HEART OF THE COMMUNITY

Promoting healthy lifestyles at the South West Acute Hospital in Northern Ireland

ALSO:

Market report: Europe
Project review: Children’s health
Scientific review: Sustainable design
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The great privilege I enjoy in my role as chief operations officer of the International Academy for Design & Health and editorial director of World Health Design, is the opportunity to travel, to experience different cultures, and to learn from some of the leading researchers and practitioners around the world, with their unbridled passion and love for the art and science of the field of design and health. Over recent years, as I have experienced and seen with my own eyes the vastly different social, economic and political contexts within which we all live. These journeys have revealed to me the enduring importance and qualities of the arts and the sciences as a platform for freedom, creativity and the progressive development of human society. It may be a long and arduous journey at times, explains John Zeisel (p47), but the rewards come with dedication and endeavour. As Alan Dilani states, scientific enquiry and the development of knowledge are a public good that should be invested in and protected (p13). The world presently defines success in relation to GDP growth, yet as Aristotle vocalised, a functioning and healthy society will only thrive through a public life in which economy is one element of a greater whole. Salutogenesis provides a model that can help us to redefine prosperity around people and the planet. Let’s continue the discussion in Brisbane at the 9th Design & Health World Congress.
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Designers line up for awards

A diverse range of health projects from around the world have been revealed in the shortlist for the Design & Health International Academy Awards 2013.

From a new children’s hospital in Peru to an aged care facility in Australia and a medical city in Abu Dhabi, the Design & Health International Academy Awards 2013 demonstrate that the delivery of health services in the 21st century, the prevention of illness and the creation of wellness takes place in many different settings, building types and cultural contexts.

Sponsored by Lend Lease this year, the awards programme comprises 10 categories across the principal areas of international health delivery, including the prestigious Lifetime Leadership Award.

Firmly established as the world’s leading advocacy programme recognising professional excellence in the research and practice of designing healthy built environments, the awards ceremony will be held on 13 July in Brisbane, Australia, during the Gala Awards Dinner of the 9th Design & Health World Congress & Exhibition (10–14 July), where the overall prize winners will be announced.

Each award will be presented by the Queensland Minister of Health, a representative of the judging panel for the category and a representative from the board of the International Academy for Design & Health.

The judging panel consists of a group of independent multidisciplinary experts within both research and practice from around the world.

The shortlist:

**International Health Project (over 40,000sqm)**
South West Acute Hospital, commissioned by Western Health & Social Care Trust, and designed by Stantec

New Public Collado Villalba Hospital, commissioned by Capio Sanidad, and designed by F Forwart

Queen Elizabeth Hospital Birmingham, commissioned by University Hospitals Birmingham NHS Foundation Trust, and designed by BDP

Baylor Charles A. Sammons Cancer Center; commissioned by Baylor Health Care System, USA, and Designed by Perkins + Will

**International Health Project (under 40,000sqm)**
Children’s Hospital Tony Molleapaza Rojas, Peru, commissioned by PAZ-Holandesa, Netherlands, designed by EGM architecten Akerman, commissioned by Building Better Health and Lambeth Primary Care Trust, and designed by Henley Halebrown Rorrrison

St John’s Rehab Hospital – the John C and Sally Horsfall Eaton Centre for Ambulatory Care, commissioned by St John’s Rehab Hospital, Canada, and designed by Farrow Partnership Architects and Montgomery Sisam Architects

**Future Health Project**
New Queensland Children’s Hospital, commissioned by Queensland Health, and designed by Conrad Gargett Lyons

Vienna North Hospital, commissioned by Vienna Hospital Association, and designed by HealthTeam KHN – Albert Wimmer

Sheikh Khalifa Medical City, commissioned by SEHA, Abu Dhabi Health Services Company, and designed by Skidmore Owings & Merrill in joint venture with ICME and Tilke

**International Salutogenic Design**
Potter Street Redevelopment, commissioned by Wintringham, and designed by Allen Kong Architect

RFBI Basin View Masonic Village Aquaponic Garden, commissioned by Royal Freemasons’ Benevolent Institution, and designed by Paul Van der Werf of Earthan Group

Lebovic Campus Community Complex, Sherman Health and Wellness Centre, commissioned by UJA Federation of Greater Toronto, Mount Sinai Hospital, Toronto, Canada, and designed by ARK Canada

The Children’s Hospital Tony Molleapaza Rojas, Peru is shortlisted in the International Health Project (under 40,000sqm) category.
International Mental Health Design
Mental Health Care: “High Care”, commissioned by Stichting Rivierduinen, and designed by de Jong Gortmaker Algra architects and engineers
Gold Coast University Hospital Mental Health Unit, commissioned by Queensland Health, and designed by PDT + STH + HASSELL
CAMH Village Family Health Team, commissioned by the Centre for Addiction and Mental Health, Toronto, Canada, and designed by ARK Canada

Use of Art in the Patient Environment
University of Kentucky, Albert B Chandler Hospital, Arts in Healthcare program, commissioned by University of Kentucky Healthcare, and designed by AECOM
Royal Brompton Centre for Sleep, commissioned by Royal Brompton & Harefield Hospitals Charity and Royal Brompton & Harefield NHS Foundation Trust, UK, and created by Steven Appleby with rb&hArts
Global Fund MDR TB Hospital, commissioned by The Global Fund, The National Department of Health South Africa, Limpopo Department of Health, Council for Scientific and Industrial Research and Sakhiwo Health Solutions, and designed by HDG

Product Design for Healthcare Application
SafeSee Door, designed by Britplas
Whiterock Wall Cladding Systems, designed by Altro
Artis Q.zen Interventional Imaging System, designed by Siemens Healthcare – AX Division

Interior Design
CAMH Village Family Health Team, commissioned by the Centre for Addiction and Mental Health, Toronto, Canada, and designed by ARK Canada
South West Acute Hospital, commissioned by Western Health & Social Care Trust, and designed by Stantec
Kaleida Health Gates Vascular Institute/Suny at Buffalo Clinical and Translational Research Center, designed by Cannon Design

Sustainable Design
South West Acute Hospital, commissioned by Western Health & Social Care Trust, and designed by Stantec
Flinders Medical Centre New South Wing, commissioned by SA Health, and designed by Woodhead
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Images: Lend Lease, clockwise from upper: NELLI Katz Women's Hospital, New Hyde Park, New York, USA; St Francis Wellness Centre, Virginia USA; Romford Hospital, Essex, United Kingdom; Central Manchester Hospitals, Manchester, United Kingdom; the New Royal Children's Hospital, Victoria, Australia.
Copper is bug killer

New research from the University of Southampton shows that copper and copper alloys will rapidly destroy the highly infectious sickness bug, norovirus. The virus can be contracted from contaminated food or water, person-to-person contact, and contact with contaminated surfaces, meaning surfaces made from copper could effectively shut down one avenue of infection.

Norovirus is responsible worldwide for more than 267 million cases of acute gastroenteritis every year. There is no specific treatment or vaccine, and outbreaks regularly shut down hospital wards and care homes, requiring expensive deep-cleaning, incurring additional treatment costs and resulting in lost days when staff are infected. Its impact is also felt beyond healthcare, with cruise ships and hotels suffering a significant loss of reputation when epidemics occur among guests.

Professor Bill Keevil, chair in environmental healthcare at the University of Southampton and lead researcher, presented his work at the American Society for Microbiology’s 2013 General Meeting in May. The presentation stated norovirus was rapidly destroyed on copper and its alloys, with those containing more than 60% copper proving particularly efficacious.

The contamination model used was designed to simulate fingertip-touch contamination of surfaces.

“Copper alloy surfaces can be employed in high-risk areas such as cruise ships and care homes, where norovirus outbreaks are hard to control because infected people can’t help but contaminate the environment with explosive vomiting and diarrhoea,” Keevil explains. “The virus can remain infectious on solid surfaces and is also resistant to many cleaning solutions. That means it can spread to people who touch these surfaces, causing further infections and maintaining the cycle of infection. Copper surfaces, like door handles and taps, can disrupt the cycle and lower the risk of outbreaks.”

New cancer centre breaks ground

The new Fred and Pamela Buffett Cancer Center at the University of Nebraska Medical Center (UNMC), has broken ground.

Designed by HDR, and following the success of the HDR-designed Durham Research Centers I & II and the Michael F. Sorrell Center for Health Science Education (CHSE) on the same campus, the US$323m cancer research and treatment centre will join the research centres as part of the Durham Research Plaza.

The Buffett Cancer Center will combine both cancer treatment and research to provide the highest level of cancer care, with the goal of earning a ‘Comprehensive Cancer Center’ designation from the National Cancer Institute. The project consists of three components: a 10-storey, 252,000sqft (23,412sqm), cancer research tower with 98 laboratories a seven-storey, 325,000sqft (30,193sqm), 108-bed hospital tower; and a multidisciplinary ambulatory clinic. This comprehensive, translational approach will allow researchers to accelerate breakthroughs in the lab and clinicians to provide personalised care plans for patients.

“The Fred and Pamela Buffett Cancer Center represents an unprecedented opportunity for translational medicine,” said Bruce Carpenter, HDR senior vice president and project principal. “We’re providing research and clinical space in the same facility, focused on cancer patient care, designed to encourage collaboration. This will be a true embodiment of the translational medicine concept.”

The new cancer centre is named for Fred and Pamela Buffett. The late Fred Buffett, a first cousin to Warren Buffett, lost his fight to kidney cancer in 1997, and the centre was made possible through a major gift from his wife’s foundation. Construction is expected to be complete in 2016.
Bringing him home sooner

No one wants to be in hospital.

But if a visit is unavoidable, you want it to be as comfortable – and short – as possible.

AECOM strives to meet the needs of patients, healthcare professionals and communities through smart thinking, design and engineering solutions.

We introduced fresh-air systems to the wards of the Fiona Stanley Hospital in Murdoch, Australia to reduce cross-infection risks and help make the best part of going to hospital – getting out – come a little sooner.

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Bahrain Oncology Centre gets the green light

Scheme design has been approved for a new Oncology Centre at the King Hamad University Hospital (KHUH) in Bahrain. Led by HASSELL for the Bahrain Defence Force, and working in partnership with Bahrain-based Mazen Alumran Consulting Engineers (MACE) and team members AECOM, Baker Willis Smith and MJ Medical, the new building will be designed to the highest international standards of healthcare provision, bringing first-class cancer care and research facilities to Bahrain in a single ‘translational’ environment.

Incorporating the latest advances in technology, the new Oncology Centre will combine research functions with comprehensive inpatient, outpatient, diagnostic and treatment facilities. Its location on the existing KHUH site will ensure an integrated approach to a wide range of healthcare services for all patients, while further treatment integration will include work with other hospitals in Bahrain. This holistic approach to healthcare provision in Bahrain is designed to establish a multidisciplinary and effective care programme for all citizens.

The Oncology Centre will play a leading role in the worldwide development of radiation oncology. Bahrain’s location at the centre of the Arabian Gulf, neighboured by Qatar and Saudi Arabia, will be critical to achieving national and internationally coordinated clinical trials to improve medical knowledge beyond borders and contribute to the worldwide fight against cancer.

Colin Hockley, managing principal for HASSELL in the UK, commented: “Bahrain is working looking forward to cooperating with the Bahrain Defence Force in achieving this goal through our research-based approach to healthcare design, focusing on delivering high-performing clinical spaces and environments for patients, visitors and staff which promote health and wellbeing.”

AECOM in Monaco

An AECOM-led consortium has been awarded a US$85m contract for the new Princess Grace hospital in the Principality of Monaco.

AECOM will act as consortium lead and programme manager for the approximately 90,000sqm, 400-room hospital. The consortium was selected after being one of three groups invited to participate in a design competition for the new hospital.

In addition to AECOM, the consortium includes AIA Associés as international architect, the Monaco architect Natacha Morin Innocenti, AIA Ingénierie for heating, ventilation and air conditioning design and sustainability, and Tractebel Engineering for foundations and structural design. “AECOM is delighted to work with our consortium partners in playing a significant role in imagining and creating an innovative design for this prestigious project,” said John M Dionisio, AECOM chairman and chief executive officer. “I look forward to the team delivering a state-of-the-art hospital to serve Monaco’s residents and visitors for decades to come.”

Design work for the new hospital is expected to begin in July and last for two years, followed by a 10-year construction period.

Suters and dwp partner

Australian firms Suters Architects and dwp have announced a fully integrated design partnership: ‘dwp+suters’. dwp+suters says it now offers an extended range of capabilities to both local and international markets, and combined design services in four portfolios: community, lifestyle, work and infrastructure. dwp+suters brings to Australia globally awarded expertise in hospitality, residential and corporate design. This augments existing expertise in health, education, workplace, sports and seniors living.

“dwp is delighted at this next chapter in our continuing quest to deliver a one-stop integrated design service offering to our clients. Suters Architects shares our vision of providing excellence at the highest international standards. We are both incredibly excited and proud to be partnering with such a highly reputable and award-winning company,” remarked Brenton Mauriello, CEO for dwp+design worldwide partnership.

Clarifications

The Olivia Newton-John Cancer & Wellness Centre in Heidelberg, Victoria, featured on p31 of World Health Design April 2013 was designed by Jackson Architecture/ mcconnel smith & Johnson

The Ng Teng Fong General Hospital & Jurong Community Hospital in Singapore, featured on p17 of World Health Design April 2013 was designed by CPG Consultants with HOK and Studio 505.
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As western world economies struggle to emerge fully from recession, the banking crisis and massive budget deficits, the focus has failed so far to shift from an emphasis on the role of finance to the need for more balanced, creative and productive economies, stimulated by science, research and innovation.

