; Dr Liz Gale, health consultant, Australia; Christine Hancock, C3 Collaborating for Health, UK; Michael Roughan, HDR Architecture, USA





After six months of work, including three long haul trips to Australia and many weeks of working nights to launch the inaugural Design & Health Australasia 2010 International Symposium, needless to say the last thing I expected was to be spending the event 3km down the road researching the impact of hospital design on the patient experience personally and with my own health at risk.

As a regular business traveller, I had never before displayed any signs of a predisposition to Deep Vein Thrombosis (DVT), but as the pain in my left calf developed over the flight, and I found my mobility severely restricted on leaving the airport, I sensed that this may be more than just some temporary muscular pain.

After a night's sleep on arrival at my hotel and finding the pain even worse on waking, I called the doctor, who immediately arranged for me to visit the nearest private clinic for a vascular ultrasound on my calf and a CT scan on my chest.

Highly professional, the staff should be complimented on the speed and attention they paid to my condition. Being asked to wait dressed in a typically undignified patient gown between scans in a changing room no bigger than a shoe cupboard was less to my liking, however. One of the staff kindly left the door of my cupboard open, but swung out into the corridor; it only served to create an obstacle for other staff to negotiate every time they walked past.

This was also the first moment I started to appreciate the seriousness of my condition, as the consultant nervously explained that they would be sending me straight to emergency at the local hospital, where as it turned out I would spend the next eight days of my visit to Sydney.

I have always been aware of the risk of DVT from long haul flights. I was less aware, however, of the risk of a Pulmonary Embolism (PE), which

# Personal preferences

A recent experience in an Australian hospital has left WHD's editorial director **Marc Sansom** convinced that patient choice is central to recovery and wellbeing

occurs when the clot breaks off from the leg and travels up the main artery to the lung.

On arrival at St Vincent's Hospital, a ten year old facility designed by BVN, I made my way through the front doors of the Emergency Ward (ED). Initially unsure of whether to introduce myself at a small window for people wishing to see the doctor or the administrative reception window a few paces on through a set of swing doors, my anxiety began to build amidst the managed chaos of the ED.

I waited for ten minutes as my quiet frustration increased and around me patients and their families competed for the attention of the staff. When seen, I can't fail to compliment the efficiency, professionalism and attention given to me by the clinical staff. Within minutes I was in a bed with nurses buzzing around, all my vital signs being monitored, blood being taken for tests and supplementary oxygen being given. A physician also arrived soon to inform me of the consultant who would be taking on my case, whilst she explained the process of scans, diagnostics and treatment in store for me.

As more tests were performed, the diagnosis of a 17cm clot in a superficial artery, a 3cm clot in a deep vein on my leg and the more serious clot blocking the lower and upper regions of my left lung were confirmed.

A heart echo also revealed an abnormal heartbeat on my left ventricular caused by the strain of pumping around the clot.

These moments were perhaps the most traumatic of the experience, when uncertainty and confusion reigned. I felt strangely comforted therefore by the noise and distraction of activity around me in the ED, and it was important to me that the curtains around my bed were left open so I could see what was happening around me and understand more about the context in which I had found myself. Isolation at this stage was my greatest fear. With the curtains open, I found distraction in the chaos of the ED.

**The 'dirty brown' curtains around the patient beds gave little inspiration for recovery**

I was in the ED for 24 hours until my vital signs had settled and the immediate danger to my life had passed, after which I was taken up to the stoke and neurology ward. I found myself in one of six 4-bed bays within the 'racetrack' designed ward. There were also eight single rooms. On arrival, the stunning views over Sydney and the abundance of natural light coming through the large 'ceiling to (almost) floor' windows had an immediate impact on how I felt after the noise and darkness of the chaotic ground floor ED. But I still felt grateful for the distraction of the other patients around me, and the visibility I had of the nurses responsible for our bay.

I was less impressed with the interiors of the ward however, which were generally drab, colourless and highly clinical. The 'dirty brown' curtains around the patient beds gave little inspiration for recovery and when drawn around my fellow patients, blocked the natural light and views from the windows. Hand written name boards above the beds gave the experience an amateur feel, even though the overall nursing care was professional and expert at all times.

The nurses themselves too often found themselves unnecessarily visiting the bay as my fellow patients and I regularly sat on our nurse call systems for which there was no natural place for them to be clipped. Most frustrating of all personally was the lack of somewhere to clip my oxygen lead, which meant that every time I visited the toilet, I had to leave it on the bed from where it inevitably fell to the floor. One erroneous nurse's comment that the "floors were clean" did not allay my fear of infection.

From the nurses' perspective, they complained to me about the lack of ventilation in the drugs room, but agreed that the decentralised nurse station design worked, even though it had proved to be a cultural challenge at first. Having the medical notes close to the patients had certainly made the nursing more efficient, said one nurse. The work stations were however too small, and when the doctors were conducting their rounds, competition for seats to perform paperwork became a challenge. The location of the linen cupboard closer to one end of the ward also increased walking distances for the nurses, whilst the lack of storage elsewhere meant the large shower room at one end was being used to store cleaning materials and buckets, a patient bedside unit and other equipment. One nurse also commented how nice it would be for patients to have a shelf to place pictures of families or for flowers which had no natural place to help brighten up the patient environment.

**The stunning views over Sydney and the abundance of natural light had an immediate impact on how I felt**

Did the designed environment assist my recovery and improve my sense of wellbeing? In respect of the views, the natural light and the visibility and attention of the nurses due to the decentralised work stations, I believe so. Against my expectations, I also found that I was pleased to be in amongst other patients recognising that addressing the emotions of fear, confusion, uncertainty and the prospect of isolation were critical psychological factors in my recovery.

I am certain I would have found the experience psychologically more difficult to deal with in a single room, despite the greater control I would have had over my environment. Less positively, the highly clinical and drab interiors, lack of design detail in and around the patient bedside and general maintenance of the facility left a lot to be desired.

More importantly however, the experience gave me a timely reminder of how important the work we do at the Academy and the work of all our readers and stakeholders truly is, but that we still have a long way to travel.

**Marc Sansom is editorial director of *World Health Design***



The managed chaos and noise of the emergency department provided distraction from the seriousness of my condition

# Heart of glass

Completed in December 2009, the US\$10.5m refurbishment and expansion of the Kaiser Permanente Los Angeles Medical Center aimed to transform what was a collection of unremarkable, disparate buildings into a unified campus with a façade that created a recognisable identity, as well as creating a new staff and visitor cafeteria.

The 16,000 sq ft medical centre spans five city blocks on Hollywood's Sunset Boulevard. To develop the exterior into a visual gateway for the campus, architectural firm Taylor used colour, landscaping and streetscaping to develop a sense of place. A notable feature was the undulating glass sculptured glass curtain wall system of the new Rejuv(e)nate Cafe.

"I saw an opportunity to do something more playful with the streetside façade of the cafe-to-be and challenged contractors to come up with a cost-effective alternative to flat glass," says Taylor's project manager, Harbans Ghatoade. "When the scaffolding was removed, people saw it as a work of art."

The 400-seat, 1,500 square foot cafeteria includes a 500 square foot terrace, and offers space for both dining and relaxation. Its circulation plan leads people from food stations and a coffee bar to the dining area and to lounge-style seating with upholstered chairs and coffee tables. Transparent resin-formed hanging 'clouds' and a decorative rippled 'water wall' help define the spaces and add visual interest, as well as helping to create a calm, relaxing atmosphere. A programmable lighting system adjusts light levels throughout the day to maximise daylight and support energy efficiency.

The cafe acts as a hub for the medical centre, carrying people through rather than past the space. "Creating a clear connection from the parking garage to the concourse, and then extending the concourse right through the cafe and into the medical facilities let us have an inviting space that many people can see," says Mark Costa, Kaiser Permanente's executive director. "Even if they don't stop, they note what it is and how they might use it when they can."





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# The winning formula

The Design & Health International Academy Awards recognise professional excellence in the research and practice of designing healthy built environments. This special report profiles the winners announced in Toronto in June

By setting standards and benchmarks, the Design & Health awards programme has a significant influence on the global design and development of humanistic environments that support health, wellbeing and quality of life. Comprising 12 categories across the key areas of international healthcare delivery, the awards were presented during the Design & Health Canada 2010 International Symposium at a prestigious ceremony at the University of Toronto.



The glass trophies were awarded to this year's winners

#### The 12 categories were:

- Lifetime Leadership Award
- Special Judges' Award
- International Research Project
- International Health Project (over 40,000 sqm)
- International Health Project (under 40,000 sqm)
- Mental Health Design
- Sustainable Design
- Elderly Care Design
- Interior Design
- Use of Art in the Patient Environment
- Product Design for Healthcare Application
- Low-cost Project in a Developing Economy

#### Setting new benchmarks

Reflecting important aspects of the exceptional work undertaken by researchers and practitioners at the forefront of the field, the recipients of this year's awards are those who, through unique and outstanding efforts, have contributed to the progress of knowledge, and demonstrated vision and leadership in exemplary initiatives and projects.

Chaired by John Wells-Thorpe, writer, architect, historian and international

advisor to the International Academy for Design & Health, the awards are open to international organisations and individuals in both the private and public sectors participating in either research or practice, including the planning, procurement, design, construction and management of healthy built environments.

#### Judging process

Constructed from a group of independent experts from Europe, Asia, Africa, Oceania and the Americas, the judging panel comprised specialists in their field from multidisciplinary backgrounds, bringing with them a breadth of experience.

While each award category had its own criteria, the judges were also asked to consider the following key aspects of any built project: concept; fitness for purpose, originality, application of research findings, benefit to the community, life cycle costs, client satisfaction, value for money, building performance, procurement, and the quality of design and construction.

The academy's director general, Professor Alan Dilani says: "We are grateful to all our judges for their critical contribution to this year's outstanding awards programme, and offer our congratulations to all the finalists and winners for their exemplar work."

Please turn to the following pages to view the criteria, finalists and winners for each award category.



Chair of the Academy Awards 2010, John Wells-Thorpe



Dr Ray Pentecost, president of the American Institute of Architects, Academy of Architecture for Health, announces the award winners at this year's awards ceremony in Toronto

# Lifetime Leadership Award



## Chair of judging panel

**John Wells-Thorpe**, International Advisor, International Academy for Design & Health (UK)

## Criteria

Awarded to a healthcare leader and visionary who has shown an ongoing, lifelong commitment to enhancing the health, wellbeing and quality of people's lives through their dedication to healthcare design. The award recognises the human and personal qualities needed to push back the boundaries of progress and inspire future generations.



## Judges' Citation

"Eb Zeidler has designed numerous healthcare projects in the USA, Germany, Hong Kong as well as Canada. He has received over 80 national and international awards and over 400 articles on his work have been published. Beyond practice, he has shared his ideas academically and in his writing, having completed four books and lectured widely.

Three seminal healthcare projects – McMaster University Health Sciences Centre, Hamilton; Walter C. MacKenzie Health Sciences Centre, Edmonton; The Hospital for Sick Children, Toronto – from the 1960s, 1970s and 1980s respectively, have captured imagination, opened eyes and sparked debate among the healthcare architectural profession. All have received international acclaim for their visionary approach to raising the status of hospital design beyond providing a purely technical solution.

Eb Zeidler was a pioneer in showing the world that modern, operationally efficient hospitals need not be mere 'factories' for treating the sick. Instead, his innovative design recognised the physical, psychological, aesthetic and intellectual needs of patients, staff and visitors alike.

He showed the way to future generations of architects and masterplanners by dealing practically with the reality of ongoing change in the delivery of healthcare. His approach to the use of interstitial space and modular planning as a means of increasing flexibility and reducing life cycle costs was widely regarded as having set a new standard for 'futureproofing'.

Whereas many healthcare architects are known solely for excelling in this area of this specialisation, Eb Zeidler's pioneer work spans the boundaries of commercial, retail, entertainment, education, healthcare and places of worship. Indeed, his ability to apply holistic expertise in all these human spaces attracted wide admiration.

He has influenced many of today's architects who are shaping the next generation of hospitals. For many architects, the time working with Eb stands as a significant episode in their career – inspired by exposure to his unique foresight, his attention to detail and his capacity to combine human sensibilities with practical requirements."



## Winner

Eb Zeidler

Winner of the inaugural Lifetime Leadership Award



Eb Zeidler (centre) receiving the Lifetime Leadership Award from Prof Alan Dilani of the International Academy for Design & Health (right), and Cliff Harvey, chief architect at the Ontario Ministry of Health (left)



Clockwise from top: Toronto Eaton Centre, Toronto; Princess Margaret Hospital, Toronto; The Atrium, Hospital for Sick-Children, Toronto

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# Judges' Special Award



## Chair of Judging Panel

John Wells-Thorpe, International Advisor, International Academy for Design & Health (UK)

## Criteria

Awarded to a project entered into any category that delights the judges by demonstrating unrivalled innovation, displaying salutogenic qualities and setting new boundaries and aspirations for architectural quality in healthcare design.

Sponsored by  
Stantec



## Winner

*Centro de Rehabilitación Infantil Teletón, Tamaulipas (Mexico), Sordo Madaleno Arquitectos*

The judges said: "This unique project for children of all ages suffering from neuromuscular skeletal disabilities, demonstrates a highly sensitive respect for human dignity. The use of colour complements the visual expression of an idea, not only describing the form, texture and size but also adding an expression of human emotion."



Talía Finsod (right) of Sordo Madaleno Arquitectos receiving the award for the Centro de Rehabilitación Infantil Teletón, Tamaulipas, from Michael Moxam (left) of sponsor Stantec Architecture



# Medical Architecture



Wandsworth Recovery Centre, UK

- Australia, Adelaide mental healthcare facilities
- Australia, Queensland masterplanning consultants
- Canada, Toronto mental healthcare consultants
- Denmark, Skejby acute hospital competition
- Turkey, Bakirkoy mental healthcare consultants
- UK, Middlesbrough mental healthcare facilities
- New Zealand, Waikato masterplanning feasibility study



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MAAP are engaged in planning and designing facilities for leading healthcare providers worldwide. Our approach brings professionalism and skill and knowledge to the design of healthcare environments. With over 20 years experience we collaborate with a network of consultants to draw on the latest thinking and international best practice as well as our research to deliver high quality and effective medical architecture.

# International Research Project



## Lead judge

**Dr Paul Barach**, Department of Anesthesiology and Center for Patient Safety, Utrecht University Medical Center; Utrecht (Netherlands)

## Panel

Dr Eve A Edelstein, MArch, PhD (neuroscience), Assoc AIA, F-AAA, University of California, San Diego, NewSchool of Architecture & Design, San Diego Academy of Neuroscience for Architecture (USA)  
Mungo Smith, director; MAAP Architects (UK)

## Criteria

Awarded for a completed, innovative, independently assessed piece of research focused on a particular aspect of the design, function, construction, financing or maintenance of a healthcare facility or addressing a relevant topic concerning public health in the context of the working environment.

## Finalists

*The Effect of Art on Patient Agitation in a Psychiatric Holding Unit & Implications for the Business Case* (USA), Upali Nanda, Sarajane L Eisen and Deborah Owen, Texas A&M University

*An Empirical Examination of Patient Room Handedness in Acute Medical-Surgical Settings* (USA), Dr Debajyoti Pati (HKS), Thomas E Harvey Jr (HKS), Jennie Evans (HKS), Dr Carolyn Caso (University of Texas Arlington)

*How to Implement the Healing Potential of the Built Environment: The Emergency Department as a Significant Case Study* (Italy), Daniela Sorana, TESIS InterUniversity Research Center, Department of Architecture, Technology and Design, University of Florence

*Light, Health and Wellbeing: Implications from Chronobiology for Architectural Design* (Switzerland/UK), Anna Wirz-Justice and Colin Fournier

*Researching the Relationship between Patient Safety and the Provision of Single-Bed and Multi-Bed Rooms* (UK), Patricia Young (National Patient Safety Agency), Kate Fairhall (Arup), Laura Bache (Arup), Peter Dodd (Arup)

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## Winner

*An Empirical Examination of Patient Room Handedness in Acute Medical-Surgical Settings* (USA), Dr Debajyoti Pati, Thomas E Harvey Jr, Jennie Evans and Dr Carolyn Caso

For the full paper, see pp 74-81



Dr Debajyoti Pati (centre) and Dr Carolyn Cason (right) receiving their award from Chris Shaw of sponsor MAAP Architects

## Nominator's Citation

"This study is the only empirical research that systematically addressed the questions of standardisation and same-handedness, developed objective definitions of complex concepts and drew meaningful inferences. A trans-disciplinary approach with representatives from architecture, environmental design research, nursing, nursing research, kinesiology and statistics, and a strong stakeholder participation by RNs, renders this study one of the highest quality. The authors employed all rigours employable in a design research project, including randomly sequenced tasks and configurations, and multiple analytical procedures involving quantitative and qualitative data analyses. The use of real caregivers (RNs) maintained the ecological validity of the data." **Jaynelle F Stichler**

# Health Project (Over 40,000 sqm)



## Lead judge

**Kirk Hamilton**, Associate Director, Center for Health Systems & Design, Texas A&M University (USA)

## Panel

Prof Ian Forbes, Architect and Health planner at Design Inc and adjunct professor, University of Technology Sydney (Australia)

Craig Dixon, director – health practice, Tribal (UK)

## Criteria

An award for an outstanding acute or non-acute healthcare building where patient-centred considerations are as evident as clinical and managerial priorities. The project must demonstrate an understanding of the therapeutic effect of a 'healing' environment, and show how innovative design permits ongoing flexibility of use, addresses issues of sustainability and recognises the broader civic context.

## The finalists

3430 Burnet Avenue Medical Office Building (USA), DNK Architects  
Abbotsford Regional Hospital and Cancer Centre (Canada), Silver Thomas Hanley/Musson Carrell Mackey  
Henry Ford West Bloomfield Hospital (USA), Albert Kahn Associates  
Jersey Shore University Medical Center (USA), WHR Architects  
Montfort Hospital Redevelopment (Canada), Stantec Architecture  
University of Arkansas Medical Services Bed Tower (USA), HKS

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## Highly Commended

**Montfort Hospital Redevelopment, Canada**

**Designed by Stantec Architecture**

The judges said: "A clearly articulated design that transformed the patchwork fabric of the existing hospital into a contemporary environment of wellness."



Michael Moxam (right) of Stantec Architecture receiving the award from sponsors Zeidler Partnership Architects (left)





## Winner

Jersey Shore University Medical Center, USA  
Designed by WHR Architects

The judges said: "The transformational impact of this stunning project could only have been achieved through wide stakeholder engagement and a commitment to strong guiding principles focused on improving the patient experience through evidence-based design, advanced technology and a responsive environment."



WHR Architects and the project team for Jersey Shore University Medical Center receiving the award from sponsor Zeidler Partnership Architects (far left)



# Health Project (under 40,000 sqm)



## Lead judge

**Susan Black**, Principal and Director, Perkins Eastman Black Architects (Canada)

## Panel

John Cooper, chairman, Architects for Health and Principal, John Cooper Architects (UK)

Mike Nightingale, Founder, Nightingale Associates (UK)

Stephen Tattle, PRISM Partners (Canada)

## Criteria

An award for an outstanding acute or non-acute healthcare building where patient-centred considerations are as evident as clinical and managerial priorities. The project must demonstrate an understanding of the therapeutic effect of a 'healing' environment, and show how innovative design permits ongoing flexibility of use, addresses issues of sustainability and recognises the broader civic context.

## The finalists

Assuta Medical Centre (Israel), Zeidler Partnership Architects

The Alfred Hospital ICU (Australia), Billard Leece Partnership

Bristol Heart Institute (UK), CODA Architects

Centro de Rehabilitación Infantil Teletón, Tamaulipas (Mexico), Sordo Madaleno Arquitectos

Christus St. Frances Cabrini Hospital (USA), WHR Architects

The London Clinic Cancer Centre (UK), Anshen + Allen

Mansfield Community Hospital (UK), by Swanke Hayden Connell Architects

Mass General/North Shore Center for Outpatient Care (USA), Shepley Bulfinch

Mater Calvary Hospital (Australia), Suters Architects

Miller Children's Hospital Addition (USA), by Taylor

New Stobhill Hospital (UK), Reiach & Hall Architects

New T&O Facilities, Craigavon Area Hospital (Northern Ireland), Milligan Reside Larkin Architects

Queens Centre for Oncology and Haematology, Castle Hill Hospital (UK), HLM Architects

Royal Manchester Children's Hospital (UK), Anshen + Allen

Skypad: Teenage Cancer Trust Unit, Cardiff (UK), ORMS Architecture Design

Sponsored by  
HDR Architecture



## Highly Commended

**Assuta Medical Centre (Israel)**

**Designed by Zeidler Partnership Architects**



The judges said: "The design of this outstanding project successfully merges patient expectations with the hospital's objectives by integrating the site with the clinical systems and the culture of the organisation."

**Bristol Heart Institute (UK)**

**Designed by CODA Architects**



The judges said: "The visually stimulating and human-scale design of this project has created a modern, efficient and accessible cardiac centre that promotes a sense of dignity as well as organisation."



## Winner

New Stobhill Hospital (UK)  
Designed by Reiach & Hall Architects

The judges said: "This project is truly world class, placing people at the heart of the design process within an architecture embedded in location and in the psyche of its community. The hospital creates a dignified, calm environment for healing patients and staff alike."



Andy Law (right) of Reiach & Hall Architects receiving the award from lead judge Susan Black (centre) and Steve Goe (left) of HDR Architecture



# Mental Health Project



## Lead judge

**Chris Liddle**, chairman, HLM Architects (UK)

## Criteria

Awarded for a mental health facility where an effective reconciliation between issues of security and perceived 'openness' are evident and where the operational need for supervision does not overwhelm the imperative to provide a civilising and humane setting to support therapeutic intervention. The project should appear community-friendly. Evidence of safe landscaping is important, as are levels of construction specification to meet informed standards of sustainability.

## The finalists

Maroondah Mental Health Unit (Australia), Silver Thomas Hanley

Roseberry Park, St Luke's Hospital Site (UK), MAAP Architects

Sister Margaret Smith Centre (Canada), Montgomery Sisam Architects in association with Kuch Stephenson Gibson Malo Architects & Engineer

Wandsworth Recovery Centre (UK), MAAP Architects

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HLM Architects

**HLM** ARCHITECTS



## Highly Commended

**Roseberry Park, St Luke's Hospital Site (UK)**

**Designed by MAAP Architects**

The judges said: "Despite being the UK's largest newly constructed mental health facility, the innovative design has created buildings that are functional, flexible and affordable. At the same time, the design is consistent with the client's model of care, providing a sympathetic domestic environment that promotes security, dignity and independence for residents and staff."





## Winner

Wandsworth Recovery Centre (UK)  
Designed by MAAP Architects

The judges said: "This comprehensive project sets a new international benchmark for mental health facilities, demonstrating how design is concerned with more than just the aesthetic, supporting a major redesign of the way mental health services are delivered in this area of London."



Chris Shaw (right) of MAAP Architects receiving two awards from Cliff Harvey (left) of the Ontario Ministry of Health

# Sustainable Design



## Lead judge

Phi Nedin, Global Healthcare Business Leader, Arup (UK)

## Criteria

Awarded for a completed healthcare project where issues of sustainability are achieved at a level conspicuously above the present mandatory norm and which set a new standard of attainment to satisfy legislative, technical, financial and moral imperatives. The award will only be made for exceptional solutions which must have been in full operation for a minimum of one year.

## The finalists

Abbotsford Regional Hospital and Cancer Centre (Canada), Silver Thomas Hanley/Musson Carrell Mackey  
Assuta Medical Centre (Israel), Zeidler Partnership Architects  
Centro de Rehabilitación Infantil Teletón, Tamaulipas (Mexico), Sordo Madaleno Arquitectos  
Henry Ford West Bloomfield Hospital (USA), Albert Kahn Associates  
Jersey Shore University Medical Center (USA), WHR Architects  
Mater Calvary Hospital (Australia), Suters Architects  
Medical Center of the Rockies (USA), Heery International  
New Stobhill Hospital (UK), Reiach & Hall Architects  
St Anthony Hospital (USA), ZGF Architects

Sponsored by  
Arup



## Highly Commended

Medical Center of the Rockies (USA)

Designed by Heery International

The judges said: "The project successfully combines sustainable design, circulation and wayfinding ease, expandable infrastructure, a hospitality environment with patient amenities against the backdrop of the Rocky Mountains in a world class healing facility."



Russell Sedmak (right) of Heery International receiving the award from Alisdair McGregor (left) of sponsor Arup



## Winner

St Anthony Hospital (USA)  
Designed by ZGF Architects

The judges said: "The design approach of this outstanding project focused on the interconnection between nature, health and wellbeing, reflecting and making use of the stunning local backdrop of wooded forests, panoramic landscapes and views to the water."



Jennifer Mountain (right) of ZGF Architects receiving the award from Alisdair McGregor (left) of sponsor Arup

# Elderly Care Design



## Lead judge

Derek Parker, Anshen + Allen (USA)

## Panel

Mikael Paatela, Sweco Paatela Architects (Finland)

Ninotschka Titchkosky, principal, BVN Architecture (Australia)

## Criteria

An award for accommodation designed specifically for the elderly, physically and/or mentally frail, where a balance has been struck between operational efficiency and the 'domestic' atmosphere necessary for long-term care and support. The demands of sympathetic landscaping and levels of construction specification to meet informed standards of sustainability are important.

Sponsored by  
Anshen + Allen

ANSHEN+ALLEN



## The finalists

Belong Wigan (UK), Pozzoni

NewBridge on the Charles (USA), Perkins Eastman



## Highly Commended

NewBridge on the Charles (USA)

Designed by Perkins Eastman

The judges said: "The architectural excellence of this community centre demonstrates a more public identity that does not promote ownership by any one group, providing cues to residents and visitors that this is an environment where everyone is welcome and encouraged to interact."



Brad Perkins receiving a high commendation on behalf of Perkins Eastman from Annie Coull of sponsor Anshen + Allen





## Winner

Belong Wigan (UK)  
Designed by Pozzoni

The judges said: "This project is a new lifestyle concept for elderly people that sets new benchmarks for the design and shape of future environments, delivering care and support within schemes that prevent social isolation and promote people's sense of control and independence."



# Interior Design



## Lead judge

Annette Ridenour, President, Aesthetics (USA)

## Panel

Susan Francis, Special Advisor for Health, Commission for Architecture and the Built Environment (CABE) (UK)

Kate Bishop, Researcher and Design Consultant (Australia)

## Criteria

An award to recognise a therapeutic space that enhances the health, wellbeing and quality of life of the patients, staff and visitors. Preference will be shown to projects, which respect the privacy and dignity of patients, and illustrate originality in the design approach and environmental sustainability.

## The finalists

Bristol Heart Institute (UK), CODA Architects

Evelyn H Lauder Breast Center; Memorial Sloan Kettering Cancer Center (MSKCC) and MSKCC Imaging Center (USA), Perkins Eastman

Mount Sinai Centre for Fertility and Reproductive Health (Canada), Montgomery Sisam Architects

New T&O Facilities, Craigavon Area Hospital (Northern Ireland), Milligan Reside Larkin Architects

Radiation Treatment Suites and Waiting Areas, Credit Valley Hospital (Canada), Farrow Partnership Architects  
Rainbow Babies & Children's Hospital Neonatal Intensive Care Unit (USA), Array Healthcare Facilities Solutions

Skypad: Teenage Cancer Trust Unit, Cardiff (UK), ORMS Architecture Design

Trillium Health Centre – West Wing (Canada), Perkins Eastman Black Architects, Parkin Architects

Sponsored by  
Farrow Partnership Architects



## Highly Commended

Rainbow Babies & Children's Hospital Neonatal Intensive Care Unit (USA)

Designed by Array Healthcare Facilities Solutions

The judges said: "To promote a soothing, hopeful experience for all families, the design team successfully developed a themed environment incorporating both whimsical and enduring elements."



Evelyn H Lauder Breast Center, Memorial Sloan Kettering Cancer Center (MSKCC) and MSKCC Imaging Center (USA)

Designed by Perkins Eastman

The judges said: "An outstanding and innovative interior in a sensitive setting that enhances the patients' experience and helps to maintain their dignity. In this, the scheme has succeeded admirably."



## Winner

Trillium Health Centre - The West Wing (Canada),  
 Designed by Perkins Eastman Black Architects / Parkin Architects (JV)

The judges said: "The vision of this project successfully embraced the patient perspective to bring staff closer to patients while giving them more control in a holistic environment of wellness."



The team from Perkins Eastman Black receiving its award from lead judge Annette Ridenour (far left) of Aesthetics Inc and Tye Farrow (far right) of sponsor Farrow Partnership Architects

# Use of Art in the Patient Environment



## Lead judge

**Blair Sadler**, Senior Fellow, Institute for Healthcare Improvement (USA)

## Panel

Damian Hebron, Director, London Arts in Health Forum (UK)

Margret Meagher, Arts in Health (Australia)

## Criteria

An award that recognises the effective application of creative endeavour (of any type or in any medium) which further advances knowledge of the potential of the arts to assist significantly in the therapeutic process. Preference will be given to conspicuous success in new approaches, stretching still further the boundaries of possibility in the wide creative field.

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Perkins Eastman

**Perkins Eastman**

## The finalists

Arts at Callington Road (UK), Willis Newson

Catherine Mayer Ambient Art (USA), Catherine Mayer Ambient Art

Kadlec Regional Medical Center – Pediatric Center (USA), Curtis Group Architects & Skyline Art Services

Mercy Regional Breast Care Center (USA), SCW Art Consulting

New Hospitals Development, Central Manchester University Hospitals NHS Foundation Trust (UK), LIME Arts

Radcliffe, Ashton and Moorgate Primary Care Centre Artwork Scheme (UK), LIME Arts

Saint John's Welcome Artwall (USA), Roundtree Visuals

Southmead Hospital: Learning, Research & Pathology Buildings Public Art Programme (UK), Willis Newson



## Highly Commended

**Radcliffe, Ashton and Moorgate Primary Care Centre Artwork Scheme (UK)**

**LIME Arts**

The judges said: "This project created an ambitious series of contemporary and original artwork that is exciting, vibrant, modern and unique, but based around the participation of the communities that will make use of the buildings."





## Winner

Saint John's Welcome Artwall (USA)  
Roundtree Visuals

The judges said: "Enhancing the patient experience and supporting the creation of a restful, calming environment, this unique art programme has proved to be flexible, informative and provides the visitor or patient with a fresh experience. The project was delivered with full engagement of the community and staff, with a very efficient use of resources."



Deborah Roundtree (centre) of Roundtree Visuals receiving the award from lead judge Blair Sadler (right) and Susan Black (left) of sponsor Perkins Eastman

# Product Design for Healthcare Application



## Lead judge

Colum Lowe, Founder, Being (UK)

## Panel

Bill Rostenberg, Principal, Anshen + Allen (USA)

## Criteria

Awarded for a manufactured product or item of equipment that adheres to human factor principles and which is integrally installed in a healthcare environment, advances levels of technical performance and integrates satisfactorily with the setting designed to accommodate it.

Sponsored by  
HLM Architects



## The finalists

DBO Commode (UK), PearsonLloyd / Kirton Healthcare  
Grand Island Sleep Sofa (USA), David Edward  
Handwashing Unit (Canada), Farrow Partnership Architects  
Opus Overbed Table (USA), Nurture by Steelcase  
Safevent Antibacterial Systems (UK), Britplas  
Seniors Living Domain (Australia), Thomson Adsett  
Sonata (USA), Nurture by Steelcase  
SYNC (USA), Nurture by Steelcase



## Highly Commended

Grand Island Sleep Sofa

Designed by David Edward

The judges said: "The Grand Island supports the caregiver in the patient environment to ensure a continued level of support throughout the healing process."



John Crawford (right) of David Edward, receiving the award from lead judge Colum Lowe (left) of Being



## Winner

DBO Commode,  
Designed by PearsonLloyd and manufactured by Kirton Healthcare

The judges said: "The DBO Commode represents a paradigm shift in commode design and the reduction of infection transfer. The team of PearsonLloyd, Kirton Healthcare and the Human-centred Design Institute at Brunel University created an elegant and robust design for bedside use that is also easier and quicker to clean."



Marc Sansom, editorial director of *World Health Design*, accepts the award on behalf of PearsonLloyd and Kirton Healthcare from lead judge, Colum Lowe (left) of Being Design





# Low-cost Project in a Developing Economy



## Lead judge

**Geoff Abbott**, Director – Health Facilities, CSIR Built Environment, Centre for Scientific and Industrial Research (CSIR) (South Africa)

## Panel

Mike Nightingale, Founder, Nightingale Associates (UK)

John Wells-Thorpe, International Advisor, International Academy for Design & Health (UK)

## Criteria

An award for completed health projects in developing countries where resource constraints pose specific challenges. Projects should demonstrate design ingenuity in achieving an optimum, cost-effective and locally appropriate functional health service environment. Designs should recognise user rights, dignity and safety, be locally maintainable and environmentally appropriate.

Sponsored by  
Ngonyama Okpanum & Associates



## The finalists

Centro de Rehabilitación Infantil Teletón, Tamaulipas (Mexico), Sordo Madaleno Arquitectos

Guga S'Thebe Arts & Culture Centre (South Africa), CS Studio Architects

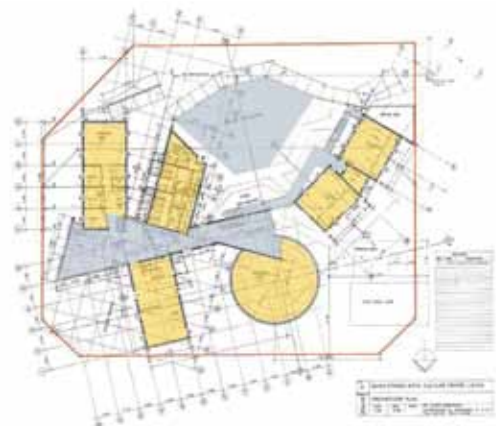
Helderstroom Prison, Caledon: Housing for Single and Married Personnel (South Africa), CS Studio Architects

Vryburg Hospital (South Africa), Bartsch Consult

## Winner

Guga S'Thebe Arts & Culture Centre (South Africa)  
Designed by CS Studio Architects

The judges said: "Situated in the oldest township of the Western Cape, this uplifting project celebrates cultural diversity supported by a multi-purpose environment. This centre successfully acts to prevent the degeneration of the community through arts and culture."





# Ngonyama Okpanum & Associates

ARCHITECTS | PROJECT MANAGERS | URBAN DESIGNERS | INTERIOR DESIGNERS | TOWN PLANNERS

Ngonyama Okpanum and Associates is dedicated to providing knowledge-based solutions to health care design.

Architecture has a strong behavioral influence on the community and society at large. Our approach to design is characterised by a focus on the interpretation of factors which impact on the built environment i.e. the social, architectural, spatial, philosophical, political and technological aspects of design; and their interpretation in the site-specific context.