Like health, education and physical infrastructure, scientific enquiry and the development of knowledge is a public good that requires investment by governments to stimulate innovation and lay the foundations for economic growth that will provide for our future society. A study of human civilization shows that great leaps forward in the arts, culture, technology and science, were achieved through the sharing of ideas and knowledge across geographies, cultures and disciplines.

Since the start of the industrial age and as we journey through today’s knowledge society, the speed of that exchange of knowledge and ideas has risen exponentially, positively reinforced by step changes in the way we communicate in a digital world and a global economy.

Knowledge-based organisations like the International Academy for Design and Health are thriving in this new world, building global networks, connecting researchers and practitioners, innovators and applicators, stimulating ideas and providing a credible forum for exchange. Creating an environment for unleashing creativity in the field of design and health has been at the heart of the Academy’s mission for two decades, but it is not enough without a context for the pursuit of innovation. It is integral to humanity to be intellectually curious in the development of new ideas, but true innovation is only possible when the context is right for the application of those ideas. The application of the theories of salutogenesis as a framework to understand the processes that support and promote human health and wellbeing in the design of the physical environment, has seen the convergence of the fields of public health and design in a demonstration of the huge potential of interdisciplinary research.

But let us be careful to understand and differentiate between the sciences and the arts, whilst valuing the critical importance of the power of these two pillars of civilized society to work in tandem for human progress.

In the USA, the emergence of evidence-based design (EBD) is flawed in its interpretation that design in itself is a science. Design is not a science, but is an art and a process of creativity. There is a critical role for credible research and science to play in informing the design of our environments, which is at the heart of the Academy’s work, but equally it is the skills, knowledge, experience and creativity of the designer and architect that will result in innovation and a successful solution. As the marketers embrace the ideas of ‘evidence-based design’ in a cynical effort to persuade and speak the ‘evidence-based medicine’ language of their clients in the healthcare industry, the risk is that EBD is prescribed like a drug to cure a hospital’s ills, transferring ideas that have not been based on robust research-evidence, and may not be appropriate to the local context. Continuous research to inform the design of healthcare environments is critical, but we must be careful about what we call evidence.

As we prepare for the 9th Design & Health World Congress in Brisbane, the interdisciplinary international focus of our work will take another giant leap forward with the creation of a new board of 13 directors, representing both different geographic zones of the world and different professional and research disciplines. We have many talents throughout our community to develop our vision. We invite you to be part of this vision.

Prof Alan Dilani is chief executive and founder of the International Academy for Design & Health
Placemaker

South West Acute Hospital, Enniskillen, Northern Ireland
Completion date: January 2012
Client: Western Health & Social Care Trust
Cost: £276m
Size: 69,000sqm
Project consortium: Northern Ireland Health Group
Architect: Stantec
Main contractor: FCC Elliott Construction Partnership
South West Acute Hospital (SWAH) is a new 300-bed acute hospital with designated centres for women and children. It is the first hospital in Northern Ireland with 100% single-patient bedrooms, replacing Erne Hospital which had become too small for the growing needs of its community. The hospital provides ambulatory, diagnostics, A&E, critical care, laboratories, maternity, women’s health, neonatal, surgery, older persons and inpatient care services to Fermanagh and South Tyrone. The organic copper-clad form of the education centre and adjacent sculptural entrance canopy give it a distinctive presence, while the strategic positioning of buildings, entrances and site circulation provide a clear sense of order and natural legibility. The linear garden forms a central circulation spine along the entire length of the building, dividing ward accommodation from clinical spaces. This spine provides natural lighting and increases wellbeing by bringing views of the landscape deep into the heart of the building. Internally, clear wayfinding is ensured through clear information points, strategically located wayfinding screens and clear signage, supported by ‘beacon’ artworks and thematic departmental interior design. A real part of the local community, the hospital has designated spaces in the main atrium and hospital street that are used by community groups, local artists, schools and museums for exhibitions. In addition, its community support services promote healthy lifestyles in the area through education.
One of the most dynamic and creative sectors within healthcare architecture, children’s healthcare continues to forge ahead with emotionally intelligent and innovative ideas for addressing the needs of patients, families and communities. One would think that the meerkat enclosures and aquaria of the Royal Children’s Hospital in Melbourne (reported in WHD’s July 2012 sector round-up) would represent some kind of high water mark, but the latest projects completed or currently under way demonstrate just as much ingenuity and commitment to improving healthcare outcomes for all involved.

Even several years into global recession, with massive cuts in healthcare provision across many regions, governments have seen fit to continue to invest in large and high-quality children’s healthcare buildings – or, perhaps more realistically, to press ahead with plans that were set in motion long before the severity of this economic downturn became apparent. Australia, for example, is investing billions of dollars in major new children’s hospitals: Melbourne’s aforementioned AU$995m Royal Children’s Hospital (a 160,000sqm clinical treatment and research facility designed by Billard Leece Partnership and Bates Smart with HKS),

The play space in the UK’s Royal London hospital is designed to get children and their families interacting with each other, and to reduce fear.
Perth’s forthcoming AU$1.2bn New Children’s Hospital (65,000sqm, also designed by BLP with Cox and JCY) and the AU$1.5bn Queensland Children’s Hospital, Brisbane (71,000sqm, designed by Conrad Gargett Riddell and Lyons) which opens in late 2014. Meanwhile, in the UK, investment continues in new children’s facilities for the Royal London Hospital (see case study), while a shortlist of design and construction consortia has been drawn up for the rebuilding of Edinburgh’s Royal Hospital for Sick Children (RHSC) in one giant combined facility with the Department of Clinical Neurosciences and the Child and Adolescent Mental Health Service, scheduled to open in 2017.

One of the UK’s biggest children’s facilities, the Alder Hey in Liverpool, is being completely rebuilt and relocated to parkland adjacent to its current site (see case study). Meanwhile the Republic of Ireland is pressing ahead with revised plans for a 100,000sqm children’s hospital in Dublin.

“One of the things that’s happened with big acute hospitals is that you are getting higher and higher levels of specialism to deal with more difficult conditions,” says Andrew Smith, director of healthcare at BDP, which is involved in some of the above projects. “For example, in children’s heart surgery, it’s been shown that the best results come from locations where surgeons are specialists and doing it all the time.” This leads logically to more large, regional, specialist-rich children’s facilities. “In the abstract it might be nicer to have a little kids’ hospital near where

In children’s heart surgery, it’s been shown that the best results come from locations where surgeons are specialists and doing it all the time.

Play space, The Royal London Hospital, London, UK
Architects Cottrell & Vermeulen, working with graphic artist Morag Myerscough, were given two large areas to transform into havens for play, retreat and restoration for children, away from the clinical and institutional environments of the new HOK-designed Royal London hospital. A two-storey atrium space adjacent to the children’s ward has become the new Activity Space, and a roof terrace has been turned into the Sky Garden. The design took inspiration from classic children’s literature including Where the Wild Things Are, The Borrowers and Alice in Wonderland. Overscaled domestic furniture – a giant television, a lamp, a chair and a globe – encourage interaction and exploration in the Activity Space, and enormous soft toys are woven into the space’s narrative. Elsewhere, puzzle cubes form stackable toys as well as seating, and the globe interior reveals itself as a cosy den. “The theme of domestication is so important to children when they are not at home,” says architect Maria Westerstahl. “The hospital can seem like a very hostile environment – all blue and steel and glass and wipe down surfaces – so it’s important to have variety in materials, textures and nature.” In the astro-turfed Sky Garden there is a rooftop forest with a tepee, a shingle-clad den and a vine-covered shelter. Secure glass balustrades are hidden behind wicker fencing and planters. The £1m scheme was funded entirely through donations.
you live but that doesn’t give you the level of expertise that allows you to deal with difficult conditions,” continues Smith. “Another development is the convergence between clinical research and trials and clinical practice.” Consequently, many new facilities accommodate large research laboratories along with care and treatment facilities.

Inspiring healthy communities

Some of the most recent projects also demonstrate heartening evidence of long-term thinking, with new children’s hospitals being designed as pivotal resources for wider community health programmes. Part of a laudable US health initiative to proactively tackle urban poverty and related diseases, the Children’s Hospital of Michigan’s Specialty Center is intended to be as welcoming, navigable and user-friendly as possible, to serve one of the most recession-blighted urban populations in the whole of the US. Designed by Shepley Bulfinch, its light and spacious layout includes flexible clinic arrangements (to accommodate clinical needs according to demand) and conference facilities that will be able to deliver advice and workshops on diet, immunisation and fitness to the local population, from teenagers to whole families, throughout the week and into the weekend.

“You have to start when the population is young if you want to improve healthcare outcomes throughout life,” says Uma Ramanathan, a principal with Shepley Bulfinch and leader in paediatric healthcare design. Social interaction is writ large in the scheme; consulting rooms are big enough to accommodate a whole family – or even two. “If you have a kid with diabetes, it also helps to have another kid with diabetes for them to talk with,” explains Ramanathan. “It’s about education through conversation.” The Center is also tackling immunisation issues head on: “We think the developing world is the one that’s challenged with immunisation through lack of access to facilities, but in cities like Detroit you have to create an event around immunisation. Here we have created a semi conference centre that facilitates this activity.” The community will be regularly invited to attend talks on immunisation here. She says, “and the immunisation clinic is just around the corner.”

More of these community children’s facilities are planned around US cities. “There are a number of other organisations thinking in this way – in keeping with healthcare reforms. A lot of children’s hospitals are moving in this direction,” says Ramanathan. Shepley Bulfinch is working on a similar scheme in Baltimore, of around the same size – 9,300sqm. “We’ve found that this size [of facility] is more navigable; children and their families can find their way around without being intimidated,” she adds.

Opened just a year ago, feedback on the Detroit facility so far is good. Ease of parking has proved to be one major plus point, as well as clinic flexibility and transparency. For young patients, a particular boon has been the freedom with which they can interact – especially in the dialysis area, which is open but with curtains across each station for privacy, if required.

Distraction and interaction for patients and families is very much the point in the Royal London’s new children’s recreation and play spaces. Two large areas, one next to the wards and one on a rooftop terrace, represent some of the most flamboyant, imaginative and beautifully realised spaces for children in any healthcare setting. Architects Cottrell & Vermeulen, together with graphic artist Morag Myerscough, were commissioned by Barts Health NHS Trust’s dedicated arts curatorial charity Vital Arts to devise an environment that would remove children completely from the clinical world of the wards and surgeries.

“Royal London is an acute hospital – it treats something like 40,000 children [a year], and 800 are long
DMC Children’s Hospital of Michigan Specialty Center, Detroit, US
Close consultation between physicians and architect Shepley Bulfinch has resulted in a potent new building typology for children’s health and wellbeing, at the Children’s Hospital of Michigan Specialty Center: an environment designed to encourage families to take responsibility for their health and wellbeing and make the facility a regular part of their lives. The five-storey building features a welcoming glass entrance. Transparency of layout facilitates wayfinding and supervision, with generous daylighting, high ceilings and colourful artwork, adding to an atmosphere of calm and comfort throughout. Large exam rooms, restrooms, waiting areas and consultation rooms accommodate whole family groups, and opening hours include weekends so that teens and their parents can attend workshops on diet and fitness. Primary services are located on the ground floor, while the majority of exam rooms on the upper floors are sited along the building’s perimeter, with large windows providing light and views. Paediatric and adolescent clinics function separately, but their spaces are not segregated and they share a waiting area (thereby also allowing for flexibility as the patient population changes over time). Incorporating many sustainability initiatives, including daylight and motion sensors throughout the building to reduce power consumption, high-performance building systems and windows, this building is the first LEED-certified project on the hospital’s urban campus.

Architect: Shepley Bulfinch
Client: Children’s Hospital of Michigan Specialty Center, Detroit
Cost: US$43m
Size: 9,300sqm
Completion: 2012
Alder Hey Children’s Hospital, Liverpool, UK
Liverpool’s Alder Hey is one of the biggest and busiest children’s hospitals in the UK, with more than 275,000 patients treated each year, but its sprawling complex of buildings is badly in need of rationalisation and upgrading. Alder Hey Children’s NHS Foundation Trust worked with the Prince’s Foundation and Arts for Health, along with patients and families, to develop a brief for a ‘children’s health park’. BDP’s new hospital is being built on the site of the old hospital will be demolished and a new park built in its place. Three turf-roofed wings of wards extend into the landscape, built on top of the hospital’s diagnostic and treatment facilities, which are below ground. This maximises views and daylight into the wards and allows for the creation of terraces and safe play spaces at multiple levels, as well as park access, while fitting facilities into an ergonomically efficient footprint. Says BDP’s head of healthcare, Andrew Smith: “If you can make a hospital compact, the doctors and nurses can spend more time treating patients and less time walking around.” There will be 270 beds (75% of them single occupancy), and 16 state-of-the-art operating theatres.

Architecture, interior design and landscaping: BDP
Client: Alder Hey Children’s NHS Foundation Trust
Developing consortium: Acorn (John Laing, Laing O’Rourke and Interserve)
Cost: £167m
Size: 52,000sqm
Completion: Estimated 2015

The play space opened in January 2013 and so far Mullins is satisfied to see how well each area is being used: “The children go in and they immediately grab all the oversized cubes and start building. It’s gratifying that our school will be allowed to use it.” (Teenagers studying for their exams use the area after 6pm.) Architect Maria Westerstahl hopes that the provision of ample open space as well as areas for retreat, and moveable soft furnishings will facilitate activity for children and family members. She says: “The stuffed cushions and seating can all be moved around. Parents with very young children can sit and read to them, whatever their condition.

term, staying from two to three weeks to several months,” says Vital Arts director Anne Mullins. “Many of them come back on and off for years with chronic illnesses like cystic fibrosis, which means that they practically grow up in hospital. You have to create an environment where you can allow them to develop and change enough so that they can continue to enjoy it.” Flexibility and adaptability are key, providing for the increasing use of technology as well as a range of physical abilities – for example, iPod docks around the play spaces allow physiotherapists or teachers to programme exercises and classes. Says Mullins: “We have worked with Nexus and Chris O’Shea, one of the leading digital artists for children’s apps. He created a new game together with the physiotherapy team:” There are a handful of games now, which will be added to through an initiative between Vital Arts and London’s Royal College of Art students so that the technology continues to evolve.
We have to think about all ages and all abilities – ill children, but also well children.”

**Enriched by technology**

The use of digital technology to add sensory richness to children’s healthcare spaces is an exciting new area for exploration, facilitated by the medium’s growing reliability and relatively low cost – not to mention children’s near miraculously intuitive understanding of how to use it. The Royal London’s rooftop ‘Sky Garden’ also features a specially commissioned natural sound recording created by wildlife sound recorder Chris Watson, together with 50 of the Royal’s young patients, who helped to edit his field recordings into a series of filmic narratives.

While such advances in the engagement, distraction and education of patients and their families are clearly to be celebrated, there are still further innovations in the operational design of children’s...
if we could bottle it, we would.

As leading consulting engineers, NDY has a history of design excellence and an understanding and expertise in sustainable healthcare design.

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Pietro Barilla Children’s Hospital, Parma, Italy

A rainbow-coloured facade greets young patients and their families at the Pietro Barilla children's hospital in Parma, Italy. Designed by OBR Open Building Research and Policreo, the facility, in a built-up area of the city, nonetheless makes the most of connections between inside and out. Viewed straight on, the facade is glazed, reflecting its urban surroundings and surrounding gardens, with the multi-coloured vertical fins only becoming apparent when the building is viewed obliquely. The architects have sited patient rooms and common areas at the periphery of the hospital, opening up views to the surroundings, while interiors are intended to be as homely as possible to set the young patients at ease. Alongside colourful rooms laid out so that parents can visit and stay, there are also large recreational areas to encourage socialising. The hospital is the first dedicated paediatric facility in Emilia Romagna, a region of about 4.4 million people.

facilities to come. With the 2014 opening of Queensland Children’s Hospital, Lyons Architecture and Conrad Gargett Riddell have drawn on research in the field to create new service delivery models, including a ‘no-wait’ triage service (patients are immediately separated into four groups and processed to the next level), and the separation of surgical and medical admissions with their own lounge/lobby on upper floors.

Is it the vulnerability and appeal of its core patient group that inspires such commitment and creativity in architects, carers and healthcare administrations? Who knows. But it certainly looks as if the power of design to transform healthcare delivery is being proven beyond doubt in this sector.

Veronica Simpson is an architectural writer and environmental psychologist.

Pietro Barilla Children’s Hospital, Parma, Italy
Architects: OBR Open Building Research and Policreo
Client: Fondazione Ospedale dei Bambini di Parma
Size: 13,000sqm
Cost: €15.5m
Completed: January 2013
Market Report: Europe

Social cohesion

Community wellbeing and environmental initiatives are driving some of the more interesting healthcare projects across Europe, as Veronica Simpson reports.

If European healthcare was “barely managing to cover its costs”, according to a 2011 Economist Intelligence Unit (EIU) report1, the picture must be even bleaker now – two years on, with severe to moderate economic contraction still forecast for Greece, Spain, Portugal, Italy and most of eastern Europe. World Bank predictions that the cost of healthcare could soar to as high as 14% of GDP by 2030 (from a 2000 base of 8%) have been influencing a diverse picture of stagnation, rationalisation and partial privatisation across the region, according to each country’s bank balances or political motivations.

However, while many healthcare building schemes in eastern and southern Europe appear to have stalled, there is still strong activity in the north as relatively solvent (or those who enjoy high taxation) nations proactively seek to minimise impact from the worst-case future scenarios caused by the triple-whammy of ageing populations, a rise in chronic disease and the escalating costs of medical technologies.

Given that most European countries’ healthcare is funded by its citizens on a ‘shared risk’ principle, the key questions for policymakers are either how current systems can be redesigned for future financial viability without losing that promise of universal healthcare coverage or, judging by the example of the UK (currently undergoing the biggest shakeup in its National Health Service since it was founded in 1948), how can private sector entrepreneurialism and funding be used to either shore up existing universal provision or encourage citizens to switch to privately-funded alternatives.

Among the key probable trends the EIU report predicted are the following:

• Healthcare spending will continue to rise because policymakers accept that improved health is inextricably linked with greater national wealth and productivity
• Services and facilities will be rationed in order to preserve universal healthcare
• GPs will become ‘gatekeepers’ of the system, moderating access to treatment
• Governments will find ways to actively promote and encourage healthy lifestyles and behaviours to minimise chronic disease
• Methods of collecting nationwide health data will improve in order to allow governments to prioritise investment decisions.

How will any of these trends impact on the type and quality of healthcare buildings being commissioned now and in the future? One of the most controversial but visible manifestations of the trend towards health promotion is the desire to encourage citizens to be more proactive in maintaining health. On the one hand, this manifests itself as controversial threats (from the UK government, for example – backed by 54% of doctors apparently) to withhold potentially life-saving treatment and surgery from at-risk individuals (smokers and the obese) if they have consistently refused to change their behaviour. On the more unequivocally positive side, many new healthcare buildings...
Kaiserslautern Military Community Medical Center, Kaiserslautern, Germany

Built to replace an older facility, this US government-funded centre will serve the 50,000 NATO US military personnel and their families posted in the town, as well as treating all US troops wounded in action in the region. In order to facilitate fast turnaround of the large number of outpatients who might have been flown in from conflict areas, HOK has evolved a design around a Rapid Cycle Evaluation and Treatment (RCET) methodology, which also improves diagnostic and treatment services to the resident population. Outpatient facilities are configured to provide multidisciplinary diagnosis and treatment, with embedded diagnostics in the clinic or ambulatory care environment such as non-invasive cardiology, neurological testing, rehabilitation gyms and simple radiography for orthopaedics. The most frequently required disciplines are clustered together to facilitate multidisciplinary team working. The clinics have been designed as a series of rectilinear modules of varying sizes, that connect along a serpentine corridor, allowing daylight to flow into each clinic and along the public pathways; behind this building is another series of fingers that house the larger, shared elements – surgery, invasive procedures, CT and MRI. Construction of this green-roofed building is on a forested site, using white pre-cast concrete, metal panels and glass. At least 50% of both building heating and cooling needs will be met by renewable energy sources.

Architects: HOK and HWP Planungsgesellschaft (joint venture)
Client: US government
Size: 92,900sqm
Completion: Estimated 2019
Collado Villalba Hospital, Madrid, Spain

Situated just outside Madrid in a spectacular mountain range and parkland, Collado Villalba Hospital is designed to maximise the benefits of the surrounding views and landscapes while minimising the visual and environmental impact of the building. The facility is arranged in three sections depending on the intensity of treatment: social, admission and operating theatres, while diagnostics is sandwiched in the middle, serving both populations. These spaces are all accessed via the main public hall/atrium, which is filled with art, views and daylight, and is naturally ventilated, with openable windows. The facility is intended to serve a patient community of 110,000 with 140 bedrooms, 87 outpatient offices and nine operating theatres. Its design is inspired by the terrain – a granite base topped with vegetation – with substantial glazing across each elevation. The building incorporates natural materials – stone, glass, wood, earth – and reuses materials disturbed during construction wherever possible (for example, the granite dug out during construction was crushed and used to fill gabions hung on the facade). Around 2,200 local species of trees have been planted on the rooftop and in surrounding gardens.

Driving the agenda for sustainability

The need to cut costs has also powered the agenda for sustainable design, with several exemplar projects emerging across all territories – including the Collado Villalba Hospital outside Madrid.

Architecture/interiors: Francisco Ortega Montoliu
Client: Capio Sanidad
Cost: €74.5m
Size: 65,000sqm
Completion: 2013
Principal contractor: Obrascón Huarte Lain

sit at the heart of communities, integrating them with other services that help to encourage more active lifestyles and community cohesiveness.

Danish practice Henning Larsen Architects, for example, is putting health and civic engagement at the heart of a new scheme, Egedal Town Hall and Health Centre in north Copenhagen. The Health Centre is designed as a ‘village’, with courtyards and green, internal walkways connecting to a central square, around which various activities sprout up; its ground floor foyer offers spaces for exhibitions, concerts or special events, and the health centre itself has an attractive roof garden. The firm has also won laudits for its design of Herlev Hospital in Helsingborg, a low-rise 52,000sqm extension to the existing hospital’s 1960s tower block that it says will create a “sensory hospital” that will become an exemplar for patient-centred design.

In north London, Murphy Philips Architects recently completed a new community facility, Finchley Memorial Hospital (see case study), which plays a key role in establishing an urban park, complete with healing and therapeutic gardens, a bowling green, playing fields linked to a local primary school, a memorial garden and a cafe. These schemes build on the emerging trend that was noted in World Health Design’s July 2012 European regional report of a ‘core hospital’ model, placing healthcare at the heart of a community.

Meanwhile, in the Netherlands, an exemplary new scheme recently won by architects Mecanoo – famous for creating exuberantly detailed destination libraries and civic centres – sees the practice presenting an admirably restrained but handsome urban block combining extra-care accommodation with a nursing home, a community wellness centre, a neighbourhood school, a shopping centre and parking garages. It exemplifies social and cultural health, even if it doesn’t contain any treadmills.
in recession-blighted Spain (see case study).

HLM, meanwhile, is part way through the construction of several healthcare projects for Wales that put sustainability high on the agenda, recently completing a £70m, 18,500sqm hospital in south Wales, Ysbyty Cwm Cynon. With stepped, low-rise green roofs pitched to minimise impact on surrounding housing and the rolling landscapes beyond, the scheme has just won a prestigious LABC South Wales Building Excellence Award for Best Community/Healthcare Development, thanks to its socially and environmentally intelligent design.

In the north of the UK, Houghton Primary Care Centre, a new facility in Tyne and Wear, won a Leaders in Sustainability Award 2012 for its holistic design solution. Designed by P+HS Architects, it’s the first UK healthcare facility to achieve BREEAM Outstanding accreditation. Welcoming and accessible, its ambition to set the sustainability bar high involved working with BREEAM assessors from the earliest stages, and brainstorming with natural ventilation engineering consultants to develop a groundbreaking solution – a bespoke 50m thermal wall constructed along the spine of the building. PV and solar-thermal panels, a green roof, a ground-source heat pump, wind turbine, rainwater harvesting and electric car plug points all contributed to the Outstanding assessment.

Steve Naylor, head of estates for NHS South of Tyne and Wear, will be striking a chord with any healthcare manager when he says of the project: “Our ultimate aim is to meet the needs of the present without compromising the needs of future generations. The extended work at Houghton contributes to improved public health and reduced health inequalities as well as sustainable development.”

The BREEAM Excellent Finchley Memorial Hospital has also garnered praise for the extensive community consultation that informed its design and the wider masterplanning – helping to dictate its eventual placement at the heart of a range of appealing and inclusive outdoor community spaces.

A strong sense of civic engagement and generosity is also tangible in schemes such as Henley Halebrown Morrison’s (HHbR) recently completed Akerman Health Centre in Lambeth, south London (see case study) – a building that both establishes its own solid civic credentials and somehow unites all the disparate elements of the surrounding urban grain in one beautifully resolved structure.

With its Corten steel podium, brick facade, generous, light-filled spaces and integral public art work, this looks like a building that was commissioned long before ‘austerity Britain’ became a daily reality (and sure enough, it was started in 2006 and went on site in 2010).

However, BDP director of healthcare Andrew Smith says that the UK sector is beginning to improve. “Immediately following the new government coming in, in 2010, things slowed down in health and education,” he says. “There are a number of schemes starting up again. There does seem to be more activity in the UK and Ireland right now for a number of different healthcare fields.”

Gareth Hoskins Architects, with offices in Scotland and Berlin, is increasingly busy in the healthcare sector in Scotland and Northern Ireland where the practice, in conjunction with Keppie Design, is busy creating a new
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Akerman Community Health Centre, London, UK
The fourth community health centre designed by Henley Halebrown Rorrison, the Akerman’s services include GP surgeries, dentistry, children’s services, midwifery, primary care and community health. It also serves as a base for Lambeth Council’s nursing teams. A very civilised and civic building, it responds sensitively to its users’ needs and its particular urban surroundings. The 16m-deep floorplate creates east- and west-facing accommodation between which ancillary spaces such as toilets, storage rooms, stairs and lifts are located. Foyers, stairs and lifts are positioned to minimise the journey to each clinical cluster for staff and visitors. Two GP practices share the first floor and another two the second floor. A shared waiting space per floor sits directly opposite the central stair and lifts, and overlooks the nearby parkland. Staff accommodation is on the top floor, offering showers, small meeting rooms, a library/training space, staff room and roof terrace. High-quality artworks are integrated into the building’s materials, including an external Corten steel frieze by Daniel Sturgis and murals in the hall and staircase by Paul Morrison.