Ngonyama Okpanum and Associates provides developmental, managerial and technical services in this respect, and within the context of human upliftment and the development of the built environment. Our architecture seeks to promote quality buildings with a strong recognition of the positive influence of architecture through the creation of pleasant therapeutic environments and well-designed spaces.



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COMPLETED 2009



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JOHANNESBURG, SOUTH AFRICA  
COMPLETED 2009

# Child in mind

Healthcare design is becoming more responsive to the needs of children and their families, reports Liz Griffin

Children are not little adults. They are different physically, emotionally and socially. So says Derek Parker, former president of Anshen + Allen – and this difference is perhaps most apparent in the way in which children expect to interact with their surroundings. For example, they prefer an active use of space, as Australian researcher and design

consultant Dr Kate Bishop notes: "They approach any environment with the question 'what can I do here?' – as soon as they are well enough."

Bishop acknowledges that while both children and adolescents may respond to a vibrant environment, adolescents place a greater emphasis on being able to alter and personalise their surroundings to reflect their own interests and identity. While both groups need age-appropriate distractions, "children tend to have a smaller wandering range than adolescents who travel further and seek more sophisticated activities".

This has clear implications for physical range, spatial requirements and layout. Anshen + Allen director Jonathan Wilson cites the futuristic recreation pods implemented in teenage cancer units in Leeds and Newcastle in the UK as one way to provide personal space. Flexibility is also important due to the fluctuation in patient numbers, as well as children's differing medical needs and personal preferences. Wards that can be configured to allow for single and shared rooms, so that those who prefer to share with another patient can, while others are given the space they need, are increasingly in demand.

## Age-appropriate design

The opportunity to vary, personalise and engage with their environment offers children a valuable coping strategy. However, overstimulation is a common pitfall.

"We say we are designing for children, but what does that mean?" questions Parker, citing a diverse patient group ranging from newborns to toddlers, school-age children, teenagers and young adults returning to hospital with

chronic childhood diseases such as cystic fibrosis. "The common approach of primary colours and a Disney-like carnival atmosphere is inappropriate and naïve."

He favours a subtler solution: "A neutral, friendly environment, as devoid of designer ego as possible."

Similarly, Blair Sadler, senior fellow at the Institute for Healthcare Improvement in Cambridge, Massachusetts, feels that for teenagers with cancer, chronic conditions or orthopaedic problems a baby-like environment can be distinctly unhelpful.

A considered use of colour can be seen in Mexico's award-winning Teleton Tampico, a centre for disabled children (see *WHD*, January 2010). The centre provides medical, educational and psychological care for children and young people up to the age of 18 and designer Sordo Madleno Arquitectos saw colour as key way in which to promote wellbeing. A bold palette in intense pinks, yellows and oranges, set among gently landscaped surroundings, was chosen to relax, motivate and elicit positive emotions. There are also sports courts, fountains and special therapy gardens.

A world away in urban south London, UK, children are also benefiting from a brush with nature. Brixton Water Lane child and adolescent mental health team, with funding from NHS Lambeth, has responded to feedback from children and their families by transforming a concrete yard into a garden and relaxing play area.

Both staff and children tend the raised flowerbeds and eat the strawberries that are grown there. The children enjoy the freedom that this new open environment gives them, and it also allows staff to observe as they interact or play independently. One parent commented that the new garden "has offered my daughter the space she needs... it allows us to talk about our family."

Whether a child or young person is in for a short stay, a regular visitor or



Surgery in-take area, undersea level, Miller Children's Hospital



Assassi Productions

likely to remain in hospital or hospice care, facilities such as cafes, cinemas, computer rooms, play and sports areas, enable social interaction and encourage peer support. And this can make an enormous difference to their experience.

### Keeping connected

Teenagers and, increasingly, younger children need the access to computers that has become part of everyday school and home life. The ability to communicate with the 'outside world' and to keep in touch with friends and interests has real implications for wellbeing, particularly for those who need longer term care. Such provision is both expensive and invaluable.

Social facilities also enable young people to form new friendships – as UK architect John Wells-Thorpe says: "A child may have become physically isolated at home and can re-engage with someone who is equally pleased to see them."

Likewise the opportunity to go the cinema can help children feel connected. The charity MediCinema opened its flagship site at London's St Thomas' Hospital in 1999. Over the following ten years two further cinemas have opened (at Glasgow's Royal Hospital for Sick Children and Newcastle's Royal Victoria Infirmary). Patients can attend in wheelchairs and even beds, allowing them to escape their normal surroundings. An installation at South Gwent Children's Centre in Newport, Wales is under development, and funding for the completion of the construction and internal fitting out has been negotiated between the local NHS trust and the Welsh Assembly. Further potential MediCinema sites throughout the UK are under discussion.

Good design supports good clinical practice, says Parker, citing Anshen + Allen's first children's hospital – the Lucile

### Miller Children's Hospital, Long Beach, California

The 'Hero's Journey with a Castle Refuge' forms the central theme for the expanded paediatric facilities at Miller Children's Hospital, which opened its doors in December 2009 following completion of a US\$150m, 120,000 sq ft expansion project. "Inspired by the often-told story of the hero's journey, and also by the way Long Beach's shores touch the lands of children all around the world, we began to imagine a magic castle by the sea," says architect Linda Taylor. "Our building would rise up from the street like a castle rising from the rocks on the shores. It would glow like a warm light and be a welcoming beacon. It would be a fitting refuge for a hero."

Children were consulted at a visioning event and their ideas fed into the final design, reflecting the experiences and cultures of the diverse population. Artwork complements the themes on each of the hospital's four levels: under the sea, the shore, the garden and the city/citadel. The lobby is filled with sites and images of the beach and there is a play centre in which siblings can play and be supervised.

The hospital includes a dedicated paediatric surgery suite with seven operating rooms, a dedicated paediatric imaging centre, 24 additional neonatal beds with a further 24 shelled in and 24 general paediatric private patient rooms shelled in.

### Miller Children's Hospital, Long Beach, California

Client Long Beach Memorial Medical Center

Cost: US\$150m

Area: 120,000 sq ft

Completion: December 2009

Architecture and interior design: TAYLOR

Contractor Turner Construction

Construction manager: Cleo Enterprises, LLC

Structural engineer: TMAD Taylor & Gaines

Landscape Architects: Rabben Herman Design Office

Packard Children's Hospital at Stanford in California, now over 20 years old – where innovative design and clinical practice go hand in hand.

### Striking a balance

We're now seeing a more sophisticated approach to the role of art and landscape. Parker also points to the Meyer Children's Hospital in Florence, Italy, which Anshen + Allen designed with CSPE (Centro Studi Progettazione Edilizia), drawing on the expertise of consultants in environmental psychology, ergonomics, visual art and landscape architecture (see *WHD*, July 2009). Opened in 2007, the partially EU-funded hospital is sensitively housed in a 1930s villa set among mature trees and surrounded by the Florentine hills. Patients and visitors enter through an arbour-like *serra* (or greenhouse) of dappled light and shade – and this quality of light and airiness is maintained throughout. The architects also sought to 'humanise' the facility (formerly a TB institution) by enhancing the acoustic signature of the site and introducing subtle sound into the child's environment to reduce stress.

At Tallahassee Memorial Hospital in the US, music is now used instead of anaesthesia to aid relaxation prior to treatment in a large proportion of cases. Sadler says this type of work is aided by the wide availability of low-cost technologies and is part of a growing interest in arts in health in general, with significant developments in the US, UK and elsewhere, and with children's hospitals often leading the way.

Likewise, Wells-Thorpe believes that sensory perception therapy incorporating light, music or texture is becoming more sophisticated and can help children to achieve an equilibrium that an adult might gain from aromatherapy, for example.

**The challenge  
with the arts  
in health is to  
remember who  
we're doing it for**

CHEX, the Children's Hospital Explorers initiative, was founded when Anshen + Allen was appointed to design the Lucile Packard Hospital. The organisation brings together poets, artists, landscape architects, lighting designers, sculptors and environmental psychologists to discuss and form best practice in children's health design. Parker feels the group's work has led to better understanding of how a sense of discovery can be incorporated in design, of detail as a visual distraction, of the roles of play and socialisation, and of the dilemma of privacy and supervision. "One member of CHEX said, 'Is it fair to expect sick children to be happy?' Children feel sad, bored and scared, and sometimes angry. So we use design to address the mind, body and spirit of the child in authentic and holistic ways while allowing individual expression," Parker explains.

CHEX also explored the role of visual arts, acoustic environments, poetry and kinetics in the healing environment at Comer Children's Hospital at the University of Chicago – and these techniques are now being applied to the design proposals for the Alder Hey Children's Hospital in Liverpool, UK.

Dr Bishop is currently embarking on a pilot study of adolescents' experience of acute mental health units. She says: "Participatory research with children and young people in healthcare settings is limited in general, however very little is known about the experience of this patient group in this kind of healthcare setting."

Indeed Bishop believes that until children and young people are consistently allowed to influence the design of healthcare facilities, there is likely to be a huge variation in the child-friendliness of these environments. "Design teams often claim that elements in their designs are for children and that these features will work a certain way in children's experience – with little or no reference to children and young people themselves," she comments.

Sadler agrees. He says the focus must always been on children and their needs. "The key thing is to get the clinicians and nurses interacting with an artist and get full understanding and buy-in." He also emphasises the value of getting children involved and making the decisions where possible. "Like all of us they can be incredibly anxious and



Meyer Children's Hospital was designed with a sense of light and airiness throughout



## Chestnut Tree House Children's Hospice, Sussex, UK

Completed in 2003 with a contract value of £3.45m, Chestnut Tree House hospice is an inspiring example of child- and family-focused healthcare design. Caring for children with complex and severe conditions and families under enormous pressure, Chestnut Tree offers an invaluable respite environment; it is also, by design, set up for coping with the last days of a child's life.

Project architect Neil Holland Architects took great care in developing a building that would be in keeping with its sensitive rural site, opting for the form of a traditional settlement, broken down into smaller scale forms, with low eaves, in the style of traditional agricultural buildings. Natural materials, some locally sourced, and bricks and tiles in warm tones continue this aesthetic and promote patient and family wellbeing.

Developed on "a scale and aesthetic that is absolutely reminiscent of home", Chestnut Tree House features open domestic kitchen and dining areas, with parents' bedrooms upstairs, "well-developed but invisible security and the minimum of healthcare paraphernalia". Children's rooms are separate from the parents' areas, but have sofa beds and space for another bed for parents or siblings, as well as communicating doors. There is also a young person / teenage bedroom wing to ensure these patients have the privacy and independence they need. As all major care areas demand full access for severely disabled children, and most areas require full bed access as well, all have been sited on the ground floor.

There are many communal and private areas as well as specialist facilities – wet and dry play areas, and music and computer rooms, a hydrotherapy pool room, quiet room and multi-sensory therapy areas. The hospice also has a chapel area and bereavement suite, with its own private and secluded walled garden.

## Chestnut Tree House Children's Hospice, Sussex, UK

Client: Chestnut Tree Trust

Architect/designer: Neil Holland Architects

Completion: 2003

Cost: £3.45m

scared about the environment so being aware of that is job one. The challenge with arts in health is to remember who we're doing it for," he says.

In terms of arts in health, Sadler feels that there is still a lack of awareness by healthcare leaders of the positive impacts such projects can have on patients, families and staff. This is something that his recent book, *Transforming the Healthcare Experience through the Arts*, co-authored with Annette Ridenour, seeks to address. Of course, there is also the financial barrier to overcome, whether a project is funded from a hospital's operating budget or by philanthropy. Yet, as Sadler says: "Such programmes are relatively low cost with funds available if one has the creativity and commitment to look for them."

### Going forward

So what next for children's healthcare design? Wells-Thorpe believes the typology is changing, and cites developments like the Maggie's Centres in the UK as an inspiration for this shift. There is a drive to respond more effectively to the needs of communities with polyclinics, smaller, more localised sites, and those that bridge the gap between hospital and hospice care. Yet he notes that it is difficult to compare international developments: "Many of the US facilities are breathtakingly expensive and private so it's very difficult to make a fair comparison with other countries."

However, he also expresses concern that post-occupancy appraisal often doesn't happen, as by the time it is appropriate, teams have moved on or are too busy. He says this is deeply regrettable as architects are generous in admitting in retrospect what they would have done differently. "We need to talk to chief execs and say if you had the opportunity what would you do differently next time? You need to build in time for that."

Liz Griffin is a healthcare writer and journalist

good design transforms lives



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### **Serenity Suite, City Hospital, Birmingham, UK**

Client: City Hospital, Sandwell & West Birmingham NHS Foundation Trust  
Completion: April 2010

Architect: Simon Houldcroft, RPS Planning & Development

Structural engineer: Chris Perry, SDP Design

Mechanical & electrical consultant: Engineering Services Design Practice

Main contractor: Stan Hughes, E Manton

City Hospital project manager: Paul Scott

### **Serenity Suite, City Hospital, Birmingham, UK**

The Serenity Suite is a midwife-led unit in Birmingham's City Hospital, designed to provide a home-like environment where mothers can give birth with a high degree of privacy and dignity. The suite has five individually designed rooms, a dedicated entrance and a secure garden patio area for mothers to use. All external windows have uplifting murals which screen the rooms from the semi-public external spaces. The use of soft tones, natural looking materials and the large full-height murals of bluebell woods, the Norfolk coastline and other scenes to reduce the institutional feel and create interest in corridors and rooms.

"I particularly wanted this facility to stand apart and for families to be able to have a day they feel holds special memories for them in terms of the environment and also the care they receive," says consultant midwife Kathryn Gutteridge.

# WHR Architects is committed to sustainability



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A rapidly changing healthcare environment in the USA and around the world is reflected in the scientific programme of the 7th Design & Health World Congress & Exhibition (WCDH 2011), set to be the most progressive and challenging event in the field in 2011



**Prof Alan Dilani, International Academy for Design & Health, and Dr Ray Pentecost III, president of the American Institute of Architects, Academy of Architecture for Health**

When it transports the world of Design & Health to Boston in 2011, the International Academy for Design & Health, in partnership with the American Institute of Architects, Academy of Architecture for Health, will bring with it a leading-edge scientific programme that will underpin future professional practice in health promotion by design.

The partnership with the AIA-AAH has attracted a high level of submitted abstracts for WCDH 2011, resulting in a programme that includes world-renowned speakers from research and practice in government, business and academia from every part of the globe. With further contributions from Harvard University's School of Public Health and School of Design, expectations are rising for what is shaping up to be the most significant congress in the field of design and health throughout the world for many years.

Boston, as a city of knowledge and science, is one of the most inspiring environments for healthcare innovation. The venue has been carefully chosen to reflect the values of design and health and to ensure the congress offers an enriching experience for participants.

The scientific programme of the congress will offer delegates innovative and stimulating topics, including a broad range of plenary sessions, challenging the community to discuss the factors that contribute to the successful creation of a healthy society. We will present technical showcases, posters and an exhibition of the latest innovations and solutions in the field, providing a unique opportunity for participants to network and exchange knowledge.

Sessions will include presentations by physicians, psychologists, designers, architects, planners, artists, nursing professionals and economists, bringing together as wide a range of perspectives on design and health as possible. The rich selection of conference sessions highlights the importance and value of this interdisciplinary approach.

Topics addressed at the congress will include the latest research findings in the field including: health-promoting facilities, sustainable design, research-based design, mental health, post-occupancy evaluation (POE), senior care and public-private partnership financing models.

In addition, the trends and influences on design and health will be considered in sessions covering different global locations, including: Australia, the Middle East, China, India, South East Asia, Africa, Europe and the US.

The high quality of scientific research, presented in combination with a fascinating range of powerful case studies, a major trade show and a varied social and cultural programme, will ensure participants enjoy a unique knowledge-enhancing experience.

The annual Design & Health International Academy Awards has also been developed to incorporate 12 award categories. Supported by a well-structured judging process, the awards perform a vital advocacy role internationally, rewarding and recognizing excellence in design and health among researchers and practitioners and creating opportunities to benchmark design quality at an international level.

We look forward to seeing you in Boston, to greeting old friends and to making new ones. Join us at the opening ceremony to celebrate the 7th Design & Health World Congress and Exhibition at the Marriott Copley Place Hotel in Boston from 6-10 July 2011.

**Prof Alan Dilani is director general of the International Academy for Design and Health**

# A platform for change



**Keynote speakers will include (L-R): Lord Nigel Crisp (UK House of Lords), Dr Richard Jackson (UCLA), Dr Julio Frenk (Harvard University), Mohsen Mostafavi (Harvard University)**

While new, state-of-the-art, multimillion-dollar medical campuses have been thin on the ground in the United States in recent months, there have been plenty of US\$100m projects focused on expanding and upgrading the facilities of older hospitals, specifically in emergency and cancer care services, to competitive levels.

As that wave crests, another is surfacing, according to Richard Sprow, principal at Perkins Eastman: "The interesting thing about healthcare is that the need for capital projects never goes away. Sometimes it's technology that has to be upgraded. Sometimes it's the level of service and quality that patients now expect that has to be met. Sometimes it's obsolescence. They know they have to keep their facilities up to scratch."

The mood of the moment is of pragmatic, conservative decision-making, he says. "A hospital that needs to replace 100 obsolete beds still needs to do that. It's just a matter of when."

At a time when more ambitious plans have been scaled back, there are always strong arguments for replanning or rationalising what exists and transforming building usage with clever expansions – and there is plenty of such work around. Architects are bringing to it all the skills they've learned in creating the newest patient-friendly, technology-assisted and ergonomic megahospitals of the boom years. Says Sprow: "In the same way that the phrase 'green/sustainable' has gone from being something Al Gore talked about to something everyone talks about, on the design side, the idea of designing healthcare facilities that are friendly to patients and their families, that offer a healing environment and relationship to the outdoors, is now an expectation. Hospital executives are very much alert to these issues that once were seen as softer. Now in every discussion, they are asking us what's happening with evidence-based design (EBD)."