Architects: Henley Halebrown Rorrison
Client: Lambeth Primary Care Trust with Building Better Health/ Fulcrum
Cost: £12.4m
Size: 5,186sqm
Completion: 2012
Contractor: Willmott Dixon
Structural engineers: Price & Myers
Services engineer: Cundall
Landscape architect/designer: Landscape Projects
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**Strategic masterplanning**

Across northern Europe, BDP has noted an increase in masterplanning of existing hospital sites so that facilities can be used more effectively, with additional interventions. “This makes it more interesting for the architects, while achieving greater efficiencies for hospitals. It’s about responding to the pressures that they face,” says Smith. There are several UK schemes on the cards, he adds, which demonstrate this welcome, more sustainable and long-term approach – including an enormous HOK-designed project uniting two of London’s key hospitals, St Bartholomew’s and the Royal London, to become Europe’s largest teaching, research and care facility. This evolution, says Smith, reflects a greater understanding within healthcare estates of design and sustainability issues: “Maybe through the process of doing PFI hospitals with major redevelopments we have now got a number of project directors around the NHS who recognise the benefits of strategic development. The NHS project directors who have done several schemes all tend to learn and want to improve on what has gone before each time.”

BDP has also recently picked up some coveted healthcare work in Scandinavia, beating off stiff competition from Dutch, Danish and French firms to win Copenhagen’s Bispebjerg Hospital masterplan. “It’s a massive acute hospital, with a whole lot of psychiatric facilities, labs and logistics, and all on a site where you’ve got listed buildings [from 1913] and a landscape that is also listed,” says Smith. “Our solution is to extend that landscape to create a park in the middle of the site that joins everything together and supports it. It separates the new buildings from the old ones so that they can live with each other. And we’ve brought the approach to the site through the groups of historic buildings so they won’t be cut off from peoples’ experience of the new hospital.”

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Finchley Memorial Hospital, London, UK
The Finchley Memorial Hospital replaces a 100-year-old facility with a sustainable, purpose-built, welcoming building integrated into a community health campus. Developed following extensive consultation with local residents, it sits within parkland that includes healing gardens for patients, a memorial garden for the community, plus playing fields – accessible by a nearby school – and a cafe. Extensive glazing brings natural light into the heart of the building. Double- and triple-height spaces facilitate clear sightlines throughout the hospital. The layout is based around generic modular clinical rooms and clusters to maximise flexibility and future-proofing. The building facade includes cladding with shades of green and blue to add an uplifting element, sympathetic to its landscaped setting. Colours are replicated internally as part of wayfinding and signage strategies.

Architects: Murphy Philipps Architects
Client: NHS Barnet/North London Estate Partnerships
Cost: £28m
Size: 9,500sqm
Completion: September 2012
Contractor: Galliford Try Partnerships

Market Report: Europe

says Denmark, Sweden, Norway and Germany are the strongest, though they tend to be extremely well provided for by their own home-grown firms. One of Denmark’s leading practices, Schmidt Hammer Lassen (SHL), tends to lead the field in Scandinavia, along with the aforementioned Henning Larsen. SHL recently won a restricted competition for the new £511.5m Aalborg University Hospital in Denmark, comprising a 330,000sqm masterplan with a 134,500sqm hospital and a faculty of health science of 17,000sqm, completing in 2020.

Germany also has a great reputation for excellent healthcare architecture, but it, too, is blessed with fine architects of its own and – more forbiddingly for international firms – its competition process is expensive (open competitions, usually bidding against at least 30 other practices). However, HOK has
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just begun an unusual scheme in Germany, the Kaiserslautern Military Community Medical Center (see case study). The unusual configuration of its patient population, as well as the unique requirement to meet the highest standards of both German and US healthcare architecture (it is US government-funded), has led to a unique solution. The town of Kaiserslautern is home to 50,000 NATO and US military personnel and their families (including army and air force troops) and also treats troops wounded in action around Europe and the Middle East. The previous facility often had to move patients off campus for diagnostics, which delayed both assessment and treatment. With the design developed using the RCET methodology, patients can be admitted and assessed by the entire team and then dispatched within two days, either back to their assignment or to the US for specialist care. Virtual collaboration is also designed into the scheme for rapid evaluation and sign-off: every examination/treatment room is configured to call up test results and host teleconference calls with other specialists – albeit only where the patient’s conditions facilitate such treatment.

HOK’s practice director Chuck Siconolfi says: “There are clear benefits for both the military and the local community: high speed diagnosis and the right diagnosis. Imagine being a doctor and not having all the available information or being able to consult a colleague. The proximity and virtual connectivity these doctors and specialists have gives them that ability to have that conversation or collaboration to make it possible to make a quick and accurate judgment.”

This solution has potential implications for future facilities. “All health systems are now under financial pressure,” says Siconolfi. “Everyone is looking at having to produce better outcomes with fewer resources. The ability to have multidisciplinary collaboration, and have it up front in the initial assessment of the patient, is a very important tool in realising that result. Regardless of the system an individual facility may have, everyone shares this interest.”

Veronica Simpson is an architectural writer and environmental psychologist

References

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PROJECT: ABUJA INTERNATIONAL AIRPORT
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REGIONAL AIRPORT
PROJECT: ENUGU REGIONAL AIRPORT
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BDP wins Hampshire cancer centre

Hampshire Hospitals NHS Foundation Trust has selected BPD from a shortlist of six to design its new cancer treatment centre in a north Hampshire location, due to be completed in 2016. According to the trust’s clinical director for cancer services, Dr Lara Alloway, the facility will “improve the experience of living with cancer for our patients, their families and friends, and which reflects the excellent care we provide,” adding that BDP “showed their experience and knowledge by not only considering the look of the outside of the building but carefully considered how the inside of the building will feel, making it a welcoming, reassuring and comforting space.” BDP’s proposal envisages a ‘hospital without corridors’, which will be filled with light and bring the outside inside; it will provide a vital service for cancer patients from the north of the county who may currently have to travel long distances for radiotherapy. The Ark Cancer Charity is currently raising a further £5m to fund support services for the facility, such as complementary therapies and counselling.

Sexual health clinic breaks taboos

London’s Burrell Street sexual health clinic is architectural practice Urban Salon’s first project for the NHS – the result of a competition to attract non-healthcare design specialists to the fold. Run by Guy’s and St Thomas’s NHS Trust, the facility is aimed at 16–24 year olds and aims to break down traditional taboos surrounding sexual health. It takes up two railway arches, its non-standard format neatly setting the tone for the studio’s tongue-in-cheek design approach. Art is used to put patients at ease (such as the mobiles by Parisian artist Arnold Goron in reception), to distract (the ceiling art in each of the 16 rooms, by Allison Dring, is intended to be viewed from the treatment couch), and to assist wayfinding (Martin McGrath’s outsized wall graphics). The furniture comes in bright colours and is distinctly non-institutional, such as Vitra’s Eames chairs. A double-height reception space fills the front of the arches, with consultation, counselling and treatment rooms towards the rear.

Forum for health

Cambridge is set to receive a major new health complex in 2016. The Forum, a £120m mixed-use development located on the Cambridge Biomedical Campus (CBC), will include a postgraduate medical education centre with specialist surgical training facilities, a conference centre, a 200-bed hotel and a 75-bed private hospital. Nearby Addenbrooke’s Hospital will oversee the training facility while Ramsay Health Care UK will operate the private hospital. CBC aims to be one of the leading biomedical centres in the world by 2020. The new development is strongly motivated by the need to create a central collaborative hub for Cambridge University Hospitals, where clinicians, researchers and academics can come together to share knowledge and expertise. NBBJ is designing the complex, with the practice’s principal Jane McElroy describing it as “a landmark development on a human scale.”
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Oak Ward grows from office space

IBI Nightingale has demonstrated the importance of flexible, adaptive healthcare design with the conversion of existing offices into a high-specification ward for a specialist heart and chest hospital. The new 20-bed Oak Ward at the Liverpool Heart and Chest Hospital is a surgical cardiac ward consisting of 12 single bedrooms and two four-bed bays, giving patients spacious surroundings and superior facilities. The practice originally designed the hospital in 2008, and was drafted in again to help realise the expansion plans that had intentionally been built in first time around. “The proposed solution for the Oak Ward meant design and installation was quick as services were already accounted for,” says project director John Knape. “Consequently we were able to focus on the quality of the patient environment, testing the single bedroom and ensuite ergonomics, aesthetics and buildability to ensure they fully supported the clinical services.”

Cancer care for Ballarat

March saw the opening of the new Ballarat Regional Integrated Cancer Centre, designed by Billard Leece Partnership. The centre will serve a region of approximately 100,000 people in and west of Ballarat, in Victoria, Australia. The building includes facilities for care, therapy and treatment, as well as office, research and education spaces, community facilities and a Wellness Centre. The design combines old and new – reinvigorating the former Ballarat Base Hospital building and adding a new five-storey glass tower which flanks a central waiting/meeting atrium space. The atrium acts as a visible town square through which all activity passes. Using feedback from cancer survivors and their families on the need for privacy, a discreet entry location was created separate from the main hospital entry, while recliners in the day chemotherapy area were turned towards views rather than facing the staff station. The design incorporates elements drawn from the surrounding streetscape, including bluestone flooring and natural timbers, to help create a non-intimidating, spatially familiar, calming environment for patients and their families.

In the neighbourhood

Toronto has a new hospital with the opening in April of the 10-storey, 472-bed Bridgepoint Hospital, whose focus is on advancing the treatment, management and prevention of complex chronic disease and disability, and providing rehabilitation services. The former 148-year-old Don Jail, transformed into the hospital’s administration and education centre, sits at the centre of the site’s nine-square grid of streets, which are organised into ‘neighbourhoods of care’, encouraging a feeling of community. The design by HDR Architecture and Diamond Schmitt Architects prioritises deinstitutionalisation, with spaces for socialising and direct access to the healing benefits of nature. Patients’ rooms have wall-to-wall, low-silled, horizontal windows and each patient unit has a floor-to-ceiling glazed lounge with dramatic views for patients, family and visitors. The hospital also has communal dining and therapy spaces on every floor as well as a therapeutic pool, sky garden and multiple terraces to encourage patient self-efficacy.
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Solid underfoot

The refurbishment of Dublin’s Mater Misericordiae University Hospital included 35,000sqm of Tarkett flooring. Seven different types of Tarkett flooring were used in the project, which was overseen by Sisk Group – including Tarkett iQ Toro SC flooring, which was chosen for the 12 new operating theatres because of its static dissipative properties. The floor is made specifically for use in areas that need to remain free of static electricity. Tarkett’s Linoleum Veneto xf and Etrusco xf were used in the corridors and ward bedrooms, while the non-slip Tarkett Safetred Universal was chosen for the toilets and sluice rooms, and Tarkett Granite Multisafe for the en-suite bathrooms and wetrooms. “Tarkett has a broad range of impressive products designed specifically with health and aged care in mind,” says sales director John Devine. “The products come in a variety of colours and styles with enhanced performance characteristics.”

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Safety first

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The Latin phrase, “Through hardships to the stars” reflects the journey the field of environment-behavior (E-B) in healthcare design has traveled since its beginning in the 1960’s: defining post-occupancy evaluation (POE) in ways that adequately captures both designers’ intent and users’ responses, demonstrating how triangulating multiple-methods augments the analytic power of each, formulating evidence-based guidelines that capture the essence of the research base yet do not restrict design creativity, describing design in terms of testable hypotheses instead of non-falsifiable tautological solutions.

The research-design articles in this issue demonstrate that we have arrived at an important plateau in this arduous journey and that we still have a way to go. The Bridgepoint Hospital POE represents multi-method research firmly located in a practical-academic researcher-designer collaboration aimed at better design, explicit policy, and defined user outcomes hypotheses. Such a project was only a glint in the eyes of those who started on the E-B journey nearly half a century ago. To prevent us from sliding off this new plateau, only one thing is necessary – to carry out the POE as planned, to carefully analyse the complex interacting data, to make the findings available in an easily accessed form, and to modify design practice on the basis of the evidence developed. All I can do is wish the team good luck.

Clare Cooper Marcus, one of those on this treacherous journey since its beginning, and Naomi Sachs have clawed their way onto the plateau with a plea that those who influence design of healing gardens through policy-making, certification and regulation base guidelines on well-established research linking access to nature with health outcomes. To firmly establish evidence-based research as the foundation for policy and regulation, all that is needed is to follow the dictum of this article – move evidence-based guidelines from the back shelf “should” to the front shelf “shall.” All I can do is wish healing garden advocates good luck.

In Austin, Texas, the Mueller mixed use community serves as a natural setting for research – a planned community with explicit behavioral goals – both physical and social health. Mueller is made for walking rather than cars and research shows these goals are being achieved. True success will be seen in the way the community manages its mixed use and pedestrian emphasis into the future – using outcomes research carried out regularly as a tool for community management. All I can do is wish Mueller good luck.

The UK National Health Service (NHS) computer modeling of design approaches aimed at resolving the “conundrum” of reducing carbon emissions while keeping patients safe and comfortable, has made it to the plateau by careful attention to logic and causal reasoning linking desired outcomes to specific designs. The next step is clearly to refine these original guidelines by employing them in design and carefully evaluating their impact. All I can do is wish the NHS good luck.

We have arrived at a significant resting spot on our journey to the stars. It is up to us to use the calm of the moment to commit ourselves to taking the next crucial step – to act. All I can do is wish us all good luck.
Climate change:  
Robust hospitals in a changing climate

The Climate Change Act aims to cut 80% of the UK’s emissions by 2050 – a target it is hard to see being reached. A series of research projects, led by the University of Cambridge, explore how the NHS’s new and existing estate can make a serious contribution.

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The UK’s National Health Service (NHS) currently confronts a conundrum of global consequence: how can it deliver safe environments in a changing climate while at the same time dramatically reducing its carbon emissions?

The UK Climate Impacts Programme predicts the increasing incidence of extreme heat events in England, particularly within large conurbations, where the impact of summer heatwaves is amplified by the ‘urban heat island’ effect. The UK heatwave of June/July 2006 is thought to have led to an increase in deaths over baseline mortality of 4%, and there were approximately 300 excess summer deaths after the 2009 heatwave between 30 June and 2 July. In the aftermath of the 2006 heatwave the Department of Health concluded, regretfully: “During relatively mild heatwaves, excess death rates are significantly higher, being in the range of 35–55 GJ/100m³ in new buildings and 55–65 GJ/100m³ when refurbishing existing facilities; this covers all building uses, including space heating, hot water, lights, appliances and catering.”

However, the energy use of the majority of NHS trusts in England is significantly higher; being in the range of 44.8–98.0 GJ/100m³ for 2004/05, peaking at 125 GJ/100m³. It has been summarised in a film which may be streamed or downloaded at http://sms.cam.ac.uk/media/1446036.

New-build hospitals: implications

There is no viable strategy for resolving this dilemma at the time of writing. We believe it requires a fundamental reinvention of the hospital form, but neither the industry nor central government are resourced to conduct this scale of reinvention as they were in the 1950s and 1960s. In our research, very much ongoing, the hospital form is fundamentally reconsidered through work funded by the National Institute of Health Research (NIHR), ‘Design strategy for low energy ventilation and cooling of health buildings’ (project B(06/03)).

The current tendency to devise deep hospital plans, tessellating clinical departments, has been developed over perhaps 40–50 years. Deep plans are mechanically conditioned using strategies originally designed to maintain comfortable internal conditions artificially in fierce continental climates. One might question their appropriateness in a more temperate climate, especially one that might be warming. A recent hospital in London lauded for its excellent medical planning is 50 rooms deep between one window wall and the next at ground and first floor levels. However, our work suggests that a significant proportion of hospital spaces might be naturally ventilated: why impose the air conditioning needed only in a small part of the building onto the whole?

Figures 1 and 2 depict our proposed alternative. The Consulting/examination/treatment rooms are arranged around an external courtyard (7.2 m × 21.6 m) attenuated east to west, to offer predominantly south-facing elevations. The L-shaped accommodation to the north and east of the courtyards fits into a ‘slipped’ tartan grid of circulation routes, directly adjacent to the courtyard on the south and west sides. These circulation routes thus enliven what will inevitably be long corridors and aid navigability. The plan yields ‘dark’ locations for services, support rooms, and other largely unoccupied spaces. To the north of the rooms adjoining the courtyard lies a further range of rooms, facing the next courtyard to the north across a lateral circulation route.

Circulation routes are naturally ventilated directly from the courtyards. Rooms adjacent receive supply air ducted within a deep facade and exhaust back into further ducts within the facade. The facade depth shields the south-facing glazing from summertime solar gain. The inboard rooms receive supply air from the courtyard to the north across a lateral circulation route.
Supply air enters the rooms through an acoustically attenuated transfer duct. The exhausts are coupled together via a lateral high-level extract duct, connecting into exhaust stacks at regular intervals. As the tartan pattern builds, envisaged on three storeys, the 7.2m and 10.8m planning module develops 14.4m-deep floorplates on the north-section axis, 21.6m deep on the east-west axis. While North American hospital planning tends to develop a minimum of 35.0m-deep packets of floorplate, much contemporary UK hospital planning is achieved in 25m plan depth.

The cross-section (Figure 2) depicts supply air passing through a concrete labyrinth lined in anti-fungicidal surface treatment below the courtyard, feeding supply ducts within a double facade, delivering to three floors. Exhaust is provided by stacks spliced onto the supply ducts below, a simple ‘edge-in/edge-out’ strategy delivering pre-cooled (or pre-warmed) supply air. Across the courtyard, air is admitted in the circulation zone and across adjacent rooms, exhausting through a central duct, connecting, as described, to stacks. All the stacks indicated are provided with fan assistance, operated by flow sensors to prevent flow reversal.

We have developed a five-category coding system to denote the proposed environmental control strategy for each space. The principle is to employ the simplest, least energy-intensive strategy to deliver the airflow performance required by the Department of Health for each space:

Simple natural ventilation (SNV) all the time (opening windows): the ventilation of outdoor air directly into the space through occupant-controlled windows. The flow of air out of the space may be through the same window, other windows or via stacks. It is uncontrolled, except by the immediate occupant for the least sensitive spaces.

Advanced natural ventilation (ANV) with passive cooling: outdoor air is supplied via stacks fed from below-ground concrete plena providing passive cooling/warming depending upon the season. Air leaves the space via ventilation stacks. It is ‘advanced’ because of the possibility of optimised central control. Air flow rates are managed by Building Management System (BMS)-controlled dampers at the inlet and outlet locations to each space. It entails equipment to maintain and there are controls to master. Occupant override will compromise energy.
Hybrid ventilation: combined natural and mechanical ventilation (including passive down draught cooling (PDC)) and mixing ventilation strategies. This option adds robustness to an ANV system. The supply of outdoor air is made directly into the space via damper-controlled inlets. The flow of air out of the space is via exhaust stacks. During peak load (warm) conditions, fans are used to increase the ventilation cooling potential. PDC, encouraging air to fall through chilled water pipes at a high level, may also be used to provide additional cooling where and when necessary. Mixing ventilation, using exhaust flows to warm incoming supply air in winter, is also included in this category. Higher energy consumption is tempered by increasing the efficiency of fans. Sensors and controls are employed to detect down draughting and flow reversals.

Full mechanical ventilation: The need for this option is when ANV and hybrid systems are unable to deliver required constant airflow rates. Air flow into and out of the space is driven by variable speed fans providing full control over ventilation rates, but no mechanical cooling. The system enables heat recovery via an air-handling unit (AHU).

Full air-conditioning and filtration: This provides reliable, very clean, temperature- and humidity-controlled environments. Air is supplied to and exhausted from spaces via high-efficiency particle arrestor (HEPA) filters, driven by a central (AHU) controlling temperature and humidity according to the requirements of each space. It is impossible to overcome filter resistances with naturally driven airflows.

A representative quadrant of the notional hospital plan was assembled (Figure 3). The lighter the shading on the plan, the more ‘natural’ the environmental strategy. Simulations were conducted on the northwest quadrant. It has a higher proportion of spaces requiring controlled mechanical ventilation and cooling than is the case for the rest of the design; the results gained may be pessimistic in the context of the whole hospital. The first-floor quadrant revolves around the operating theatres, recovery and support spaces. The theatres shown adopt a hybrid environmental strategy; we hope to develop this concept with colleagues at Imperial College. A pathology laboratory is included, the actual
Figure 6: Addenbrooke’s Hospital in Cambridge, with the 10-storey slab block marked

laboratories ventilated mechanically, of course, to UK Home Office standards. The component plan elements were then developed into a full 35,000sqm, 180-bed, acute hospital. The first floor plan is shown as Figure 4. It indicates the tartan mat unrolled to accommodate the principal departments and ancillary functions of a small- to medium-sized acute hospital. As discussed, compact planning is favoured by clinicians and managers over shallow, linear planning because it offers a greater frequency of closer medical adjacencies. However, this theoretical deep plan will be liberally punctured to offer fresh air, using garden courtyards as daylit navigation landmarks. There is no need for the courtyards to be similar or for the plan to be orthogonal throughout, although extended west-facing elevations are avoided to mitigate solar gains. Again, the plan is coded to indicate the distribution of the five environmental strategies to cope with the present-day climate of southern England, which may become the future climate of the English Midlands, as the simulations indicate. The relative proportions of the five broad environmental strategies is indicated in Figure 5. Surprisingly perhaps, some 70% of the total floor area is indicated as naturally ventilated, simply or in a more contrived way.

The computer simulations predicted the following annual energy consumptions for the four climatic conditions considered:

- 2050 climate: 370.2kwh/m² or 37.6GJ/100m³
- 2080 climate: 361.7kwh/m² or 36.7GJ/100m³

These results suggest a near halving of typical achieved figures. As the study from which they are taken was calibrated against energy use predictions based on current hospital designs and construction, it is clear that significant energy savings can be achieved. However, the exercise reveals that delivering the lowest best target of 35GJ/100m³ will be very demanding. Medical equipment heat loads will be required to be significantly reduced at source. There is little evidence that this is a procurement priority.

Could renewable energy technologies solve this conundrum, restricted to those technologies that do not burn fossil fuels on site? The base case prediction on 2005 data of 376.7kwh/m² yields a total energy consumption of 467,485kwh. Even a 10% contribution (46,749kwh) requires a total of 234 wind turbines with a 3.2m blade diameter, rated at 1.5kw and assuming an average wind speed of 2m/s. This is infeasible in development control terms alone. Environmentally responsive design is much more effective.

The potential of refurbishment

Funded by the Department of Health and the Engineering and Physical Sciences Research Council, the next stage of our work was entitled ‘Design & delivery of robust hospital environments in a changing climate’ (DeRHECC, grant reference EP/G061327/1). The research asked whether the same concepts could be applied to the existing acute estate to increase resilience. By increasing resilience, would energy consumption rise? Would effective adaptation be prohibitively expensive?

How can one possibly comment on a distributed estate this size? Although vast, the NHS estate comprises a recognisable number of repeating ‘type’ building forms/plans of different eras. The first type comprises pre-1939 buildings, typically with ‘Nightingale’ wards arranged as finger-like pavilions. Subsequent 1950s/early 1960s ‘Nuffield’-type ward buildings may be high or low rise, of heavyweight or lightweight construction. A tower of Nuffield-type wards can be combined with a lower podium as the so-called ‘matchbox on muffin’ type. 1970s and 1980s hospitals are, in many cases, lower rise buildings punctured by courtyards; over 100 such schemes were built using the Department of Health’s ‘Nucleus’ template planning system. Very few existing buildings on the NHS estate were designed to be air-conditioned. Many are poorly insulated and often over-glazed, leading to increased risk of summertime overheating, even in relatively recently completed buildings.10

We selected one or more of each type from four partner NHS trust campuses. Here we report on two particularly revealing investigations exploring the potential to achieve the Department of Health’s target of 55–65GJ/100m³ for exemplary refurbishments.

Addenbrooke’s Hospital ward tower is in Cambridge, in the east of England. It was built between 1967 and 1972 comprising a 10-storey slab block (Figure 6).11-13 An initial survey of NHS hospital sites by the authors identified at least 50 buildings of this basic type. The tower is 120m long on its southwest/northeast axis and variously 14.1m and 18.3m deep. All floors have the same overall geometry, a long central corridor to which, on the south side, multi-bed wards (10.2m deep from corridor to window wall) occupy the wider end parts of the building. Private rooms and offices
face north. The occupied levels have a structural floor-to-ceiling height of 3.66m with, as designed, a 0.90m void above the suspended ceiling. Figure 7 shows a cross-section through a typical floor, showing the relative proportions of the single- and multi-bed spaces and also the relative height of the wards.

The windows run as a continuous ribbon at all levels on both facades, a facade-glazing ratio of 57%, incorporating opaque panels. Precast concrete panels form the spandrels. The original fenestration comprised large centre-pivot windows, offering prodigious opening area if required, but these windows were replaced with double glazing in the 1990s, which are restricted to 100mm opening, radically disrupting the natural ventilation opportunities. The continuous glazing here was intended to maximise views. Sun shading was planned, but omitted during construction. The priority was to achieve adequate winter heating (the 1962–63 winter had been brutal). Air was mechanically supplied from a central plant room into the central corridors. There is no organised exhaust except in bathrooms and utility rooms. Patent radiant ceilings, still in operation, helped to heat wards to 18.3°C (65°F) when the external temperature was -1°C (30°F).

Two floors were monitored by the research team. The building emerges as pretty resilient. Level 8 ward temperatures varied between 21.4°C and 28.5°C. Forty-five per cent of the hours during a midsummer measurement period (1 July–15 August 2010), had internal temperatures over 25°C, which for healthy people is seen as the value above which thermal dissatisfaction will occur, with 28°C being the upper limit of thermal comfort acceptance. There were 38 night-time hours (taken as 21:00 to 06:00) above 26°C (ie 8% of the total). The nurses’ stations mid-plan were consistently warmer. Temperatures were arrested by the very high air leakage from the building’s construction, while the windows were observed to be continuously open, so that energy consumption is close to the maximum recorded in the NHS, more than 100GJ/100m².

Five refurbishment options were devised by the team, ranging from the industry-standard PassivHaus-type approach (sealing the building within a heavily insulated jacket, with very efficient heat recovery) of Option 1 to hybrid Options 2 and 3, and more innovative passive schemes 4 and 5. Each is described in turn in what follows.

Option 1: sealed building, mechanical ventilation with heating and cooling (SMVHC). This depicted in Figure 8. The external envelope is overlaid to substantially improve air-tightness and U-values. The relatively recent thermal-break aluminium double glazing is retained to save cost. The ventilation system operates at 6 AC/h, as required by the Department of Health’s document Health Technical Memorandum (HTM) 03-01. Windows are sealed and a third layer of glazing added internally. The glazing is shielded by new interstitial blinds. Resilience to overheating is provided by increased mechanical ventilation with mechanical cooling for peak lopping when required. Modelling showed few summertime hours above the thresholds given in HTM 03-01 or those suggested by the Chartered Institution of Building Services Engineers (CIBSE); see Table 1. The annual predicted energy demands and emissions were 59GJ/100m², so within the DH target, and 137kgCO₂/m² respectively (Figures 9 and 10). These figures exclude delivered energy, which would add to this figure. Relatively little energy was used for cooling but the ventilation energy demand to deliver the high airflows was significant.