One strongly EBD-influenced project is WHR Architects' transformation of Jersey Shore University Medical Center. This US\$300m project was characterised by a strong commitment by the client to maximise wellbeing for all concerned, according to WHR principal and lead architect on the project, Tushar Gupta: "The hospital CEO was looking for nothing less than a transformation – he wanted us to reorganise everything about the hospital around the patient."

This included a commitment to 100% single patient rooms and the desire to create an impactful and welcoming building – including devoting more thought, care and budget to the look and feel of its busy level-one trauma centre than Gupta has seen

anywhere else in the US. An elected Pebble Project, ergonomic layouts are designed to reduce staff 'hunting and gathering' time. Crisis areas, such as the urgent care area, feature a 'zen room' for decompression (for staff or patient families). There are hybrid operating rooms which combine surgical and imaging capability, reducing surgical procedures required to diagnose and correct vascular deficiencies.

WHR also worked with the client to create a more responsive nursing layout for the single patient rooms: there is a central nursing unit for each 12-bedroom neighbourhood, but there are also decentralised stations outside the rooms, "taking the nurse closer to the patient when required," explains Gupta. The efficacy of this scheme is currently being researched, with results due in summer 2010.

Sustainability, not only for the benefit of

# Slow but steady

Although caution has underpinned the US healthcare market over the last 18 months, **Veronica Simpson** finds plenty of ambition in new and current schemes



Woodruff/Brown Photography

Jersey Shore University Medical Center comprises 100% single patient rooms



**Jersey Shore University Medical Center,  
Neptune, New Jersey**

**Client:** Meridian Health  
**Architecture and interior design:** WHR Architects  
**Area:** 378,361 sq ft new construction,  
 plus 38,000 sq ft renovation  
**Cost:** US\$300m  
**Completed:** July 2009  
**Structural engineer:** DiStasio & Van Buren  
**Mechanical & electrical engineer:** PWI Engineering  
**Civil engineer:** Dewberry-Goodkind  
**Landscape architect:** Melillo & Bauer Associates  
**Construction manager:** L F Driscoll Company  
**Project manager:** Granary Associates  
**Lighting consultant:** Bos Lighting Design

**Jersey Shore University Medical Center,  
Neptune, New Jersey**

A US\$300m expansion and renovation programme sees Jersey Shore University Medical Center enter a new, ambitious phase to be one of the region's leading teaching hospitals. Doors opened on the WHR Architects-designed facilities last August, revealing a new patient care pavilion with all private rooms, a state-of-the-art diagnostic and treatment building offering surgical suites, a new emergency department and level-one trauma centre capable of treating 100,000 patients. The trauma centre has its own, daylit and welcoming entrance, looking onto a small healing garden. WHR principal and lead architect Tushar Gupta says: "After all, it's in the emergency department that the most stress is experienced."

There is generous provision of public space throughout the new buildings. Gupta explains: "With a diverse variety of spaces, from intimate family accommodation in the rooms to big gathering space in the atrium and central healing garden, the idea was to provide positive distraction and an opportunity for healing, respite and rejuvenation whether you are patient or staff."

For the design, Gupta was inspired by the image of a sailing boat, its sails caught by the wind, as the motif of 'transformation with a path in mind', and he used this motif in the central node of the T-shaped building to create a 'wow factor' orientation point and vertical circulation space. The centre has achieved LEED Gold certification for its sustainability and energy-efficiency measures, including the use of recycled, durable materials, low volatile organic compound (VOC) paints, fabrics and non-PVC vinyls, and 100% outdoor air use for ventilation.

- Featured on this issue's front cover, the Jersey Shore University Medical Center is also the winner of the Best International Health Project (over 40,000 sq m) at the Design & Health International Academy Awards 2011 (see pp24-25).

the environment but also for patients, staff and the business itself, was also a key objective in the design and construction process. Low-flow water systems were introduced wherever practical, reducing water consumption by around 30%. Two gas-fired co-generation units that convert on-site waste into steam heat brought about a 32% reduction in energy costs. Recycled materials made up US\$6.5m of the materials used in the project. In addition, light pollution to the surrounding areas was reduced and the provision of 100% outdoor air was incorporated into the design. A continuous measurement and verification plan was also implemented to ensure that all energy-efficiency strategies were being realised throughout the lifetime of the building. As a result, Jersey Shore became the first LEED Gold-certified healthcare facility in New Jersey.

Elsewhere, the RTKL-designed Banner Del E Webb Medical Center Patient Care Tower in Arizona has used EBD theory to plan for a predicted massive growth in population, as young families are moved into a traditionally retirement-aged community. Services have been expanded strategically to allow for better and faster treatment at all ages, with additional overflow space facilitated in its new tower to provide more patient rooms, operating rooms and another intensive care unit (ICU) as demand dictates.

In another example of creative re-use, and possibly the first instance of its kind, an expansion programme at Stanford University Hospital and Clinics saw executives decide to convert four former dot-com boom office buildings in Redwood City for outpatient premises rather than build new, bespoke facilities on their own sprawling Palo Alto campus. Less of a renovation than a reincarnation, Anshen + Allen worked hard to utilise the best aspects of these entirely glazed, four-storey, steel and concrete buildings' daylight provision while ensuring appropriate levels of privacy and heat control (see case study on p57).

The continuing emergence of spa-influenced design has found outlets in both small and large facilities. In Rexburg, Idaho, Ward + Blake Architects' design for the Teton Radiology Center is light years away from the sealed boxes that these imaging centres have traditionally been housed in. With slate floors, no-glare natural lighting, cedar-clad ceilings and even a fireplace in the lobby, the spacious and light-filled facility has been designed to calm and reassure its largely female clientele, as well as to minimise energy use. Sustainable features include Solarban windows, skylights and solar tubes, and sensors that shut down electrical lighting when they detect adequate natural light.

It is clear to see that although the market may be cautious, innovation is still thriving in the US healthcare market.

Veronica Simpson is an architectural writer



Chris Cooper

### St Vincent's Medical Center, Bridgeport, Connecticut

A major modernisation project, expanding and reprogramming a community teaching hospital, Perkins Eastman created a four-storey 125,000 sq ft link between the existing lobby and nursing school, to provide a new cancer centre and expand the emergency department. Natural light floods into the building via a stacked central spine with atrium roof. On the second and third storeys, the spine creates a double-height internal winter garden which offers communal public space, and private exterior courtyards used by patients for healing and recovery while undergoing chemotherapy. Skylights into the ground floor below illuminate the critical care rooms of the expanded emergency department. Perkins Eastman's masterplan for St Vincent's also includes a renovation and modernisation of the surgical and medical ICUs, a new patient tower and medical office building.

### St Vincent's Medical Center, Bridgeport, Connecticut

Client: St Vincent's Medical Center

Architect: Perkins Eastman

Cost: US\$550m

Size: 125,000 sq ft

Completion: January 2010

Construction manager: Gilbane Building Company

MEP engineer: Van Zelm Heywood & Shadford

Civil engineer: Tighe & Bond

## West Chester Medical Center, West Chester, Ohio

Located to serve a fast-growing suburban community between Cincinnati and Dayton, West Chester Medical Center is designed to serve the needs of the 65,000-strong population now and into the future. Designed from scratch as a 'new market hospital', the project evolved through brainstorming with clinicians and consultants as to what the healthcare environment of the future would offer and look like.

The result is a 162-bed (all-private) acute care hospital, which can accommodate a 144-bed expansion with future addition of a second tower. The hospital is organized in a concentric fashion around the rotunda atrium lobby, with growth planned to expand outward from the central radius point. The lobby provides registration plus elevators to both first phase tower and the second phase tower when it arrives. The first bed tower's graceful, contemporary, curve provides a longer radial line at the patient corridor than at the exterior wall – it also gives each room a slightly pie-shaped design. The room sizes exceed requirements for ICUs, so that they accommodate the movement of beds and equipment access, and allow for larger care teams when necessary; they also have a pull-down couch for family members, plus a chair and desk for reading or computer use.

Incorporating the latest healthcare technologies, the facility is 100% digital, and includes a first-of-its-kind nurse call system where a patient uses a bedside touch screen that reaches out via VoIP to find the patient's lead caregiver; uses infrared locator tags to find the closest nurse if the main one is not available, and allows nurses to answer questions remotely via wireless phone. And since RTKL designed the hospital architecture and the technologies, high-tech tools are highly integrated throughout.



## West Chester Medical Center, West Chester, Ohio

Client: The Health Alliance  
of Cincinnati

Architects: RTKL Associates

Cost: US\$116.5m (construction); \$195m  
(approx total project cost)

Size: 389,520 sq ft

Completion: May 2009

Medical equipment planning:

RTKL Healthcare Technologies

Low voltage systems: RTKL Special

Systems Design Group

Construction manager: Mortenson-Messer

Healthcare Construction

MEP engineer: Fosdick & Hilmer

Structural engineer: Zinser Grossman

Structural

Civil engineer: Woolpert LLP

Landscape architect: Vivian Llambi  
& Associates



Photos: Jeffery Totaro



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Photos: Joe Fletcher Photography



### Stanford Medicine Outpatient Center, Redwood City, California

The adaptive re-use of a former dot-com office complex into the Stanford Medicine Outpatient Center (SMOC) is a story of transformation for building, client and community. The first project to successfully transfer clinical departments from the main university campus to a new satellite campus, SMOC houses seven specialty outpatient clinics. The primary goal was to create a world-class healthcare destination of choice that reinforces Stanford University's reputation for exceptional care and clinical excellence.

The project also represents the first step of renewal for the light industrial and small business district of Redwood City. The adaptive reuse of this complex of abandoned office buildings was as much about revitalising a community and providing exemplary, affordable healthcare as it was about providing a cost-effective, eco-friendly design that demonstrated responsible stewardship of the client's (and the earth's) resources.

Added elements such as a new porte cochère, connective walkways and a triple-height main lobby help to create a sense of arrival, announce a concise entry sequence and establish a positive, reassuring impression for patients. Self-registration kiosks, equipped with EPIC technology and able to accommodate individualised wayfinding, further facilitate patients' access to care.

Planning prioritised daylight and views in patient care spaces to assist orientation and organise distinct patient flows. Clinic entries and waiting areas have views to the garden and adjacent staff work areas are screened from public view. Transoms and clerestory windows draw abundant natural light from the perimeter into the staff workspaces and diagnostic imaging areas that occupy the core of the floorplate.

Several measures were necessary to make the site appropriate for clinical use, including upgrading the envelope's energy performance through sunshading louvres and a high-efficiency direct/indirect evaporative plant with heat recovery to reduce energy costs and improve thermal comfort.



### Stanford Medicine Outpatient Center, Redwood City, California

Client: Stanford Hospitals and Clinics

Architects: Anshen + Allen

Area: 270,000 sq ft, set in 12 acres

Cost: US\$110m

Completion: opened October 2008

Design consultant, public spaces: Brayton Hughes Design Studios

Construction manager: DPR Construction

Structural engineer: ESE Consulting Engineers

Façade analysis engineer: ARUP

Mechanical engineer: Guttman & Blaevoet

Electrical engineer: The Electrical Enterprise

Civil engineer: BkF Engineering

Landscape architecture: Hargreaves Associates

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# Solutions



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The Urban Tree Planter provides a simple solution for healthcare facilities wanting to increase the number of trees in the built environment. The planter allows mature and semi-mature trees of up to 12m to be installed in structurally sensitive locations such as rooftops and streetscapes. A wide variety of trees can be grown with the root ball pruned and securely contained without damaging the tree. An integrated irrigation, drainage and lifting system allows the planter to be hoisted or lowered into position and easily accessed for maintenance. In addition, the internal collar design allows the planter to be fully or half submerged to accommodate external facades, such as communal seating, solar panels or advertising panels.

[www.urbantreeplanter.co.uk](http://www.urbantreeplanter.co.uk)



## Sleep easy

Highly commended at the Design & Health International Academy Awards 2010, (see pp38-39), the Grand Island Sleep Sofa series was designed by US furniture manufacturer David Edward and architects HDR to enable healthcare facilities to provide a sleep sofa for caregivers in a patient room with a very tight footprint.

The sofa can be easily converted from sleeping to sitting position without the need for a mechanical metal mechanism and its seat cushions are made of highly resilient foam for long-term support, with nylon zippers to enable the covers to be reversed and easily cleaned. The Grand Island can be customised to fit in different sized patient rooms and to provide storage for linens and pillows.

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## Safety and simplicity

Medical technology supplier Karl Storz has taken its ORI integrated operating theatre to the next level with the launch of the ORI NEO. The new system combines all functions in a newly designed user interface. "ORI NEO expands the user's capabilities and protects against human error; with a focus on the safety of the patient and the operating room team," the company says.

The system's user interface has been optimised for touch control with simple controls to help make it more intuitive. Its colours have been adapted to lighting conditions in the operating theatre and the World Health Organization (WHO) surgical safety checklist has been integrated into the system to help surgeons identify the next steps they need to take. The checklist can be adjusted to different standard procedures and is accessible for both skilled and non-skilled users.

"We strive to help surgeons and nurses feel safe and concentrate in a safe environment," the company says. "This calm mood is also noticed by the patients and it increases their perceived and actual safety."

[www.karlstorz.com](http://www.karlstorz.com)

## A sense of place

Dementia patients in Longreach Hospital's Cove Ward, part of Cornwall Partnership NHS Foundation Trust in southwest England, are benefiting from an improved environment, thanks to a redesign of the interior of the ward by Boex 3D Creative Solutions. "We wanted to create a space which would help patients with orientation, give them a sense of wellbeing, calm and maximise their recovery," explains the hospital's modern matron Ian Bartlett.

Teal blue walls contrasting with brown upholstery and ash wood help patients to define doors, windows and seats. Ceiling pelments, local images from the 1920s and 1930s and speakers disguised as 1930s radios all help to reduce the institutional feel and create a sense of time and place.

The ward also features new uplighting, seating which can be dismantled for easy cleaning, a ward-based interactive sensory board and a range of everyday objects to stimulate the senses.

[www.boex.co.uk](http://www.boex.co.uk)



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## Design & Health Scientific Review **Systems and Standards**



Marc Sansom is editorial director of *World Health Design and Communications* Director at the International Academy for Design & Health

One of the most influential reports in the last two decades set in motion a global push for improved patient safety that continues today. *To Err is Human: Building a Safer Health System*, which was published in 1999 by the US Institute of Medicine, was a wake-up call for the healthcare industry, identifying that between 44,000 and 98,000 people in the

US died every year as a result of avoidable and preventable medical errors.

Since then organisations such as the World Alliance for Patient Safety, established by the World Health Organisation, and the National Patient Safety Agency in the UK have worked tirelessly to embed new cultures and support the design of new systems and processes to minimise the risk of adverse errors occurring.

More than a decade on from the report, however, and the contrast in the departure points of the two papers published in this issue of *World Health Design* perhaps go some way to demonstrating how far the industry has, or may not have come. In their 2010 Academy Award winning paper for Best International Research Project, 'Room handedness: Patient Room Layout in Acute Patient Care', Pati, Harvey, Evans and Cason, are clear in their objectives to provide a comparison between two types of standardised patient rooms in terms of their impact on process and workflow.

Despite few empirical studies in healthcare to demonstrate the value of standardisation both in terms of workflow and patient safety, the work of the aviation industry to establish the role of human factors as a major cause of error, and the opportunity that standardisation of equipment, system layout, displays and colour philosophy, creates to minimise this risk, is an argument that is already won.

By contrast, the paper by the Imperial College Healthcare NHS Trust and the Robens Institute for Ergonomics, 'Operating Theatre Design and its Influence on Patient Safety' raises implicit concerns from the outset that 'design practice and understanding in the NHS is less advanced than in other safety-critical industries', such as for example, the airline industry. It calls for 'better, evidence-based physical design', and an 'improved awareness of psychological needs in Operating Suite environments'. These implicit concerns are given substance in the findings of the report which clearly demonstrate 'no systematic or long-term approach to the design of operating theatres', which as a result are causing 'problems with safety, such as the risk of infection, efficiency and physical health problems of theatre staff'.

The authors of both papers should be congratulated on two thorough studies that systematically address their objectives and apply an interdisciplinary approach with a wide group of stakeholders engaged through multiple analytical procedures involving quantitative and qualitative data analyses, including data mining, focus groups and workshops. The reality suggests however that the importance of standardisation in addressing issues of patient safety are yet to be addressed in the UK, whilst arguably in the US, the debate appears moved on to efficiency of workflow and process. This contrast demonstrates the significant value of this journal help create a better understanding of the current status of different international health systems and the critical role of design.

### 64-73

#### **Patient Safety: Operating Theatre Design and its influence on patient safety**

Imperial College Healthcare NHS Trust and the Robens Institute for Ergonomics

### 74-81

#### **Room handedness: Patient room layout in acute patient care**

Debajyoti Pati, PhD, FIIA, LEED AP, Thomas E Harvey, FAIA, MPH, FACHA, LEED AP, Jennie Evans, RN, BS, LEED AP; Carolyn Cason, PhD, RN

## Patient Safety:

# Operating theatre design and its influence on patient safety

Design that aims to minimise the increasing problem of patient safety incidents must start by considering the behaviours of staff, patients and relatives under stress. This study has shown that currently, well-intentioned design, may be breached through behavioural requirements

*Imperial College Healthcare NHS Trust and the Robens Institute for Ergonomics*

This study was commissioned by the UK's National Patient Safety Agency (NPSA) in order to develop a better understanding of the safety risks associated with the design of the physical environment in operating suites (OS). One objective was to use the findings to assist in the development of recommendations about how to design a safe operative environment for surgical inpatients.