Option 2: sealed mechanically ventilated environment, radiant ceilings active in winter (heating) and summer (cold water for cooling) and heat recovery (SMVRHC). This option exploits the radiant action of the ceilings both in heating and cooling mode, thermally upgrades the envelope

<table>
<thead>
<tr>
<th></th>
<th>Existing</th>
<th>Predicted</th>
<th>HTM 03-01: Total hours² over 28°C</th>
<th>CIBSE: Night time³ hours over 26°C</th>
<th>BS EN 15251: Total hours over Cat I Upper limit⁴</th>
<th>Total hours over Cat II Upper limit⁴</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Min. temp. (°C)</td>
<td>Mean night time¹ temp. (°C)</td>
<td>Mean night time¹ temp. (°C)</td>
<td>Mean night time¹ temp. (°C)</td>
</tr>
<tr>
<td>1. SMVHC: Sealed building, mechanical ventilation with heating and cooling</td>
<td>28.6</td>
<td>21.3</td>
<td>24.0</td>
<td>16</td>
<td>21</td>
<td>789</td>
</tr>
<tr>
<td>2. SMVRHC: Sealed building, mechanical ventilation but radiant ceiling heating and cooling</td>
<td>27.3</td>
<td>21.5</td>
<td>23.1</td>
<td>0</td>
<td>0</td>
<td>na</td>
</tr>
<tr>
<td>3. NVMVPH: Natural ventilation, mechanical ventilation, perimeter heating</td>
<td>25.2</td>
<td>21.6</td>
<td>22.8</td>
<td>0</td>
<td>0</td>
<td>na</td>
</tr>
<tr>
<td>4. CVPH: Natural cross-ventilation, perimeter heating</td>
<td>25.7</td>
<td>20.9</td>
<td>21.5</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5. SVPH: Natural stack ventilation, perimeter heating</td>
<td>25.6</td>
<td>21.0</td>
<td>21.8</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

¹ Night-time hours are 21:00 to 06:00.
² Simulated hours are for May to September (153 days, 3,672 hours).
³ The grey shows where limiting criteria are exceeded.
⁴ The HTM 03-01 threshold is based on air temperature and rest are based on dry resultant temperature.
⁵ It is assumed that during the winter half of the year (October to April), the space will not overheat due to elevated ambient temperatures and solar gains. The limiting overheating values are therefore HTM 03-01, >50hrs over 28ºC; BS EN 15251, >438 hours above category upper thresholds; and CIBSE, >37 night time hours (1%) over 26ºC.

Table 1: Predicted dry-resultant temperatures in the refurbished wards during May to September: 2010 Cambridge weather
as Option 1, and retains the double glazing but adds solar shading. The mechanical supply delivers the fresh air requirement only so that it is below 6 AC/h and heat recovery is provided. The original radiant ceiling installation is refurbished to provide additional radiant heating. The simulations indicated an insignificant number of summertime hours above each of the HTM 03-01 and CIBSE thresholds (Table 1). The annual predicted energy demands and emissions were 46GJ/100m³ and 102kgCO₂/m² respectively (Figures 9 and 10). This represents a further improvement.

**Option 3:** natural ventilation and concurrent mechanical ventilation supply, heat recovery, opening windows and perimeter heating (NVMVPH). This hybrid option adopts a similar thermal upgrading of the envelope, retaining the current double glazing. All of the glazing can be opened by the occupants in peak summer periods, an important contribution to the overheating defence strategy of this option. In addition, the suspended ceilings are cut back as far as the supply ductwork allows, in order to expose the thermal mass of the concrete soffits. It performs well. There were no predicted summertime hours above the CIBSE or HTM 03-01 thresholds, or indeed the recent adaptive comfort British Standard, BS EN 15251, which allows for occupants to become accustomed to raised temperatures over a period of time (Table 1). The annual predicted energy demands and emissions were 40GJ/100m³ and 111kgCO₂/m² respectively (Figures 9 and 10), with ventilation energy (to deliver 4 AC/h) being about 40% of the whole.

**Option 4:** natural cross-ventilation, perimeter heating (CVPH). This option (Figure 11) dispenses with the mechanical ventilation system altogether. It enables cross-ventilation by threading crossover ducts in alternating directions across the width of the floorplate and upgrades the external envelope to the standard of Options 2 and 3. Perimeter heating is provided with actuated trickle vents below fully operable occupant-controlled windows, adapting the existing installation. Effective night ventilation will be important. All suspended ceilings are removed to expose the full flat concrete soffit above all patients so that vigorous night ventilation will cool the soffits. In this entirely naturally driven scheme there were no predicted summertime hours above each of the thresholds (Table 1) and the annual predicted energy demands and emissions were just 20GJ/100m³ and 44kgCO₂/m² respectively (Figures 9 and 10), the omission of fans being the key to such low energy demand.

**Option 5:** natural stack ventilation with perimeter heating (SVPH). This option (Figure 12) adds external exhaust stacks to develop more reliable air flows as required. A potential difficulty is the effectiveness of stub stacks on the windward face in which the flows may reverse with a reversing flow.
regime set up on each floor. In a hospital where the avoidance of the risk of airborne infection spread is clearly important, reversing flow regimes are unacceptable. This option removes the envelope of a floor at mid-height to provide a free air environment in which the stacks to the lower four floors can terminate. The stacks are strictly dedicated to one space per cell, as the part elevation/section reveals. The occupation of the elevation by deep stacks reduces the glazed area beneficially and the depth also shades the glazing through the critical summer overheating period. All windows are rendered operable and the cross-ducts of Option 4 are introduced below a fully exposed concrete soffit.

The intention would be to vigorously night-ventilate within the comfort parameters of sleeping patients and patrolling medical staff. All five schemes dramatically improve performance, but these predictions do not include energy use for matters unconnected with space conditioning (small power, medical equipment, restaurants etc), which can be 44% of the total. Given this, it is likely that only Options 2 to 5 could plausibly meet the NHS energy target and CO₂ emissions benchmark of 55–65GJ/100m². Importantly this excludes Option 1, which has a mechanical supply of 6 AC/h as stated in HTM 03-01.

Predictions of future performance use Test Resultant Year (TRY) and Design Summer Year (DSY) data for 2030, 2050 and 2080 supplied by the Prometheus project at Exeter University using the UKCP09 Weather Generator assuming the benign A1B scenario, which is now less credible due to the unexpectedly rapid rise in atmospheric carbon concentration. The existing building will 'go off the rails' by the 2030s. Table 2 shows that that Options 1 and 2 can eliminate overheating hours, but in the case of Option 1 this is done at a prodigious energy cost. Radiant cooling is much more effective. In extreme years, the hybrid Option 3 can maintain comfort to 2050 but clinical spaces are in difficulties by 2080. In standard TRY years, the natural ventilation Options 4 and 5 are remarkably robust but in extreme years performed well, as judged by the BS EN 15251 adaptive comfort method, in the 2030s but by the 2050s performance is unacceptable in Cat I spaces, the clinical spaces for the vulnerable, and by the 2080s also in Cat II spaces for less vulnerable patients.

In these extreme years, the number of hours internal temperatures exceeded 28°C was greater than exceeded externally, suggesting that passive night-time cooling will be less effective in future extreme years. The answer, then, is a naturally ventilated option with the capacity to install cooling in the future.

The UK’s pre-1939 stock
A parallel De²RHECC investigation suggests the masonry-built ‘Nightingale’ ward type is exceptionally resilient and has the potential to contribute to the solution of the conundrum if fundamentally reconfigured to deliver NHS modernisation policy goals. In the early 2000s, the NHS was directed to abandon the traditional collective healthcare model of an open shared ward and adopt the single room model hitherto reserved for the very unwell and the privately insured. Pre-1948 wards built to Florence Nightingale’s original, very detailed specifications were condemned by the British government. Nightingale wards in Britain comprised open dormitories for, on average, 24–30 patients.

The De²RHECC research team has measured and modelled the Nightingale wards at Bradford Royal Infirmary since 2009. These are four-storey ward buildings, a little narrower than the typical Nightingale ward, but in all other respects they conform to the type. The original Nightingale glazing configuration offered prodigious free areas for cross-ventilation, quadruple-banked hopper windows alternately top- and
bottom-hung. Internal temperatures in two full wards were recorded using calibrated data-loggers. During the monitoring period (1 June–11 August 2010), the ambient temperature reached a maximum of just 24.1°C. In mid-June, external night-time lows of just over 5°C were recorded. Across all eight measuring points in the first ward measured, the temperature only varied from 20.1°C to 27.4°C with a mean of 23.7°C. The mean night-time temperature was 23.2°C and the maximum diurnal swing recorded was just 5.2°C. The temperatures in a second ward were similar:

<table>
<thead>
<tr>
<th>Refurbishment option</th>
<th>TRY</th>
<th>DSY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Max. temp. (ºC)</td>
<td>Min. temp. (ºC)</td>
</tr>
<tr>
<td>Existing</td>
<td>28.6</td>
<td>21.3</td>
</tr>
<tr>
<td>1. SMVHC</td>
<td>27.2</td>
<td>21.8</td>
</tr>
<tr>
<td>2. SMVRHC</td>
<td>24.9</td>
<td>21.6</td>
</tr>
<tr>
<td>3. NVMVPH</td>
<td>24.9</td>
<td>20.8</td>
</tr>
<tr>
<td>4. CVPH</td>
<td>24.9</td>
<td>19.7</td>
</tr>
<tr>
<td>5. SVPH</td>
<td>24.9</td>
<td>20.8</td>
</tr>
</tbody>
</table>

2030

| Existing | 30.6 | 21.6 | 24.3 | 200 | 213 | 205 
| 1. SMVHC | 28.3 | 22.0 | 23.7 | 0 | 36 | 38 |
| 2. SMVRHC | 26.1 | 21.8 | 23.1 | 0 | 0 | 0 |
| 3. NVMVPH | 27.2 | 20.8 | 22.1 | 0 | 6 | 4 |
| 4. CVPH | 28.2 | 20.3 | 22.3 | 3 | 32 | 21 |
| 5. SVPH | 26.7 | 21.0 | 22.3 | 0 | 13 | 0 |

2050

| Existing | 31.0 | 21.2 | 24.3 | 316 | 351 | 362 
| 1. SMVHC | 28.6 | 22.0 | 24.0 | 0 | 64 | 36 |
| 2. SMVRHC | 26.2 | 21.9 | 23.2 | 0 | 0 | 0 |
| 3. NVMVPH | 27.3 | 20.9 | 22.4 | 0 | 11 | 2 |
| 4. CVPH | 28.9 | 20.3 | 22.2 | 3 | 33 | 22 |
| 5. SVPH | 27.9 | 20.9 | 22.3 | 2 | 12 | 4 |

2080

| Existing | 31.7 | 20.7 | 24.5 | 323 | 351 | 365 
| 1. SMVHC | 28.6 | 22.3 | 24.2 | 0 | 15 | 36 |
| 2. SMVRHC | 26.5 | 22.1 | 23.4 | 0 | 1 | na |
| 3. NVMVPH | 28.1 | 21.0 | 23.0 | 15 | 110 | 23 |
| 4. CVPH | 29.7 | 23.3 | 23.0 | 96 | 136 | 136 |
| 5. SVPH | 28.3 | 21.1 | 23.0 | 11 | 87 | 10 |

1 Night-time hours are 21:00 to 06:00.
2 Simulated hours are for May to September (153 days, 3,672 hours).
3 The HTM 03-01 threshold is based on air temperature and rest are based on dry resultant temperature.
4 The grey shows where limiting criteria are exceeded.
5 The darker grey indicates where the exceedence is deemed important in that it could not be easily corrected by refining the control strategy.
6 The ambient temperature exceeds 28°C in the current and future TRYs/DSYs by 2/44, 37/219, 62/341 and 126/566 hours in 2005, 2030, 2050 and 2080 respectively.

Table 2: Summary of predicted internal air and dry resultant temperatures for May to September: future Cambridge climate
Transforming the future of healthcare

“The best way to predict the future is to invent it.”
—Alfred North Whitehead, British philosopher

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for the adjusted energy demand of about 25GJ/100m² is significantly below the NHS target of 55–65GJ/100m² for refurbished buildings and significantly below the target of 35–55GJ/100m² for new buildings. In other words, it delivers the NHS carbon reduction target. Concerning CO₂ emissions, the predicted value for energy use to sustain the clinical function is about 30kgCO₂/m², which would uplift the total to about 53kgCO₂/m², just below the best Department of Health target. It is this level of provision that the target implies.

Three incremental refurbishment options were devised for the Nightingale wards (Figure 13). The first adds 100mm of insulation to the walls and 300mm to the roof; opens up the triple-light windows and protects occupants with an architectural external steel grillage; and provides a sunshade at each opening. Fresh air supply in winter is provided by the reopening of a trickle vent behind a perimeter heating element. The second option adds ceiling fans operable by the patients to this strategy, while the third option introduces 100mm-diameter high-level air inlets above each bed space, between each window, with a damper, and a simple convective heating device fixed to the internal face to enable supply air to be pre-heated and/or recirculation within the space. Primary heating and cooling is delivered through the installation of radiant panels. The addition of radiant cooling eliminates entirely the risk of overheating. The further adaptation work reported here takes the second option as the base treatment of the envelope.