A series of small studies were undertaken during which the experiences of patients, relatives, surgeons, other clinicians and a range of healthcare staff were considered. These were complemented by workshops with architects, designers and equipment manufacturers and epidemiological analysis based on two sources of patient safety data, adding further insights into how and where patient safety incidents arise.

Part of the NPSA's work is to lead and contribute to improved safer patient care by informing, supporting and influencing the UK health sector. It is also responsible for the National Reporting and Learning Service (NRLS), which aims to improve patient safety by enabling staff to report and learn from patient safety incidents. The study was able to use data from this source, as well as from the NHS Litigation Authority (NHSLA) database to further examine the safety of the OS.

What has emerged is a complicated and often unsatisfactory picture. There is a need for better, evidence-based physical design of operating suites – but the benefits of enhanced physical design can only be realised with improved awareness of psychological factors in OS environments and a fuller understanding of the interactions



The Karl Storz ORI NEO integrated operating theatre has been consciously designed to improve the user interface

between physical and psychological needs.

The study has demonstrated that sometimes simple needs have been overlooked with attendant consequences for performance and patient safety.

The work follows the approach originally established in the *Design for Patient Safety* report<sup>1</sup>, which demonstrated how design can be used to minimise the risk of patient safety incidents – making hospitals safer for patients and improving environments for healthcare workers. The report found that the NHS was “seriously out of step with modern thinking and practice” on design. It also found that design practice and understanding is less advanced in the NHS than in other safety-critical industries. It also demonstrated that any design initiative needed to be seen in the light of the ‘big picture’ of the healthcare system and how it relates to patients.

### Goal of the study

The basis for commissioning the research was that compromises in patient safety have arisen as a result of recent rapid advances in surgery which have redefined the function of the present-day OS. The design of the OS has lagged behind technological advances, leading to a widening hiatus between the structure and process of surgery. A considered, ergonomics approach to the design, structure and function of the modern OS was therefore required to redress the issues.

Further research was also needed to understand the role that the physical factors or procedural and communication factors might play in the following incident types:

- objects left *in situ*;
- preparation requirements prior to surgery as failure to identify defective/inappropriate equipment leading to patient safety incidents; and



- the physical layout and design of equipment in theatres.

The objectives of the work were to:

1. undertake a literature overview relating to the physical aspects of the OS that had been identified relative to patient safety issues;
2. develop a framework for undertaking an appropriate study of OS ergonomics and patient safety;
3. analyse a patient safety incidents sample from the NRLS to establish an appropriate framework and taxonomy;
4. review NHSLA sample data to establish and prioritise areas of concern;
5. undertake focus groups to establish the perceptions of OS safety and physical design;
6. undertake a risk assessment of the perioperative process using failure mode effect analysis (FMEA); and
7. undertake a prospective hazard analysis (PHA) of the perioperative process using a prototype risk assessment tool being developed by a Department of Health research study.

## Methodology

An ergonomics approach was adopted and a number of short studies conducted to help assess current experiences and document concerns relating to the operating suite. The principal researchers spent considerable time familiarising themselves with the layout and functions relating to the operating suite and the tasks involved in surgery. This included observing complex surgery, meeting with clinicians and facilitating focus groups.

A literature overview was undertaken with the aim of providing background material to inform the study rather than to be a systematic critical review. The literature reviewed has been drawn from recent, peer-reviewed literature and the short review presented in the report provides a useful introduction to the topic.

A framework to study theatre ergonomics and patient safety was developed using the NRLS database, from which a purposive sample of 700 patient safety incidents were extracted and analysed.

The NHSLA shares data it collects on all clinical negligence claims with the NPSA. Between April 1995 and 31 December 2006, there were just over 40,000 (open and closed) claims in this database, including

all open and closed clinical negligence claims made to all trusts in England. It was decided that this project might benefit from an analysis of a sample of this data to identify potential design issues. The NPSA was approached to provide an overview of the total claims according to location of incident and cause of claim. An analysis of the overview data helped to prioritise cases for further analysis and also identified potential useful data in 10 separate cause classification categories. These were further requested from the NPSA.

A series of four workshops were conducted with a wide range of personnel who were involved in the design or use of operating suites. These included:

- architects, manufacturers and equipment suppliers (n=11);
- clinicians (surgeons, theatre nurse, intensive therapy unit (ITU) nurse, anaesthetist, consultant in critical care) (n=7);
- patients, relatives and carers (patients and their spouses) (n=10); and
- maintenance staff (carpenter, electrician) (n=2).

The focus groups were facilitated by an external researcher using a predetermined schedule of prompts to ensure adequate coverage of key issues. The schedule of 'prompts' was agreed by the researchers, the NPSA project officer and the workshop facilitator. The sessions were audio-recorded and were subsequently transcribed and analysed by an independent researcher.

Two risk assessments were conducted. The first used an established method, FMEA. This analysis was undertaken using 'the surgeon's journey' as the process element. The FMEA was carried out with a team of laparoscopic surgeons and developed a process map, identified failure modes and produced a derivation of estimates of risk (ratings of severity and frequency) for each failure mode. No attempt was made to proceed to solution finding for these failure modes.

In order to provide feedback to the participants at each stage, the research team developed the use of an existing software package, Mind Manager<sup>2</sup> to represent the findings at each stage of the risk assessment. This software was found to be an excellent tool for the visualisation of both the process map and the failure modes.

A second risk assessment was conducted

using a prototype risk assessment tool specifically designed to prospectively identify hazards. This tool is being developed as part of a research study funded by the Department of Health to provide guidance to NHS organisations for conducting prospective hazard analyses. A framework for risk assessment, established process mapping and PHA methods form the tool.

The toolkit consists of two parts: a preliminary risk review and a comprehensive risk assessment. Both were conducted in this study. The same process element as that used in the FMEA, 'the surgeon's journey', was risk assessed. The risk assessment was facilitated by an external facilitator and involved a team of surgeons. A preliminary risk review and a comprehensive risk assessment were conducted in the first session to identify and prioritise risks. The facilitator guided the participants to select one of the prioritised risks for a further comprehensive risk assessment. The toolkit contained templates for each step of the risk assessment and these were used in the sessions.

## Literature review

Transformations in surgical techniques, including the advent of minimally invasive surgery, endoscopic surgery, biorobotics and imaging, have revolutionised the surgical realm in terms of capability and procedure. But, while there is little doubt that technological breakthroughs themselves have contributed to patient safety<sup>3</sup>, an unacceptable number of avoidable patient safety incidents are resulting from the widening disparity between surgical innovation and the environment in which it is applied. Trailing wires leading to trips and falls, monitors inhabiting the perioperative space, leading to cramped working conditions and patient and staff injuries, are examples of the hazards accompanying the lag in OR redesign.

Ten percent of all patients treated in an acute setting are likely to experience a patient safety incident<sup>4</sup>. Patient safety incidents are thought to be the eighth most common cause of death in America<sup>5</sup>.

It is essential to stress that patient safety incidents rarely result from a single factor. Data from the Australian Incident Monitoring Study<sup>6</sup> places a vast emphasis on system-based and organisational factors as

causal factors for over 95% of patient safety incidents. Nevertheless, there is a strong tendency to direct or divert human blame in the reporting of such an incident.

The Design Council and UK Department of Health conducted a study to develop design ideas and recommendations with a view to improve patient safety<sup>7</sup>. The study found little evidence of an appreciation within the NHS of the implications of design on the provision of safe healthcare. It concluded that the latter could not be achieved in isolation of the system or the environment in which it belonged and called for a better understanding of healthcare systems and the needs of the professionals that work within it.

New technology often affects the way in which a job is conducted or perceived<sup>8</sup>. Innovations that may reduce the likelihood of patient harm have at times been abandoned because of design issues which impact on workflow and lead to general dissatisfaction<sup>9</sup>. Changes perceived to be unfavourable are often resisted and the combination of the technology with the environment and interpersonal influence together with previous negative results of technological implementation can lead to rejection of an alteration or addition which had the potential to improve patient safety<sup>10</sup>.

The importance of human factors has long been recognised in complex, stressed, scientific working environments. Human error has been held responsible for more than two thirds of accidents and incidents in such domains<sup>11,12,13</sup>. Large amounts of collected data (eg. via the Operating Room Management Attitudes Questionnaire) have shown problems in the OS to parallel those associated with aviation<sup>11</sup>. This makes aviation an excellent model from which to gain insight into improving safety within the OS, through advances in both technology design and the study of human factors. Yet in comparison with industries such as aviation, with respect to safety performance, healthcare remains at an early stage of development<sup>14</sup>.

The range of supporting equipment required for routine surgery has considerably broadened in the last two decades. It has been difficult to physically accommodate such technology due to services limitations and lack of structural support in conventional operating room (OR) constructions<sup>15</sup>. The

trolleys which serve as the cradle for such instruments result in overcrowding and create suboptimal working conditions. But increasing the size of the OR does not alter the amount of space immediately surrounding the operating table. In fact, too large an OR makes a wall-mounted screen harder to view and may in fact waste space which could be better utilised. Emphasis should be placed on organisation and layout.

### Minimally invasive surgery

The advent of laparoscopic surgery is a profound change which has been implemented with a rapid sequence of minor changes with little thought of the room in which it is conducted<sup>16</sup>. Despite the benefits to the patient, it is argued that the human factors of minimally invasive surgery have had a significant impact on the surgeon that subsequently influences outcome. There is a need to understand these human factors and adjust for them in the development and design of operating rooms in an evolutionary rather than revolutionary manner<sup>17</sup>.

Some disagree, saying the importance of physical design pales in comparison to the need for a radical overhaul in the concept of the operating room<sup>16</sup>. This school of thought views laparoscopic surgery as a transition technology leading to the widespread implementation of robotic and image-guided surgery, performed through computer assistance. It stresses the importance of enhancing the underlying information technology infrastructure, rather than the ergonomic placement of wires and booms.

With the adoption of minimal-access surgery, surgeons tend to be looking away from, rather than at, the surgical site. Screens need to be placed in an area allowing both the surgeon and their assistant an unobstructed view of the tasks. The angle at which screens are viewed have an impact not only on the comfort of the surgeon<sup>18</sup> but also surgical performance<sup>19,20</sup> and, ultimately, patient safety.

Minimally invasive techniques also present surgeons with a new host of postural challenges, influenced by screen position and instrument design, the use of foot pedals to control diathermy and the height of the table<sup>21</sup>. Eighty percent of respondents to a survey targeting laparoscopic and thoracoscopic surgeons experienced back, neck and/or shoulder discomfort, and almost

90% were unaware of the existence of ergonomic guidelines, despite 100% stating that ergonomics was important<sup>22</sup>.

The importance of medical devices is also not to be underestimated. A decade ago, the FDA estimated that the poor design of medical instruments may be responsible for half of the 1.3 million patient injuries occurring in US hospitals each year<sup>23</sup>. The purchase or replacement of an item of equipment must be considered in view of the encapsulating OR design. A certain degree of sensible standardisation for the modern OR is necessary, both within brands, by eliminating the possibility of incorrect connection and producing better user-friendly manuals – and, across brands, reducing errors associated with mistaken familiarity.

Fundamental to the design of any component of the OR<sup>24</sup> is ease of maintenance of a sterile environment. Designing to aid the process and increase the effectiveness of sterilisation may enhance patient safety beyond the scope of medical error. Basic structural modifications and intelligent devices operated through remote and voice control may ease and improve sterility.

The OR is a highly specialised piece of a large, complex process. Interrelationships between people, structure and process must be fully considered. The functioning of the OS is largely dependent upon the rapid exchange of information, services, resources and staff. Disruptions lead to uncertainty, wasted time and increased pressure. This may push staff to work 'quickly' rather than 'safely'<sup>25</sup>. However, developments in telecommunication will allow intraoperative worldwide interaction with colleagues and experts, increasing teaching possibilities and procedural safety<sup>26</sup>. In addition, the use of common technology such as wireless networks and mobile phones may be an efficient manner by which to improve patient safety<sup>27</sup>.

The OR is a high-pressure dynamic structure whose design has lagged behind the technological innovations in surgery over the last two decades. This has resulted in medical errors, which could be markedly diminished by intelligent OR design. Understanding the interplay between environment, technology and the human factors which govern surgery is

essential to the modern OR. The need to improve current outcomes, the desire to incorporate new practices and innovation are all of equal importance.

## NRLS data analysis

Seven hundred patient safety incidents reports were selected from the NRLS database. These comprised a sample of 20 patient safety incidents from each of the 35 subcategories of reported patient safety incidents in the operating theatre, anaesthetic room and recovery room. Patient safety incident reports were selected from the following categories:

- access, admission, transfer, discharge (four subcategories examined);
- clinical assessment (three subcategories examined);
- consent, communication, confidentiality (two subcategories examined);
- infection control (two subcategories examined);
- infrastructure (staffing, facilities, environment) (11 subcategories examined);
- medical devices/equipment (five subcategories examined); and
- patient accident (eight subcategories examined).

A framework was then developed using the findings of the literature review and the NRLS incident reports. Main themes relating to the operating suite were extracted and further categorised to form the framework. It is envisaged that in the future, the framework will be able to aid the categorisation of patient safety incidents in the operating suite.

The framework consisted of five main categories:

1. structure;
2. procedure;
3. movement;
4. communication failure; and
5. impact on the surgeon.

Each of the main categories were further divided into different elements.

## NHSLA data

The NHSLA database contained almost 25,000 cases where the 'location' of the patient safety incident was noted. Of these, problems associated with the operating room environment accounted for 10,122 (40.5%), the anaesthetic room 115 (0.5%) and the recovery room 47 (0.19%). While

**Table 1: Recorded causes of NHS litigation claims**

Cause	n	%
Intraoperative problems	4711	12.44
Surgical foreign bodies left <i>in situ</i>	417	1.10
Operate on wrong patient/body part	303	0.80
Application of excessive force	275	0.73
Equipment malfunction	193	0.51
Lack of facilities/equipment	162	0.43
Intubation problems	118	0.31
Diathermy burns/reaction to preparations	118	0.31
Infusion problems	97	0.26
Inadequate monitoring in recovery room	55	0.15
Total	6449	17.0

it is likely that the location of the origin of any particular patient safety incident may be hard to specify, it remains evident that the operating room itself should be the focus of greatest enquiry regarding design issues.

There were 37,874 cases in the database where the 'cause' of the patient safety incident was noted. Of these, 6,449 (17%) cases were related to the operating suite. A breakdown of these causes is shown in Table 1.

Further analysis was undertaken to understand the nature of these problems. A subset of 20 cases from each of the cause listed was randomly selected for the analysis, although limited to patient safety incidents that occurred in the operating theatre or recovery room. The findings of that analysis are presented here.

## Operating theatre

**Intraoperative problems:** The 20 cases sampled did not contain sufficient detailed information to enable a thorough analysis of design implications. This is perhaps unsurprising given the nature of litigation claims. Many of the failures recorded related to failed components (eg. screws) or incorrect placement of clips and screws. The extent to which theatre design may be implicated in these failures cannot be established. These issues were discussed in the focus groups.

**Surgical foreign bodies left *in situ*:** The cases selected for analysis (n=20) included a high proportion where swabs had been left *in situ* (n=8), although a wide variety of

other objects were also cited. These issues require a separate analysis to examine how other aspects of theatre design may increase or decrease the likelihood of these events occurring (eg. lighting, team and equipment positioning), as well as further research into how the design of the objects might be improved in the context of the whole operating room system.

**Wrong-site surgery:** Errors were of limited use in the context of design. The reports cited issues such as note transcription, misplaced clips and left-right confusion. These were explored further in the focus groups with clinicians.

**Application of excessive force:** The most notable feature here was the high frequency of issues relating to orthodontistry.

**Equipment malfunction:** This category offers significant scope for further investigation. Examples of problems identified included faulty operation of the operating table as knee-knocked adjustment lever, the need to reboot imaging equipment, detachment of the insulating beak of a resectoscope and faulty leads leading to burns. It is recommended that a full analysis of these data be undertaken.

**Lack of facilities/equipment:** The most striking aspect of this analysis was the lack of checking regarding the availability of appropriate equipment, tools or prosthetics prior to the patient being anaesthetised. Further consideration of how and when these failures occur is required with a larger data set and through focus groups.

**Intubation problems:** In one instance the

ventilator tube had become caught under the bed head. Frequent damage to teeth was also recorded as a direct result of intubation.

**Infusion problems:** Only six cases were identified in this category and little direct relevance to the systems design of the operating theatre could be deduced.

**Diathermy burns/reaction to preparation:** These were a significant cause for concern and should be explored further in the healthcare professionals focus group as it is recognised that equipment layout is likely to play a role in determining the likelihood of burns occurring.

### Recovery room

The number of cases in each category was

low, with none reaching the sample size of 20.

**Intraoperative problems:** None of the reports (n=4) contained information helpful for further understanding of the design issues in recovery rooms.

**Lack of monitoring in recovery room:** Nine reports were identified and a theme relating to patients falling was identified, ie. patients may fall from their beds following an operation. Examples of design ideas that could be considered include better design of beds, monitoring facilities and ensuring that patients have the ability to attract attention when in need.

**Application of excessive force:** There was only one report and it did not contain information that contributed to

further understanding the design issues in recovery rooms.

**Intubation problems:** None of the reports (n=3) contained information helpful to further understand the design issues in recovery rooms.

In summary, the data currently held in the litigation database provided important insights into the role that the operating room and associated infrastructure might play in the generation of the reported patient safety incidents. However, the limited nature of the reports and the lack of an appropriate classification system make interpretation difficult. Certainly, the incidence of objects left *in situ* needs further research to understand the role that the physical factors or procedural and communication factors might play. In addition, preparation prior to surgery is also a topic requiring in-depth examination, as failure to identify defective or inappropriate equipment has led to incidents. Finally, the physical layout and design of equipment in theatres has been identified as a priority for further investigation, most notably with respect to burns associated with diathermy.

### Surgeon's journey FMEA analysis

A large number (n=72) of failure modes was identified by the surgeons when undertaking the FMEA. Additional failure modes were identified by others during the focus groups and were also highlighted by architects, designers and equipment providers. And many of these need to be addressed now – their identification was an unintended by-product of the research. This is because the research was originally envisaged to be a means of identifying where future design requirements would be needed, not where a need currently exists.

Table 2 has been constructed to provide a simplified overview of the top priorities requiring attention as a result of this research. This table shows only those failure modes that had a high probability rating at least several times a week.

The model has been used to guide the mapping of those issues that emerged in the focus groups. It enables areas of disagreement, congruence and omission to be identified. We feel this could be extended to form an audit of existing guidance and become the basis for the structure of future audit tools.

**Table 2: Surgeon's journey FMEA analysis**

Task	Sub-task	Failure mode
Check theatre list		Operation cancelled
		Overbooked
		Inaccurate information
		Untimely distribution of information
Visit patient and/or speak to relatives	Check patient fit for operation	Patient does not attend
		Patient delayed
	Check blood results	Results not available
	Check patient's notes	Not done properly
Confirm patient ready for operation		Letter unavailable
		ICU beds not available
		ICU beds delayed
Operate on patient	Follow routine steps for the specific operation	Equipment failure
		Screen
		Diathermy does not heat up, connection faulty
		Physical tiredness, in same position for long periods of time causing pain/numbness
		Physical problems – ache in the back, arms, shoulders, neck, joints, legs (clots)

For example, design that aims to minimise the increasing problem of hospital-acquired infection must start by considering the behaviours of staff, patients and relatives, especially during stressful periods. This study has shown that, currently, well-intentioned design may be breached through the behavioural requirements of individuals and teams. These, coupled with the physical limitations of equipment and facilities, can greatly enhance the likelihood of noncompliance with well-intended guidelines or protocols. Use of the Moray model can quickly help identify the issues that should be considered surrounding any patient safety problem. Importantly, the model also shows what factors may be important to sustain the wellbeing of the healthcare professional working within these constraints.

## Prospective hazard analysis

**Preliminary risk review:** The purpose of this review was to identify poorly managed risks, from when the decision is made to operate on a patient to when the patient leaves the operating department. A high-level process map of the surgeon's journey was constructed. Four hazards were identified from the process map using a systematic approach. There was general consensus not to focus on the process step of operating on the patient as it was accepted that there were many hazards at this stage of the process and time constraints did not allow a full analysis of the hazards. Those hazards that were identified hazards were further assessed for risk. The hazard related to the use of the WHO checklist, 'Harm to patient', was identified to be of high risk. Actions proposed to reduce this risk included better training, encouraging correct signing practice by surgeons and checking that the signature is present.

Another step that had not been considered in the preliminary risk review – 'write operative notes' – was identified for further analysis.

**Comprehensive risk assessment:** The purpose of this part of the risk assessment was to consider the process of filling out an operative note. Downstream effects of the process were included in the scope but not the downstream details. The structured what-if (SWIFT) method was identified to be a suitable method for risk assessment.

Each process step was further examined to identify what could go wrong. Current defences that exist within the system to reduce these hazards were identified.

Participants proposed several action points to reduce the risk of problems associated with the writing of operative notes. These included:

- Use the WHO checklist to suggest adding more prompts to the operative record.
- Encourage theatre team participation.
- Create deliberate blanks on the form to show that they were not inadvertently left blank.
- Create space for specialty-specific information.
- Stock each specialty theatre with its own forms.

The outcomes of this PHA exercise illustrate the importance of involving end users in risk assessment, as well as providing real insights into sources of potential risks to patient safety. The time and resources necessary for such assessments mean that only limited, carefully selected and delimited issues can be analysed in this way. Nevertheless, the potential for developing and utilising this approach in future work on the physical design of the OS is very great.

## Results integration

A large amount of data was collected in this study, including both quantitative and qualitative data. The aim was to identify salient issues relating to safety in the operating suite that had emerged from the dataset. There were differences in the aims of the studies, the sample size, the methods used and what the data afforded. For example, some of the focus groups and the risk assessment sessions were constrained by the small number of participants. The data was also dependent on the participants' range of experiences. Table 3 provides a summary of the datasets requiring integration.

Given the nature of the data obtained in this study, a narrative review approach was considered to be most appropriate. This approach does not aim to generate new insights or knowledge but rather serves to summarise and interpret available data, usually using a form of thematic analysis.

Each dataset was analysed in sequence, starting with the reports of the four focus groups, followed by the NRLS incident reports, NHS litigation data and, finally, the

risk assessments. As the narrative review aimed to summarise and interpret available data, we did not think that the order in which the data was analysed would affect the findings of the analysis.

A thematic analysis was conducted for each of the focus group reports with clinicians, patients and carers, maintenance staff, and architects and engineers. A tabular summary of the findings was developed.

The analysis of a sample of incident reports to the NRLS was reported as the number of incidences relating to the categories in the framework developed as part of the study. These categories were added to the table developed in the analysis of focus groups.

## Results

Themes were categorised as issues before entering the operating suite, within the operating suite including intraoperative problems, beyond the operating suite, management issues and general comments and suggestions. The majority of themes related to issues within the operating suite. The following are some of the key themes.

**Anaesthetic room:** The anaesthetic room is currently situated next to the operating theatre, presenting a conflict between efficiency, patient experience and patient safety. It is more efficient to have a separate anaesthetic room so that patients can be anaesthetised before the completion of the surgical procedure on the previous patient. However, in doing so, there is a greater risk to the patient as some wires or monitors may have to be removed for a short period of time while transferring the patient to the operating table in the operating theatre. There were also complaints about the lack of space in the anaesthetic room and that it was not designed to be sterile. A suggestion was given for a dedicated scrubs sink and sensor taps. Patients in the focus group reported a very positive experience in the anaesthetic room describing it as calm and clean, and thought staff were very reassuring, friendly and inspired confidence.

**Maintenance access:** Access to theatres was reported to be poor both on weekdays and weekends, when maintenance workers are required to perform urgent and routine maintenance work. This means that staff are not able to complete required repairs.

**Doors:** There were many complaints

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**Table 3: Summary of data collected**

	<b>Aim(s)</b>	<b>Method</b>	<b>Nature of data</b>
Focus groups (n=4)	Establish how the design of the physical environment influences patient safety during the pre-, peri- and postoperative process.	Qualitative elicitation of experiences around issues affecting safety in the operating suite. Participants were encouraged to talk freely around the issues rather than respond to a series of preset closed questions.	Narrative descriptions of a thematic analysis based on the questions asked in the workshops.
NRLS patient safety incident reports	Develop a framework to categorise critical incidents in theatres. Analyse a sample of incidents using the developed framework.	b. The framework was developed based on a literature search and the nature of reported patient safety incidents to the NRLS. 700 incidents (20 random incident reports from each of the 35 subcategories of reported patient safety incidents in the OR, anaesthetic room and recovery room) were analysed and categorised using the developed framework.	A framework to categorise critical patient safety incidents. Categorisation of 700 patient safety incidents using the developed framework.
NHS litigation data <sup>4</sup>	Identify causes and locations of problems in the operating suite based on both open and close negligence claims.	a. A request was made to the NPSA to provide the relevant information. A further 20 cases from each of the causes identified, where the location was given as the OT or recovery room, were requested for further analysis.	Total number and percent of locations where problems were reported to have occurred, and their causes. A brief narrative description of the analysis.
Risk assessment using failure modes and effects analysis (FMEA)	a. A risk assessment of the surgeon's journey through the operating suite.	Surgeon participants were guided by experienced facilitators through an established method of conducting FMEA.	A process map of the surgeon's journey through the operating suite. A list of potential failure modes associated with the journey at each point in the process. A severity score of each of the potential failure mode identified

regarding doors in the operating theatre. They are heavy, do not stay open, do not open fully, don't seal or do not have a seal.

**Physical space:** Rapid changes in the way that surgery and surgical education are delivered have contributed to the current poor use of space. There is no systematic or long-term approach to the design of operating theatres. The consequences are problems with safety, such as the risk of infection, efficiency and physical health problems of theatre staff. Suggestions given include the use of wireless equipment, providing a separate room for those who are not directly involved in surgery and tailor-made theatres.

**Lighting:** Issues with lighting were raised in four of the seven sets of data. These included lights being heavy, difficult to manoeuvre, issues with mobile lighting, poor design of switches, brightness, maintenance problems, access to maintain lights and the need for natural light to help both the recovery of patients and improve the wellbeing of staff and patients.

**Noise:** Sources of noise in the theatre include background noise from the

theatre equipment, building work around the theatres and general chatter that is irrelevant to the operation. These noises disturb the surgeons and can also be tiring after long periods of time. There were also complaints about noise beyond the operating suite; patients in intensive care units and general wards commented that these wards were noisy all day long and the snoring habits of other patients affected their ability to sleep.

**Temperature and ventilation:** Issues with temperature and ventilation were raised in both the focus groups and the NHS litigation data. Focus group discussions surrounded the difficulty of determining the optimal temperature in theatres. In theatres that are cold, theatre staff may wear sterile gowns for warmth. But this can be misleading as they are not sterile. If the theatre is too hot, staff can feel exhausted. A conflict exists between the comfort of the patient and the surgeon.

**Utilities:** The issue of electrical system overload was raised by maintenance staff. This problem is acute in old buildings. Cost constraints were reported to be a major

contributing factor to changing the current system. However, maintenance staff also reported difficulties in finding spare parts for very old equipment.

**Cleanliness and infection control:** There were comments on the lack of strict guidelines or discipline on the sterility of surgical instruments and where not to wear scrubs. The problem with the wearing of scrubs largely stemmed from poor design of the theatre complex. There was also frustration surrounding cleaning roles and responsibilities.

**Communication:** There were comments on the lack of communication and feedback from other theatre staff. Other issues included not knowing how to use equipment, not communicating clearly or performing wrong actions such as giving the wrong equipment.

**Physical and cognitive problems:** Physical tiredness and problems such as aching limbs, numbness and pain were reported by clinicians. Issues with lighting, noise, temperature, ventilation and the physical space of theatres were reported to be contributing factors to physical

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tiredness. Cognitive fatigue reduces the ability of clinicians to think clearly during operations.

**Equipment:** There were many issues associated with equipment and its use including equipment failure and equipment not being available. Comments were also made about the variability in the way that equipment is used by different surgeons, which can lead to mistakes. Checking systems are required to ensure that the necessary equipment is available prior to the patient being anaesthetised.

**Privacy:** There is a need for a private place to speak to relatives following an operation. The lack of privacy was also raised by patients. This was particularly problematic when they were in the admissions lounge, hospital lifts and wards, dressed in a hospital gown.

**General layout:** Lifts presented a bottleneck in the operating process. It was suggested that the admission lounge be located nearer to theatres to reduce delays. A hub-and-spoke approach to designing the operating suite was also suggested.

**Recovery room:** Patients were not forewarned of the possibility of hallucinations, related to post-anaesthetic recovery. They also complained of a rigid system of communicating with nurses, where they were required to press a bell

and there was no other option. Patients were also reported to have fallen from beds.

## Conclusion

This exploratory research has shown the very real benefits of academic institutions working closely with staff at NHS institutions. It also demonstrates the importance of working not just with patients but also their relatives or other carers.

However the researchers feel that data taken from one small sample should not be used as indicative of all theatre suites, although the experiences of those who have contributed to this study have suggested that similar concerns occur within other operating suites within the NHS.

The research has utilised contemporary ergonomics/human factors thinking. As such, a systems model (see Figure 1) may prove a useful starting point for developing a better understanding of the relationship between physical design and behaviour in modern operating suites (OS).

The outcomes of this research are perhaps best considered as the start of the work required. Our methods and results are not yet ready to be considered a finished product nor are we yet able to deliver solutions to the problems that are emerging. Nevertheless we are in a position

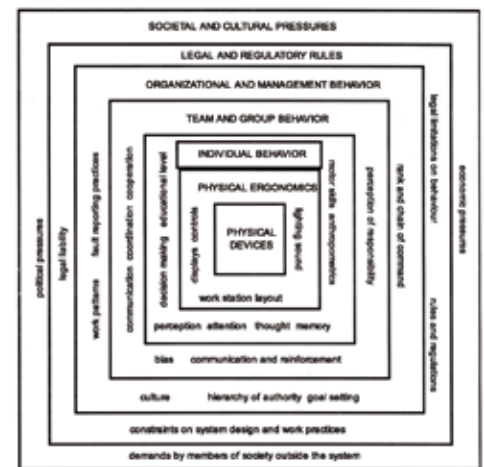


Figure 1: A systems model of ergonomics<sup>28</sup>

to develop this understanding of the design requirements and feel we have developed a pragmatic methodology for capturing issues.

## Authors

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The Robens Institute is a registered consultancy of the Institute of Ergonomics and Human Factors.

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# Room Handedness: Patient room layout in acute inpatient care

This US study asks whether standardised same-handed patient rooms contribute any more to process and workflow standardisation than standardised mirror-image rooms in acute medical-surgical settings

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Since the publication of the Institute of Medicine and Agency for Healthcare Research and Quality reports highlighting unsafe conditions in American hospital care<sup>1-5</sup>, the healthcare design industry has responded with a number of design concepts that are hypothesised to contribute to safety and efficiency. One of the design concepts proposed is the 'same-handed patient room'<sup>6-8</sup>, with an increasing number of hospitals adopting the concept at all levels of patient acuity.

Despite the safety assertions<sup>6,8,9</sup>, the balance between perceived premium in capital expenditure and perceived enhancement in efficiency and safety continues to be the focus of debate. Empirical data on the true premium in capital expenditure is not available. However, anecdotal estimates on additional costs per room range between US\$2,500 and US\$5,000 (see Schneider, for instance<sup>9</sup>). This premium is attributed to, among others, the additional medical gas lines and bathroom plumbing chases and lines which in the case of mirror-image configurations are shared by two rooms. Figures 1 and 2 show typical configurations of mirror-image and same-handed rooms.

## Human factors

The key question here is not about standardisation. While empirical studies on the impact of physical environment standardisation in inpatient care settings are not available, there is considerable evidence in the aviation industry supporting standardisation. In aviation, human factors have been shown to be a major cause of errors<sup>10,11</sup> and are associated with 80%

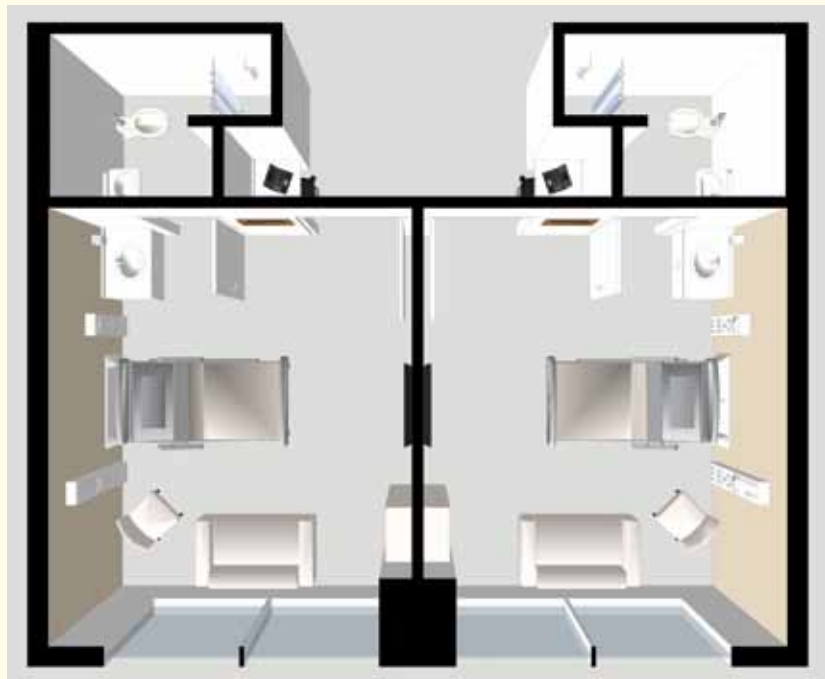


Figure 1: An example of the standardised mirror-image patient room configuration

of fatal accidents<sup>12</sup>. The standardisation of processes and workflow through standardisation of flight deck controls and interfaces has been shown to improve safe performance, and has been examined and codified in standards<sup>13-15</sup>. Among those are the standardisation of equipment, system layout, displays and colour philosophy<sup>16</sup>. In essence, the standardised physical environment supports the standardisation of processes and workflow, which in turn improves safety and efficiency.

Physical environment standardisation is defined in this study as the process of configuring the attributes of a physical entity in relation to one or more axes following one or more universal rules, to maintain certain type of uniformity across multiple instances of the entity. In

this framework, standardisation could be attempted at multiple scales or levels – from headwalls and the interiors of supply cabinets to the caregiver zone, the patient room and the entire unit. Both the same-handed configuration and the mirror-image configuration can be standardised, and constitute two variants of standardised patient rooms.