For each option, the annual energy demands and CO₂ emissions were predicted (Figure 14). For the first option the space heating demand dropped from about 13GJ/100m² to an extremely low value of about 5GJ/100m²; lighting and small power gains remained unchanged. The CO₂ emissions were about 15kgCO₂/m². Clearly the added insulation has an impact. There were just 196 hours above the BS EN 15251 Cat I upper threshold, which represents about 5.3% of the total for the summer period (May to September) modelled. Assuming that the heating system is appropriately controlled during the wintertime so there is no overheating, then over a year there will be just 2% of the hours over the Cat I envelope, which is well within a suggested BS EN 15251 limit of 5%. The refurbishment reduces the impact of higher ambient temperatures and solar gain, resulting in a reduction in the peak temperatures. This effect may well yield benefits as the climate warms (see below). Full removal of the suspended ceiling might result in greater benefits still.

The second option’s slow fans are set at 0.3m/s air speed, well inside the allowable upper limit of 0.8m/s, to give an operative temperature depression of 1.2°C, at an assumed fan power of 70 watt per fan. The fans resulted in very little change to the occurrence of elevated summertime temperatures, there being about 5.2% of summertime hours above the Cat I upper threshold. Neither was there much difference in the energy demand and CO₂ emissions. This is because the predicted internal temperature rarely exceeded 26°C, the temperature at which the fans were set to switch on.

Internal temperatures were predicted for current and future typical and extreme temperature years as represented by TRYs and DSYs for current and future conditions, developed for Bradford by the University of Exeter using the customary CIBSE methods, as for the Addenbrooke’s exercise. Simulations were undertaken with all eight weather years for 2010, 2030, 2050 and 2080. Predictions of the likely air and operative temperatures were compared with the CIBSE, HTM 03-01 and BS EN 15251 overheating criteria (Table 3) as appropriate. The results clearly indicate that neither the existing or refurbished building will overheat in typical years, as judged by the HTM 03-01 and BS EN 15251 criteria. However, in the 2050s warmer nighttime temperatures may be experienced (although these might be ameliorated easily with a refined window-opening regimen if the windows are openable to a useful degree in sufficient numbers). In the extreme temperature years (ie the DSYs), however; HTM 03-01 shows overheating will occur in the existing building and in
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refurbishment Option 1 as early as the 2030s. Options 2 and 3 are resilient.

The highly resilient Option 2 was then taken as the basis for exploring reconfiguration possibilities with staff at The Bradford Royal Infirmary. The aim was to couple this resilient envelope with an internal layout better suited to privacy, though evidence from the hospital suggests the value of open wards for geriatric patients. Figure 15 shows:

a) The original Nightingale layout
b) Partitions: Subdivided into one-bed cubicles, the full 16 feet in height, with the addition of external bathroom towers
c) Pullman: An arrangement like a compartmentalised railway carriage, with the incorporation of an internal corridor and subdivision into six two-bed rooms served by split bathroom towers
d) Zig-zag: Preserves the full open volume but configures the beds either side of a wardrobe-high central partition set out to a zig-zag plan, offering visual if not acoustic privacy with fixed external bathroom towers
e) External corridor: The recovery of more usable floorspace by adding an external corridor to each floor, enabling ward rooms of three to five beds.

The options were modelled to assess airborne infection implications by our colleagues at Leeds. They perform well, and the results will be published in early 2014. The British government Cabinet Office is enthusiastic about the zig-zag arrangement, almost a kind of aeroplane ‘business class’, rethought for NHS patients.

Conclusion

In addition to the projects reported here, other types of hospital building have been modelled. They include an early 1970s medium-rise maternity wing, a low-rise 1980s maternity hospital, and a Nucleus hospital (which is highly resilient because of its recurring courtyards, but is dramatically impaired if courtyards are infilled). Work on modular buildings suggests they merit uptake: being fundamentally lightweight, they have inherently low resilience.

All the schemes have been costed in detail. The new-build scheme is costed at £5,360/m² by AECOM Davis Langdon. This figure can be compared, perhaps harshly, with capital costs for notional best upper and lower target hospitals at £5,060/m², but these targets are not achieved at this scale in reality. However, in payback terms, the new-build option comes into its own in the 2030s as ‘business-as-usual’ hospitals suffer radical air-conditioning refits. The Addenbrooke’s refurbishment schemes costed between £1,000 and £1,300/m². The Nightingale adaptation schemes are very similar, ie within current NHS refurbishment norms. The new director of the Department of Health Estates and Facilities Policy believes the optimal adaptation schemes could be rolled into the annual backlog maintenance operation across the NHS. These are grounds for optimism and action.

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References

15. Nightingale F. Notes on Hospitals: Being two papers read before the National Association for the Promotion of Social Science with evidence given to the Royal Commissioners on the State of the Army in 1857. London: John Parker and Son; 1859.

Figure 15: Various options for reconfiguring a Nightingale-type ward’s internal layout.
Bridgepoint Hospital is a new 404-bed complex continuing care and rehabilitation facility with the largest cohort of complex continuing care and complex rehabilitation patients in east Toronto, Canada. Patients at Bridgepoint Hospital have multi-morbidity (many health issues), often accompanied by psychological and social issues that affect health outcomes and quality of life. The new hospital — designed by Stantec Architecture/KPMB Architects (planning, design and compliance architects) in joint venture, and HDR Architecture/Diamond Schmitt Architects (design, build, finance and maintain architects) — was purposefully designed to address the needs of this patient population.

In 1860, a 100-bed house of refuge was opened on the site. Over the ensuing years, various new and repurposed facilities evolved to address healthcare challenges of the time, including a smallpox hospital, an isolation hospital, a regional centre for polio and a provincial centre for complex continuing care for people living with HIV/AIDS. The new hospital replaces a deteriorating (both in form and function), architecturally distinct half-round facility that was built in 1963 to meet the growing need to support people with long-term illnesses. Care provided in this facility had shifted from long-term care to complex continuing care and rehabilitation and it was branded as Bridgepoint Health in 2002. The new Bridgepoint Hospital, opened in 2013, has been branded as Bridgepoint Active Healthcare.

This research examines the impact of architectural design on psychosocial wellbeing (ie psychological wellbeing as a function of interactions with the social environment) and health in the context of the Bridgepoint Hospital redevelopment. This unique opportunity for a naturalistic quasi-experiment allows for the comparison of consistent patient, staff, and organisational performance outcomes based on design elements of the new facility design against their counterparts in the old facility, with a constant comparator. Three buildings are at the focus of this research: the in-situ historic building (occupied until April 2013), the new build (occupancy effective April 2013), and a complex continuing care and rehabilitation facility with similar patients, slated to undergo redevelopment in the coming years.

Background and rationale

Worldwide, chronic disease (eg long-term progressive illnesses such as diabetes, heart disease, osteoporosis, or neurological diseases that require ongoing management for which there is no cure) is considered to be one of the most pressing health issues of the 21st century. Public health advances together with an ageing population have contributed to an increased prevalence and burden of chronic disease, resulting in an expanding crisis within the healthcare system. While some individuals with chronic disease manage with minimal health intervention, growing proportions of individuals are complex and require ongoing care. Individuals with complex chronic disease (CCD) have frequent or lengthy stays in the hospital and face considerable challenges in adapting to changes stemming from their illness.

Over and above the physical health conditions, individuals with CCD experience considerable psychological distress resulting from the erosion of their self-concept as they adjust their role from that of a healthy individual with a normal life to that of a patient with a debilitating disease requiring long-term to permanent medical care. With the acceleration of population ageing over the next three decades, the complex continuing care and rehabilitation patient population will be the norm rather than a niche patient population.

The chronic disease crisis is global.
and as care needs shift from acute to chronic disease management, the ability to accommodate the current and future cohorts of patients with the current infrastructure is diminishing. Knowledge of design that leads to a high-performance healthcare facility for the patient of the future is limited. The shift in care needs, coupled with the projected growth of capital investments in healthcare facility redevelopment presents an opportunity to develop new architectural paradigms to optimise health outcomes for this emerging patient demographic. As evidence shows that psychosocial support and adaptation can influence health outcomes, psychosocially supportive or salutogenic design (ie design to promote positive psychological and social wellbeing) is increasingly relevant in the planning, design, and construction of healthcare facilities for this patient population.

Post-occupancy evaluation (POE) is the systematic evaluation of newly constructed buildings after they have been occupied for at least one year. POE of hospital buildings emerged in the 1990s to assess the effects of healthcare environments on safety, efficiency, and clinical outcomes with limited focus on outcomes related to psychosocial wellbeing. Despite the acknowledgement of POE as standard practice, and the burgeoning literature on evidence-based design, there are very few industry standards, guidelines or established methodologies for conducting POEs of healthcare facilities. Among the published research, there is variable methodological rigour and limited comparability of measurement and outcomes across POEs.

Moreover, POEs often lack a true pre-test comparison, which is commonly attributed to the construction or redevelopment of a facility to serve a different purpose than the original facility.

To date, relatively few research studies have compared pre- and post-construction facilities to assess the impact of design elements on health outcomes, thereby limiting the ability to attribute causality of outcomes to differences in architectural design. In addition to these shortfalls, POEs are often conducted by architectural firms and/or healthcare organisations with a vested interest in identifying successful outcomes associated with the design and investment rather than an independent research team to ground the evaluation in science.

Design intentions for Bridgepoint

With an awareness of the evidence on salutogenic design and the therapeutic benefits of nature, the architects sought to “enhance quality of prolonged life” and “restore courage and lift spirits” through the “power of good design.” The central design intentions were to create an environment of wellness by enhancing the connection to community, nature and the urban environment, providing opportunities for social interaction and inspiring physical activity and health. According to the architects, “the project is as much about city-building and engagement with the community as it is about creating an architecture of wellness”.

These intentions are evident in the design through specific elements described below.

Communal and social spaces: A greater quantity and variety of lounge, retail, and public spaces are provided in the new hospital. The architects sought to “enhance quality of prolonged life” and “restore courage and lift spirits” through the “power of good design.” The central design intentions were to create an environment of wellness by enhancing the connection to community, nature and the urban environment, providing opportunities for social interaction and inspiring physical activity and health. According to the architects, “the project is as much about city-building and engagement with the community as it is about creating an architecture of wellness”.

Examples of these design elements include:

- public spaces at grade with amenities (eg auditorium, library, pharmacy, coffee shop, urban porch connected to the public park and street access
- outdoor south facing terrace, café and ‘sky lounge’ on the top (10th) floor with distant views to the lake and city
- cybercafé located on the 5th floor (mid-building).

Physical and visual connection: Expansive glazing and passages from both rooms and corridors connect the patients to both the adjacent community and park both visually and physically. Its connection to the adjacent community is balanced with a conscious and constant connection to the park to derive “therapeutic benefits of nature.” Examples of these design elements include:

- use of glazing configured to draw patients to near and distant views of the lake, city, park and community
- main internal corridors and elevators terminate in views, exits and entrances to the exterior
- programming at grade encourages community interaction.

Therapeutic, respite and contemplative spaces: More and varied spaces that allow for rehabilitative and restorative therapy, quiet contemplation and respite were incorporated to foster calm and reduce anxiety. The new hospital includes an increased amount of

Figure 2: Plan of Bridgepoint Hospital showing programme layout

Source: Architectural KPMB Architects and Don Collins, Spacecraft
private space for patients and quiet indoor and outdoor lounge spaces. The generous spatial dimensions of rooms and corridors eliminate clutter and the sense of congestion and noise of the original building. Examples of these design elements include:

- single and double rooms, replacing four beds per room
- quiet contemplative gardens at various levels
- clear wayfinding and circulation corridors
- natural materials and colours (eg wood ceilings)
- lounges and therapeutic spaces with views to nature and the city
- outdoor labyrinth.

A rigorous approach to POE
The design intentions of the new hospital informed the theoretical basis for development of methods and measures for the POE. The overarching goal was to select outcomes that could be attributed, directly or indirectly, to the building design with consideration of the factors that might moderate the effect of design on psychosocial and health outcomes. As outlined in Figure 4, our approach to POE can be summarised according to five steps: collaborative research team development, review of sources to establish performance domains, selection of performance domains, development of the research design methods, and consideration of research outputs. Each component is described below.

1. Collaborative research team development: This research represents a unique interdisciplinary, intersectoral collaboration consisting of academic researchers, high-level government decision makers, principal architects in the field of healthcare facility design and healthcare directors. The full research team of nine core members has contributed to the development of the research questions and the consideration of outcomes to be assessed across methods in the research. All stakeholders have a vested interest in the development of consistent methods and measures to assess the impact of healthcare facility design on health, particularly as related to this facility. In contrast to POEs conducted by architects or hospital personnel,20 this collaboration was initiated by an independent research team with specialised theoretical and methodological expertise. This ‘one step removed’ aspect of the research has fostered the engagement of architects, stakeholders in executive/management roles at hospitals and their clients (patients) in the common goal of advancing research in the evaluation of healthcare facility design. Ongoing monthly meetings with opportunities for consultation and contribution fostered the active engagement of the architects and healthcare leaders and scientists throughout all phases of the research. This POE serves as a demonstration project for POEs across the province through the active engagement and participation of a senior architect within government.