## The physical environment

A standardised same-handed room is defined in this study as the result of a type of room standardisation where attributes of the physical elements (chiefly location, assuming the design of individual elements – headwall, supply cabinet and so forth – is already standardised at lower scales) in the patient room are standardised in relation

to three axial plains – the midsagittal, the coronal, and the transverse planes of a standard patient lying in bed (Figure 3).

A standardised mirror-image room is defined in this study as the result of a type of room standardisation where attributes of the physical elements (chiefly location, assuming the design of individual elements is already standardised at lower scales) in the patient room are standardised in relation to two axial planes (Figure 4). One is the coronal plane of a standard patient lying in bed. All vertical positioning of elements in relation to this axial plane is maintained as a constant across all instances of the room. The second is the central line plane of the common wall between one set of two patient rooms. The horizontal positioning of the physical entities in the two rooms is symmetrical around this central line plane.

Thus the fundamental question is not whether physical environment standardisation promotes safety and efficiency, since that notion is intuitively appreciated and used in healthcare design. Rather, the fundamental issue is the extent to which the standardised same-handed configuration contributes more to process and workflow standardisation as compared to the traditional standardised mirror-image

configuration. Currently, stakeholders base their assessments on subjective perception. There is little empirical evidence to provide an objective assessment of the alternative concepts. The aim of this study was to empirically examine the two variants of patient room standardisation from the viewpoint of process and workflow standardisation.

**Key questions**

Physical design standardisation of the patient room environment can provide two kinds of support. It can support the standardised physical execution (behavioural support) of clinical tasks – the physical position, actions and biomechanics involved in a care task – by optimising the configuration of physical elements. Both variants of the standardised patient room can be designed to support standardised physical execution of clinical tasks. The fundamental difference between the mirror-image and same-handed variant is in the approach and positioning of caregivers *vis-à-vis* the patient. In the same-handed configuration (specifically right-handed, which is most commonly promoted in literature<sup>9</sup>), the standardised approach is from the patient's right and the caregiver location is standardised on the patient's right.

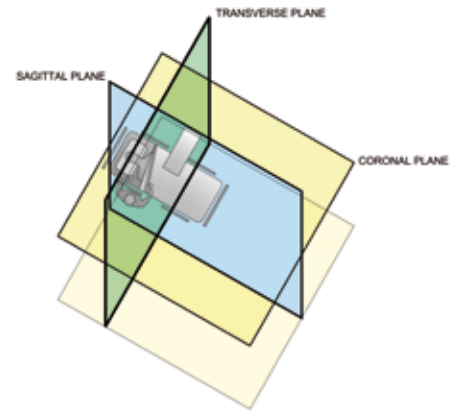


Figure 3: The reference planes used for creating standardised same-handed rooms

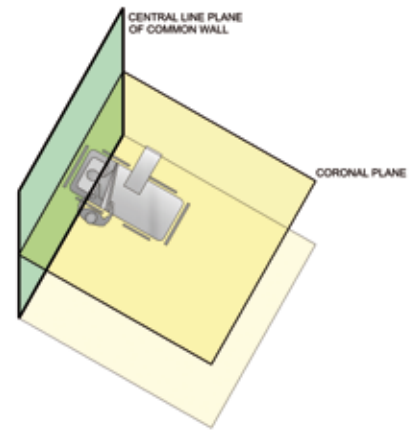


Figure 4: The reference planes used for creating standardised mirror-image rooms

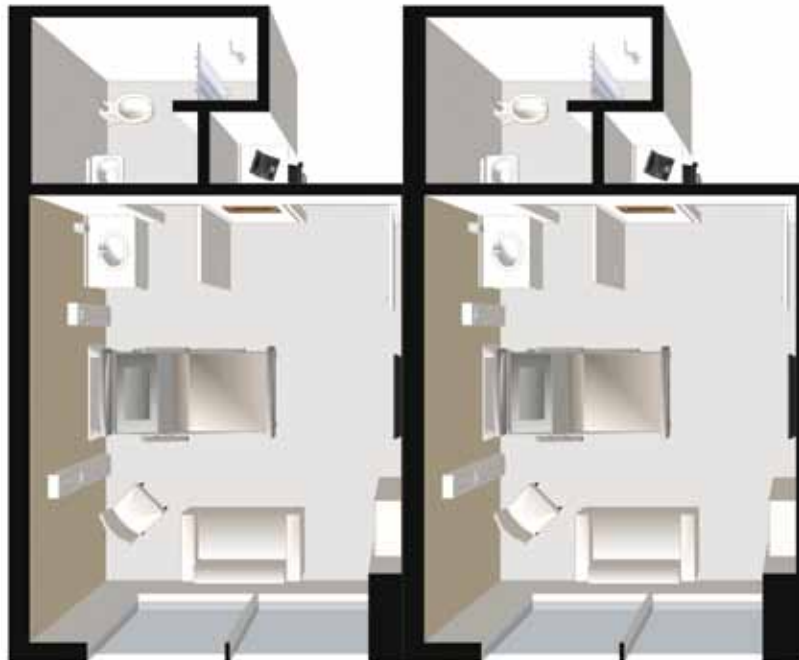


Figure 2: An example of the standardised same-handed patient room configuration

While standardised caregiver approach and location can help better optimisation of the physical entities around the caregiver, the concept is entirely dependent on whether caregiver position can be standardised on the right of the patient. The first question, therefore, is whether the caregiver position can be force-functioned.

The second type of support is cognitive. Standardisation improves familiarity with the physical environment of care, and thus, predictability. During emergency and life-threatening situations, familiarity reduces search-and-locate actions and errors. The second question, therefore, is whether the same-handed configuration provides better familiarity with the care environment compared to the mirror-image configuration.

The study focused on the following two questions, outlined above:

- Can the caregiver location be successfully force-functioned to be always on the right of the patient?
- What is the essence of familiarity in the patient care environment?

## Setting and subjects

The study focused on the acute medical-surgical setting. Since same-handed environments are promoted for all levels of acuity, the medical-surgical setting constituted a logical starting point. Further, the medical-surgical setting represents the predominant care environment in an acute care hospital, both in terms of physical design as well as care procedures.



Figure 5: View of the team training room in which the study was conducted

An experimental setting was used to conduct the study. The team training room (Figure 5) in a simulation training laboratory of a nursing school was used for setting up and manipulating the physical configurations. It was equipped with an identical array of redundant medical gases, provision for suction and power outlets on both sides of a Hill-Rom bed. The adjoining control room was linked through a one-way mirror to unobtrusively observe, record and monitor activities in the team training room. Video and audio feed from the ceiling-mounted cameras were received and processed

by custom-made software installed on computers inside the control room.

Twenty registered nurses (RNs) were recruited to perform simulated care. Of the 20, ten were left-handed and ten were right-handed. The nurses fairly represented attributes of typical RNs working in US hospitals. The age of the nurses ranged between 21 and 62 years, with a median age of 53 years. The median age of 53 years is proximal to the mean age of 46.8 years (as of March 2004) of American nurses<sup>17</sup>. Of the 20 subjects, one had a Bachelor of Science in Nursing (BSN) degree with the remaining having at least a master's degree in nursing. Work experience as a nurse ranged from less than one year to more than 30 years, with a median experience of 25 years.

## The protocol

Nine different physical configurations of the caregiver zone were created using flexible rope partitions (Figure 5). The zone included the patient bed, the headwall medical utilities and five feet of space around the remaining three sides of the bed. The physical configurations ranged from an open scenario (no forced approach direction) to the approach being forced from the left and right of the patient. In addition to the manipulation of approach, the location of an IV pole was also manipulated. That ranged

Table 1: Key attributes of the nine configurations included in the study

Scenario number	Direction of approach	IV location
Scenario 1 (S1)	Open	No IV
Scenario 2 (S2)	Open	IV on patient's left
Scenario 3 (S3)	Open	IV on patient's right
Scenario 4 (S4)	Approach from patient's left	No IV
Scenario 5 (S5)	Approach from patient's right	No IV
Scenario 6 (S6)	Approach from patient's left	IV on patient's left
Scenario 7 (S7)	Approach from patient's left	IV on patient's right
Scenario 8 (S8)	Approach from patient's right	IV on patient's left
Scenario 9 (S9)	Approach from patient's right	IV on patient's right

from no IV pole to placement of the IV pole on the patient's left and right sides. Attributes of the nine settings are outlined in Table 1.

Nurses were instructed to conduct three frequently conducted tasks in each of the nine physical configurations. The tasks involved checking vital signs using a Dynamap for blood pressure measurement, suctioning the patient using a hand-held suctioning kit, and helping the patient sit up, dangle their legs off the bed and return to semi-Fowler position. These tasks are typical tasks conducted by nurses and can be performed entirely within the caregiver zone. Furthermore, the tasks represented the need of a dominant hand in conducting suctioning and sitting up the patient. A patient actor served as the patient in all simulated care scenarios. The patient attributes were controlled; no patient variable was introduced in the study.

Each simulation run was video-recorded. The three tasks and nine physical configurations totalled 27 simulation runs for each nurse. With 20 nurses in the sample, a total of 540 simulation runs was conducted for the study. The sequence of tasks and configurations were randomised. Irrespective of the task, the nurses started from a makeshift nurse station located on the footwall of the room to provide an unbiased (neutral-handed) starting point. All aspects of the environment other than the ones manipulated were standardised at the beginning of each simulation run, namely:

- height of patient bed set at minimum;
- bed angle set at 30 degrees;
- bed rails in the up position;
- over-bed table centered at the foot of the bed;
- suction canister on platform on both sides of the bed;
- Dynamap at nurse station; and
- suctioning kit at nurse station.

Tasks were assigned to the nurses using standardised instructions that were repeated uniformly before each scenario. A structured interview was conducted with each nurse at the end of the 27 simulations to obtain triangulation data to supplement the observational data. The interviews were also video-recorded for separate content analyses.

The video segments were provided to a team of experts in nursing and kinesiology,

**Table 2: Operational definitions of posture terms**

Posture type	Operational definition
Stretch	Perform tasks outside a 30-degree radius from one's neutral position (erect position) without bending, and applying force
Bend	Moving the spine (lower back) away from the erect position and applying force. Includes all directions
Unstable	Bending or stretching while standing on one leg, and applying force
Lift	Lifting patient from a height outside the range of one's waist to shoulder area
Twist	Twisting any part of the body or the entire body to accomplish a task, with or without applying force
Reposition	Changing one's physical location (distinctly) once a task is in progress, to achieve better body posture or control
Note: Definitions are based on (with modifications) descriptions provided by Feletto and Graze <sup>18</sup> . In the definitions, 'applying force' means either lifting an object or person or pushing or pulling an object or person, or both	

who separately coded the segments to document nursing behaviour and potentially stressful or harmful actions. Nursing behaviour comprised a predetermined list including direction of approach, any hesitation in approach, over-bed table use, bed rail adjustment, bed height adjustment and bed angle adjustment. In addition, the nurses were instructed to count the number of times the following postures were observed: stretch, bend, unstable, lift, twist and reposition. Operational definitions of the postures are included in Table 2. All data coding and statistical analyses were conducted by external parties to avoid bias.

**Force-function**

The first question of interest was whether the caregiver position can be force-functioned to be consistently on the right side of the patient. A series of logistic and Poisson regressions were conducted on the nurse-coded data to examine differences between left-handed and right-handed nurses. In addition, an analysis was conducted to identify issues influencing the nurses' decision to position *vis-à-vis* the patient.

Data analysis revealed two major phenomena. First, left-handed and right-

handed nurses behaviour was significantly different on several dimensions, although within each group there was uniformity of behaviour. Table 3 provides a summary of the statistical significance from a regression analysis to examine differences between left-handed and right-handed nurses. A significant estimate indicates a difference in the exhibited behaviour between the left-handed and right-handed subjects. A major area of difference was in approach. The model examined was (where  $\beta$  represents the predicted coefficient, sets 1-8 are dummy variables representing the nine physical configurations, and the variable right-handed representing handedness of the subject): behaviour =  $\beta_0 + \beta_1 \text{ set1} + \beta_2 \text{ set2} + \beta_3 \text{ set3} + \beta_4 \text{ set4} + \beta_5 \text{ set5} + \beta_6 \text{ set6} + \beta_7 \text{ set7} + \beta_8 \text{ set8} + \beta_9 \text{ right-handed}$ .

The second key finding was that the door location (approach direction) was not a factor that consistently determined the nurse's final positioning *vis-à-vis* the patient. Other factors that influenced their decision regarding positioning included the location of the IV, their preferred side (preferred side was not consistent with their handedness), their dominant hand (for precision tasks such as suction as well

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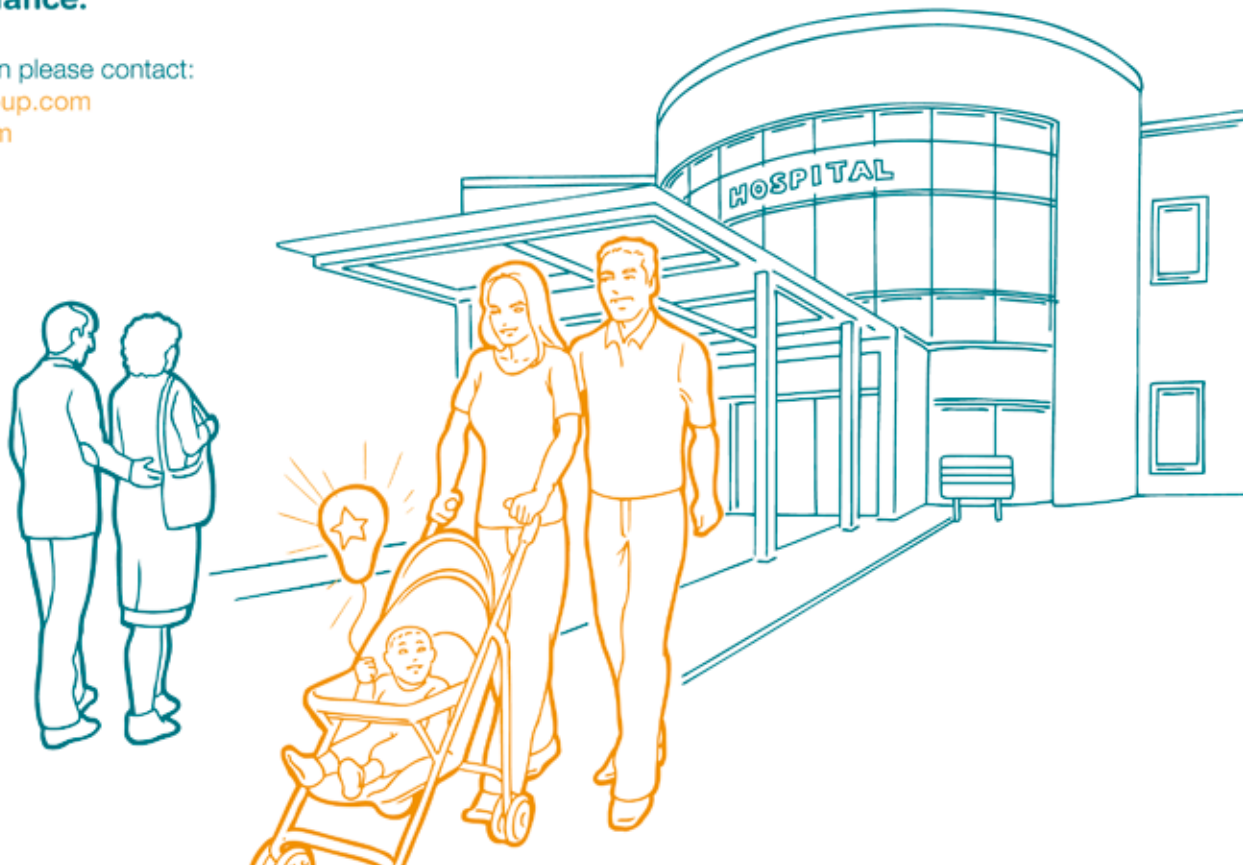


Table 3: Summary of statistical significance of the variable 'right-handed' in the models tested to identify differences between the behaviours of left-handed and right-handed subjects

	Approach direction	Hesitation	Over-bed table use	Bed rail adjustment	Bed height adjustment	Bed angle adjustment	Stretch	Bend	Unstable	Lift	Twist	Reposition
Vitals	0.07+	0.85		0.05+	0.41	0.83	0.81	0.84	0.57		0.49	0.0***
Suctioning	0.0***	0.70	0.00**	0.1+	0.28	0.76	0.00**	0.58	0.25		0.14	0.18
Sitting up	0.04*	0.87		0.83	0.01*	0.96	0.96	0.02*	0.40	0.60	0.01*	0.77

\*\*\* (significant at .001), \*\* (significant at 0.01), \* (significant at 0.05), + (significant at 0.1)  
**Note:** Blank cells imply zero observations of the behaviour

as sitting the patient up) and the walking distance involved. Figure 6 illustrates this point, using the case of suctioning task. As can be noticed, the right-handed nurses were not always on the right of the patient, nor were the left-handed nurses always on the left. Moreover, the pattern of switching between the two sides of the patient, across the nine configurations, was very similar for both categories of nurses. Each switch was influenced by one or more factors mentioned above. The same phenomenon was observed for the other two tasks. This finding has significant implications in the context of force functioning the caregiver location only on the right side of the patient. Transcripts of the interviews supported the observation data regarding factors influencing nurses' positioning *vis-à-vis* the patient.

**Nurse positioning**

This raises a pertinent question. As noted previously, the standardised location of the caregiver on the patient's right is the key difference between the standardised same-

handed and standardised mirror-image rooms in terms of behavioural support to workflow and process standardisation. In that context, considering the inconsistent and non-standardised positioning of caregivers *vis-à-vis* the patient, the additional contribution of the same-handed configuration over the standardised mirror-image configuration is not evident.

One could assert that the provision of a same-handed environment will result in the consistent right-side positioning of caregivers. However, considering the host of external factors influencing nurses' decisions regarding positioning, it could be challenging. It implies that the contribution of room handedness to process and workflow standardisation is conditional on the extent to which the physical execution aspect of processes and workflow can be standardised. This is not a design question. It is a process question that is yet to be examined in the medical discipline. On the other hand, if force-functioning the caregiver position is not an objective behind room handedness, then designing handed

configurations has little value in the domain of process and workflow standardisation.

**Care environment familiarity**

The second question of interest was whether the standardised same-handed configuration offers better familiarity with the patient care environment compared to the standardised mirror-image configuration. The study scope and methodology precluded any objective examination of cognitive load. The focus of the examination was on understanding what the nurses seek in terms of familiarity with the patient care environment.

The nurses were asked to order the physical configurations in terms of perceived supportiveness to their tasks. It is noteworthy that the set of configurations that were identified most frequently by the nurses were neither same-handed nor mirrored, but were the open configurations (70% of the subjects) where approach was not forced. The reason for the higher rated supportiveness of the open configuration, as self-reported by the subjects, was that it provided them with an immediate global view upon entry of the entire patient care environment – both sides of the patient. That global view provided them with an instant familiarisation with the patient care environment.

From the perspective of cognitive support, the concept of immediate global view upon entry warrants special attention. That is because variability originating from the patient (wound site, type of injury, stage of recovery, number and type of equipment and their locations, and so forth) could contribute

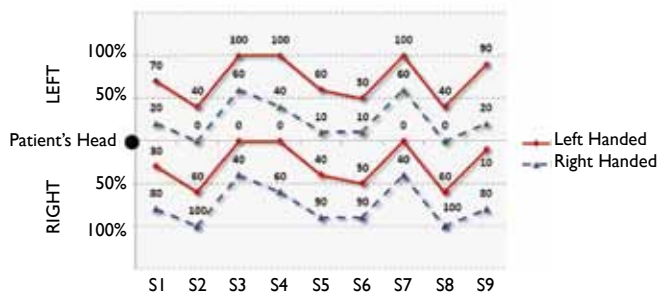


Figure 6: Position of left-handed and right-handed nurses *vis-à-vis* the patient during suctioning task, across the nine configurations (S1-S9)

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a considerable degree of complexity to the physical environment around patient care. Even in highly standardised physical environments such complexities could pose considerable cognitive challenges to caregivers. The advantages offered by the global view is directly linked to the notion of familiarity with the care environment. Since the physical configurations and tasks were randomly sequenced, the global view offered an instantaneous advantage in terms of improved familiarity to the nurses.

### Adopting handed configurations

So, do standardised same-handed patient rooms contribute any more to process and workflow standardisation than standardised mirror-image rooms in acute medical-surgical settings?

While the issue of cost premium is important, a more vital issue is of comparative effectiveness. Which configuration provides better support to safe and efficient care? From a behavioural support perspective, study data suggests that in acute medical-surgical settings the notion of a consistent caregiver position *vis-à-vis* the patient is nonexistent. Thus, configuring the physical environment to provide support to a practice of consistent caregiver location on the right of the patient may not be meaningful in the current operational context.

Comparatively, the standardised same-handed configuration may not offer any more than the traditional standardised

mirror-image configuration. Several associated physical execution issues need to be addressed. Specifically, could the caregiver position *vis-à-vis* the patient be force-functioned? Will force-functioning the caregiver position improve or reduce process efficiency and safety? How will individual flexibility be impacted?

From a cognitive support perspective, the notion of an immediate global view of the patient care environment upon entry warrants further examination in the context of comparing the two variants of the standardised patient rooms, since it appears to have significant value. Since considerable additional complexity (or unpredictability) is introduced by patient-related factors, the extent to which the familiarity difference between the two standardised room variants impacts on overall predictability or unpredictability is an important question to examine.

Moreover, whether the familiarity difference between the two standardised room variants is of any consequence to cognitive support in the overall level of unpredictability resulting from patient factors is an issue warranting examination. This is specifically important since issues related to the physical execution of workflow and processes are also potentially impacted through the two different avenues of room standardisation.

During a period of difficult financial markets and increased awareness regarding the safety and efficiency of patient care,

comparative assessment of alternative concepts are warranted for the optimisation of capital resources. From that perspective, this study creates the preliminary foundation for further examination of standardisation concepts in healthcare design.

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## Frederick Cayley Robinson – Acts of Mercy

National Gallery, London, UK

14 July – 17 October 2010

<http://nationalgallery.org.uk/whats-on/exhibitions>

When he was 50, Frederick Cayley Robinson (1862–1927) was commissioned by Sir Edmund Davis, a governor and benefactor of Middlesex Hospital, to paint four large pictures for the entrance hall of James Paine's imposing 18th century building. Their collective title, *Acts of Mercy*, derives from Christian teachings, including feeding the hungry and attending the sick, which historically guided the development of hospitals.

By 1915, Cayley Robinson had painted the first pair of pictures – *Orphans I* and *II*. Originally they hung on the wall facing the front door, separated by a door leading to the hospital wards. They show a continuous interior scene, with uniformed orphan girls filing down a staircase into a dungeon-like refectory lit by a single lamp, where others are seated at a table, with already nourished orphans departing.

Although movement is implied, the gracefully posed orphan girls and woman attendants appear suspended in a timeless scene, together yet separated by a pervading stillness. It might seem that the artist's intention in this site-specific composition was to calm agitated or worried patients, while they waited for medical attention, but it is typical of all of his works.

Mural paintings by the French artist Pierre-Cécile Puvis de Chavannes (1824–1898), which Cayley Robinson saw while studying in Paris, exerted a potent and lasting influence. This is demonstrated in his frieze-like arrangements of outlined figures, painted in flat colours, inhabiting austere landscapes or sparse domestic interiors.

Although the second pair of paintings, *The Doctor I* and *II*, ostensibly depict exterior scenes, they appear more like stage sets than reality. They were designed to be hung on the side walls, facing each other across the entrance hall – so, unlike *Orphans*, they do not present a single scene. *The Doctor I*, completed in 1916, depicts a timeless classical landscape with figures dressed in an archaic style. A woman kneels before a male healer or doctor, in a pose reminiscent of adoration or crucifixion scenes, thanking him for having

# Scenes of mercy

For 70 years, the paintings of Frederick Cayley Robinson graced the entrance hall of Middlesex Hospital in the UK. Now they are being celebrated in an exhibition at London's National Gallery, as *Colin Martin* reports

**These small acts of kindness reflect Cayley Robinson's allegorical depictions of Acts of Mercy**



treated her daughter who stands nearby. The healer's right hand is raised in a Christ-like gesture of benediction.

*The Doctor II*, completed in 1920, depicts a contemporary scene. Convalescent soldiers, clad in the distinctive blue flannel of First World War military patients, enjoy a breath of fresh air (or, in one languidly posed case, smokes a pipe) at the hospital entrance. As Nicholas Penny, director of the National Gallery, observes, this painting is among the most interesting of the immediate post-war period, showing the impact of war on the home front, rather than the horrors of trench warfare.

Two retired nurses visiting the exhibition, who trained at Middlesex Hospital from 1950 to 1954, commented that Matron always insisted that patients were treated as household guests, to the extent of their being served individually with cups of tea on trays. These small acts of kindness reflect Cayley Robinson's allegorical depictions of *Acts of Mercy*, paintings which they saw every day. A photograph taken in 1930 shows three smiling nurses forming a guard of honour when Cayley Robinson's paintings were removed before demolition of the old hospital.

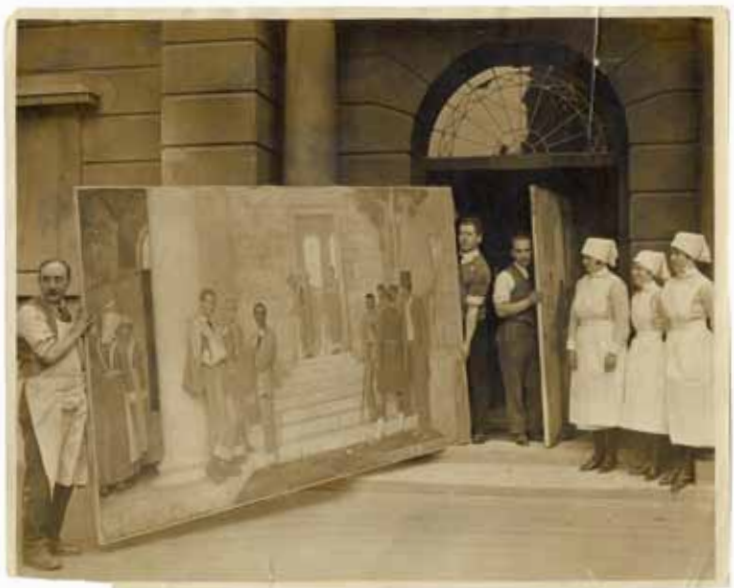
Appropriately, for paintings in which architecture itself predominates, *Acts of Mercy* were reinstalled in specially designed niches in the art deco foyer of the new Middlesex Hospital, built on the same site (1930-35), where they remained for 70 years.

When Middlesex Hospital was decommissioned in 2007, there was a public outcry when University College London Hospitals NHS Trust consigned the paintings to auction. Curators in 20th century British art at Tate Britain helped find a solution, which enabled the four paintings to remain on public display, rather than being dispersed into private collections. They were acquired by the Wellcome Trust in 2009 and are permanently housed at Wellcome Library, only a few hundred metres from the now vacant site for which they were painted.

"This is the first exhibition devoted to the work of Frederick Cayley Robinson since 1977," says Penny. "He is a distinctive artist, who had one superlative 20th century moment."

**Colin Martin is an architectural writer and journalist**

Images of *Acts of Mercy* above (left to right):  
*Orphans II*, about 1915, oil on canvas (199 x 339 cm)  
*Orphans I*, 1915, oil on canvas (198.7 x 339.5 cm)  
*The Doctor I*, 1916, oil on canvas (198.5 x 339.5 cm)  
*The Doctor II*, 1920, oil on canvas (198.5 x 339.5 cm)  
 All images © The Trustees of the Wellcome Trust Ltd



Middlesex Hospital entrance with the Cayley Robinson painting *Acts of Mercy – Doctor I* being moved during building works, 1930 © University College London Hospitals NHS Foundation Trust



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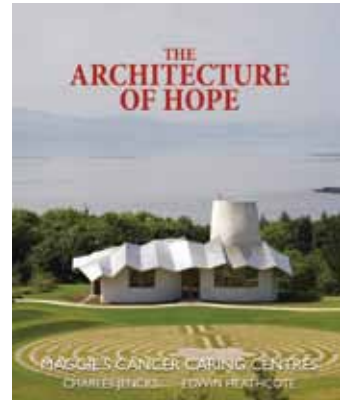
**Farrow**

## The Architecture of Hope: Maggie's Cancer Caring Centres

Charles Jencks and Edwin Heathcote with Laura Lee and Katy Mahood

Frances Lincoln, 2010

Price: £35.00 / US\$60.00



"A diagnosis of cancer hits you like a punch in the stomach," wrote Maggie Keswick in *A View from the Front Line* in 1995. "Other diseases may be just as life-threatening, but most patients know nothing about them." Although breast cancer, first diagnosed in 1988, threatened to overwhelm her, she was determined not to allow it to do so. Her feisty response was to work with her oncologist Bob Leonard, oncology nurse Laura Lee and husband, architect and writer Charles Jencks to found a charity which now provides non-clinical spaces adjacent to hospitals, where cancer patients can rest before or after their clinical appointments and also access information and psychological and social support, within informal domestically-scaled environments.

The first of what are now known as Maggie's Cancer Caring Centres opened in a converted stable building at the Western General Hospital in Edinburgh in 1996, a year after Maggie's death in 1995. There are now six Maggie's centres operating in the UK and seven more will open within the next two years. The buildings are the work of high profile architects, who waive their design fees. Given the competitive nature of the architectural profession, each new centre lifts the bar higher: "They are all great buildings, not a bummer among them," said Jencks at the launch of *The Architecture of Hope*. Maggie was a landscape architect and the couple counted many of the stellar architects of the centres among their friends.

"The NHS is obsessed with cutting waiting time – but waiting in itself is not so bad, it's the circumstances in which you have to wait that count," wrote Maggie. This astute observation informs the architectural brief for the centres: to provide functional buildings with spatial qualities which make patients and their families feel valued. The well-designed and illustrated book introduces the thinking behind Maggie's centres and profiles the designs of existing buildings, those at planning or building stages and three unrealised centres.

Maggie's Cotswolds at Cheltenham Hospital, designed by Sir Richard MacCormac, will open this autumn. Its design includes architectural features that are generic to all centres, such as welcoming hearths. Here the hearth is flanked by inglenook seating, a local arts and crafts tradition. Light-filled kitchens form the heart of all Maggie's centres. Here patients, relatives and carers can eat and drink, while sharing their experiences of coping with cancer around a large communal table. Although patients' clinical records are not available to Maggie's carers, they are trained to provide information and counsel in response to concerns expressed by patients and their families.

Natural landscaping is another feature common to all Maggie's centres. Even on a cramped corner site at Charing Cross Hospital, Rogers Stirk Harbour & Partners has provided a secluded garden setting, screening Maggie's London from noisy traffic. Other centres are less constrained, often providing inspirational views.

The book's title undersells the impact of architectural healthcare design on the wellbeing of ill (or indeed healthy) people. Maggie's centres provide more than the often fallacious "new hope for cancer victims" promised in the headlines of yellowing press clippings depicted in the book. The centres actively support cancer patients and their families, but 'architecture of support' would be misconstrued as structural engineering. 'Architecture of healing' is unverifiable, but it is important to establish additional health benefits for users of the centres.

In 1995 Maggie's applied to Cancer Research UK (CRUK) for funding to compare the benefits to users of similar support services provided from non-purpose-designed buildings (in Swansea and Oxford) with the benefits provided to users of two of its purpose-designed centres. CRUK turned down the application, advising that its remit was medical research and not architecture. Undaunted, Maggie's plans to initiate a self-funded prospective, observational study using matched controls within two years. The results should provide evidence backing its intuitively sensible provision of support for cancer patients within specifically architecturally designed and landscaped buildings.

Colin Martin is an architectural writer and journalist



Maggie's Gartnavel © OMA

**Nurse: past, present and future**

Kate Trant and Susan Usher  
Black Dog Publishing, 2010  
Price: £19.95 / US\$29.95

**K**ate Trant and Susan Usher have produced a book that is as good to look at as it is to read – a book in which the photographs are as interesting as the words. It will be of interest not only to nurses of all ages but also to those who know and care about nursing – and to those who've never given it much thought.

Florence Nightingale's centenary provides the inspiration. It takes the reader from the nineteenth to the twenty-first century, from Camberwell to Chad, learning from the past and predicting the future. This incredible journey is illustrated with the stories of nurses themselves: Zena Edmund-Charles, one of thousands of young women who came from the Caribbean to the 'mother' country in the 1950s; Carol Etherington who worked in Darfur; Veronica D'souza who was in charge of operating theatres in Mumbai; Geoff Hunt, a district nurse in England for 40 years; Flavia Simphronio Balbino, who developed the Kangaroo Mother approach in Brazil; and many others whose stunning photographs illustrate their incredible tales.

The chapters on hospital design are an unusual feature of this book and will be of special interest to nurses who instinctively know that design affects the care they can give, how they feel about their work and the recovery of their patients. Many studies show how different care environments can reduce anxiety and lower blood pressure and ease pain. The fundamentals of healthcare design are clearly spelled out in a way that can be followed by clinical staff, architects and planners. The redevelopment of Montreal General Hospital demonstrates the value of engaging nurses in the design of hospitals. Sadly, a study in England reveals that less than half the nurses thought they could influence hospital design.

Florence Nightingale bequeathed to the UK the Nightingale ward: an open and well ventilated ward of 32 beds in two rows. Generations of British and other nurses grew up working with a characteristic sweep down the centre, casting their skilled eyes from right to left observing the slightest change in their patients' condition. No wonder they resisted their patients being tucked away in single rooms out of sight. However, what was right over a century ago is not right for the needs and standards of today – although it took Nightingale's home country, the UK, longer than most to understand this. It is amazing that we would never share our bedroom with strangers when we are fit and well but assume that this is an acceptable thing to do when we are ill! Single rooms are now the preferred norm when new hospitals are built – but in the poorest places we will continue to see not just the sharing of rooms but also of beds.



**Nurses can be 'architects of change' - but only when they are fully included**

The book draws on the wisdom of some outstanding leaders of nursing, such as Canada's Helen Mussallem. It also bravely tackles some of the biggest issues in nursing: defining a nurse, the education of nurses, migration, telenursing, and working with physicians and other team members (movingly illustrated by the Japanese development of disaster management after the Kobe earthquake). It ends with a reference to the UK's Royal College of Nursing campaign to ensure dignity for all patients, illustrated by two innovative designs: a 'bed pod', which provides privacy and soundproofing around a bed space, and an improved hospital gown for patients.

The newly refurbished Florence Nightingale Museum at London's St Thomas' Hospital is a testament to the impact Nightingale has had on nursing over the past century and this book illustrates that impact through the words and pictures of nurses themselves. Today, when healthcare reform is on every government's agenda, it is clear that nurses can be 'architects of change' – but only when they are fully included.



**Christine Hancock is director of C3 Collaborating for Health**

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