2. Sources of performance domains: Sources used to identify the healthcare facility performance domains and resulting methods that are being used in the study are described below. The steps were:

   a. Document review and validation of design intentions: A review of redevelopment documents (eg the building programme, architectural design intent, building budget, models of care, blueprints, meeting minutes, briefing notes and user group summaries) provided context for the logic and decisions related to the building design. A stakeholder focus group consisting of architects, hospital administrators and redevelopment officers involved in various stages of the design process was convened to validate the design intent. The architects’ direct input in translating the design intentions, the design features, and hypothesised outcomes, together with the hospital administrators’ input on the relevance and importance of particular outcomes, enabled the development of methodological and measurement tools unique to the POE.

   b. Literature review: The impact of the built environment on psychological, social, and physical health has been widely documented3,9,19,27-33 and is fundamental to the study and practice of architecture.17,18,34 A literature review and synthesis was conducted to identify design elements that contribute to psychosocial wellbeing and health more generally, and to develop measures of relevance to the salutogenic design of the new Bridgepoint Hospital.

   c. Patient needs assessment: Chronic conditions are affected by several factors including physical health,25 personal characteristics and socio-demographics,4 mental health26 as well as health and social experiences.4,37 These dimensions formed the basis of an extensive patient needs assessment conducted at Bridgepoint Hospital prior to moving to the new facility. An emergent theme in the assessment results was the patients’ perceptions of how the building design (eg access to daylight and views, fresh air; social spaces, wheelchair mobility, wayfinding and privacy) influenced their experience, rehabilitation, and associated health outcomes.4,38

   d. Feasibility: Using the evidence generated from the document review and validation, the literature review, and the patient needs assessment, the team selected measures
on the basis of: (a) measures that are most directly relevant to the design intentions of the new facility, (b) measures for which there was a basis for comparison between the existing facility and new facility, and (c) measures that are readily available and of high quality within hospital databases.

Comparability of spaces across sites: Spaces were selected on which there was a basis for comparison and/or contrast across the existing (old) new and comparison facility.

3. Performance domains: The performance domains and associated measures were selected to be consistent with the design intentions for the new Bridgepoint Hospital, to make a novel contribution to the evidence-based design literature, and to be relevant to complex continuing care and rehabilitation. Three performance domains were selected: Psychosocial wellbeing (e.g., depression, social connectedness, sense of community, motivation, mood, stress reduction and coping), functional health (e.g., pain, mobility), and organisational efficiency (e.g., falls, infections, medical errors) across patients and staff.

4. Research design and methods: Overall, this research is based on a pre-post test quasi-experimental design with a comparison group to compare patient, staff and organisational outcomes across the earlier facility, the new facility and a comparison facility. This research design enables evaluation of interventions when randomisation is not possible, enhances the ability to infer causality between an intervention and an outcome, and enables the comparison across facilities over time.

Several quantitative and qualitative methods were embedded within the overall pre-test, post-test quasi-experimental design. Methods were selected on the basis of the research questions to be addressed, the construct to be assessed and the desired conclusions to be made. Whereas quantitative methods allow for the attribution of causality and enable generalisation, qualitative methods allow for the contextualisation and documentation of the lived experience. The selected methods enable the assessment of both anticipated and unanticipated uses and consequences of the building design.

The pre-test sample includes patients, staff, and the buildings at the earlier Bridgepoint Hospital and the similar comparison facility West Park Healthcare Centre (August 2012–February 2013). The post-test sample includes both patients and staff. Pre- and post-test groups are matched at the data analysis phase on the basis of medical conditions (patients), complexity of illness (patients), employment type (staff) and socio-demographic variables (e.g., socio-economic status, age, cultural background) of patients and staff. In addition to utilising standardised measures, other measures were uniquely created for this research to ensure relevance to the context and study objectives. The research protocol has been reviewed and approved by the Joint Research Ethics Board (JREB) of Bridgepoint Health/West Park Healthcare Centre/Toronto Central Community Care Access Centre/Toronto Grace Health Centre.

There were three patient-based research methods. First, computer-assisted survey examined the experience of the building design, psychosocial wellbeing and perceived health of patients. Data was collected via an interview format created using the Empirisoft Media Lab software platform, allowing for presentation of images, randomisation of question order,
visual response options and direct entry of responses on the computer. Measures included the experience of the building, its setting and designated spaces; sense of belonging; perceived improvement; satisfaction, mood, wellbeing, and affective reactions to various spaces in the hospital (changes in behaviour such as increased or decreased uses of various spaces), changes in emotional state (eg increased or decreased states of calm), and perceptions of room or space character (eg cheerful, contemplative, calming, exciting, depressing, stressful). Participant characteristics, psychological traits such as outlook on life and socio-demographic information (eg age, gender, cultural background) were also included in the survey.

Second, go-along interviews provided context and further understanding of the patient experience; this research component was led by Dr Paula Gardner. The go-along interviews combine focused interviewing with participant observation wherein the researchers accompanied participants on their natural outings and actively explored the physical and social practices by asking questions, listening, and observing while capturing visual (photographs), textual (field notes) and auditory (audio recording) data. This method is effective for studying the implications of place on health and wellbeing. In this study, patient go-along interviews involved guided tours of ‘day-to-day living’ with prompts from an interviewer to explore perceptions, experience and knowledge related to the design of the facility, with a particular focus on mobility, ease of navigation and self-efficacy.

Third, existing clinical and administrative data sources were used to examine differences in functional health and organisational efficiency outcomes related to patients while controlling for patient characteristics. A randomly selected subset consisting of 220 cases from patient administrative databases was extracted at each site at pre-test (spring 2013) and post-test phases (spring 2014). Measures included functional health outcomes (eg mobility, pain, level of physical function, stability of condition) and organisational efficiency and quality outcomes (eg discharge rates, length of stay, critical incidents such as falls and infections) for patients.

There were three staff-based research measures. First, a paper and pencil survey examined the experience of the building design, psychosocial wellbeing (eg burnout, satisfaction, interactions with colleagues), and functional health (eg ability to carry out their work) of staff. To allow for mass distribution and self-completion, the staff survey was administered in paper and pencil format. Key measures mirrored those in the patient computer assisted survey with slight modifications for relevance to staff. The survey also captured psychological traits and information relating to socio-demographics (eg age, gender, cultural background).

Second, focus groups with staff (eg clinical, executive/administration and facilities management) were conducted at each site at the post-test phase to provide context for the staff survey data and further understanding of the staff experience of the facility design and its implications for their work and wellbeing. Third, as a parallel to the patient database extraction, existing administrative data sources were used to extract information on staff health (eg employee turnover; sick days, critical incidents, workplace injury).

There were two building-based research measures. First, naturalistic observation, whose purpose is to examine the usage patterns of designated indoor and outdoor spaces by patients, staff and visitors. Naturalistic observation offers the unobtrusive collection of in-depth information about behaviour such as social interactions, activities and patterns of use, without disrupting naturally occurring behaviour and/or interaction. Selection of spaces to be observed was based on time of day, likelihood of use and design intentions. Six spaces were observed at each site at both pre- and post-test phases. Our team has developed a customised application for tablets (eg iPads) to capture the space, time of day, users of the space, field notes and observer narratives, contextual factors, as well as expected and unexpected uses of space. Second, the architectural design elements were documented and analysed, led by Cheryl Atkinson. The purpose of this documentation was to compare the architectural design elements of the spaces under study (based on form and function) across the old, new and comparison hospitals.

The documentation and analysis of design
elements across facilities was achieved through the visual comparison of building plans, functional and relational diagrams, and section plans. This analysis was supplemented with photographs of designated spaces and the use of software to model daylight penetration. Documented components include:

- type of space
- area and proportional differences in rooms and spaces
- organisational patterns of movement and circulation
- sectional organisation of public spaces
- plan relationships (proximities and adjacencies) of rooms and spaces
- travel distances (for patients and staff) to various activities and functions
- natural light quantity, location orientation and type (direct and indirect)
- acoustic conditions (actual noise quantity versus perceived noise quantity)
- window locations in the building and site
- window proportion, scale, dimension and configuration on wall
- material type, texture and colour.

Following the separate analyses of data within a given method, interpretive synthesis across methods and content analysis were used to triangulate and synthesise findings. The objectives of the interpretive synthesis is to identify common themes, factors and explanations across methods to inform knowledge translation and decision making support to knowledge users. Analyses include pre- and post-test comparisons between patients and staff within a facility (Bridgepoint Health or West Park Healthcare Centre) and across facilities (Bridgepoint Health versus West Park Healthcare Centre).

There are some limitations to using a pre-test post-test quasi experimental design. The most significant limitations are a consequence of: (1) a lack of randomisation and (2) pre-existing differences across comparison facilities (eg differences in physical elements of the site, differences across patients and staff) and contextual factors (eg organisational changes, unexpected outbreaks, accreditation activities, functional programming). To address these limitations, the differences across facilities have been documented and included in the data analysis to assess their impact on the results.

5. Research outputs: Results of this research will inform the development of a healthcare facility design evaluation planning guide. The planning guide will include tools, templates, and standards for research design, methodologies, and measurement of health outcomes to be applied to future hospital redevelopment projects.

Discussion

The redevelopment of Bridgepoint Hospital offers the opportunity to assess the impact of architectural design on psychosocial wellbeing and health via the comparison of outcomes at a purpose-built facility against its predecessor on the same site and with a control facility of similar staff and patients. Akin to best practice guidelines in healthcare delivery, this research offers insight into improved practices and enhanced rigour to assess design aimed at improving the psychosocial wellbeing and health of a complex continuing care and rehabilitation patient population. This research is the largest systematic POE in Canada. It represents a marked departure from the existing studies in this domain that tend to focus on operational, functional, and organisational outcomes rather than the interplay of mental, social and physical health within a complex care and rehabilitation patient population. Over and above the value of the project as an exemplar for standardised and mixed methodologies in the evaluation of healthcare facility design, it represents a unique approach to evaluation that uses the design intentions as a theoretical basis on which to measure outcomes.

In Canada, POEs of facility functionality are commonly included in the redevelopment plan but typically they are not designed as systematic research studies. The movement towards evidence-based design and increased need to demonstrate substantive outcomes related to capital investments has initiated a movement to incorporate facility evaluation from the beginning of the planning and design process. The expertise of our team and engagement of knowledge users will ensure a comprehensive, relevant and scientifically rigorous programme of research to improve decision making about strategic investments and policies related to healthcare facility design to improve health outcomes, and models of complex care and rehabilitation that include the built environment. On a smaller scale, results will be used to develop interventions related to design and the use of space at the new facility post-occupancy.

Beyond the Canadian context, this research is well positioned to contribute at an international level. Worldwide, healthcare planners are faced with the challenge of how to address the needs of this growing population in an era of deteriorating infrastructure and financial constraints. Key questions remain concerning how to make strategic investments in facility design. The development of consistent methodologies and measurement tools will generate the data that are necessary for comparisons across facilities. It will also enhance our understanding of the design elements that have the greatest impact on psychosocial wellbeing and health in general, as well as those that show greatest promise for specialised patient populations. This will serve the ultimate goal of improving wellbeing and health within a hospital context.

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References
26. Diamond and Schmitt to design new Bridgepoint Hospital, Canadian Architect. 18 October 2009.

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Walkable communities: Impacts on residents’ physical and social health

Researchers from Texas A&M University studied residents in a newly developed ‘walkable community’ in Austin, Texas to see how it changed their habits for physical activity and whether it increased social interaction and cohesion in the community.

Xuemei Zhu, Zhipeng Lu, Chia-Yuan Yu, Chanam Lee, George Mann at Texas A&M University

Living in a ‘healthy community’ is everyone’s dream. However, today’s communities have been increasingly designed around automobiles instead of pedestrians. Such auto-oriented communities have been questioned and criticized for their impacts on residents’ physical and social health.

In terms of physical health, a substantial body of evidence has shown that automobile-centred communities with segregated land uses, low density, disconnected street networks, and insufficient pedestrian and bicyclist infrastructure are associated with reduced physical activity such as walking or exercise in outdoor spaces. In contrast, walkable communities with mixed land uses, higher density, connected street networks, rich physical activity resources, and pedestrian-friendly designs have been linked to increased physical activity in daily routines. This environment-physical activity relationship is especially important in the context that obesity has become a leading public health problem in many parts of the world, and physical inactivity is a significant contributing factor. Traditional approaches of promoting physical activity are focused on personal factors and have not been very successful. Recent trends have shifted to a more comprehensive approach, targeting multi-level (personal, social and built environmental) factors. This shift came with the increasing popularity of the socioecological theory, which considers human behaviour to be influenced by interactive factors on intrapersonal, interpersonal, institutional, community, and public policy levels.

Community environments, in particular, have been increasingly recognised as important intervention venues, which may help promote sustainable, population-level changes toward more physically active lifestyles. However, the actual impacts of moving to walkable communities on residents’ physical activities have not yet been sufficiently studied.

In terms of social health, automobile-oriented communities tend to ignore the needs of pedestrians and make everyday life dependent on automobiles, which in turn reduces opportunities for social encounters and interactions in neighbourhoods. Limited studies suggest that walkable communities promote social health by encouraging walking and other outdoor activities, and thereby, facilitating social interactions among neighbours. Specific environmental features identified in previous studies include pedestrian-friendly community layout and site design, rich and diverse natural features and open spaces, and mixed land uses providing diverse destinations. For example, a US study reported a greater sense of community in Kentlands – a prototypic New Urbanist community with walkable environments, compared to a suburban, automobile-oriented development. Kentlands features diverse natural features and open spaces, pedestrian-friendly community layout, and traditional architectural style, as well as many other walkable environmental features. Another US study in Portland, Oregon found that residents’ sense of community was greater in a pedestrian-oriented neighbourhood than in an auto-oriented counterpart, and the perception of pedestrian environment is the most significant predictor of sense of community. Similar results were also found in Galway, Ireland. However, some inconsistencies have also been reported on the impacts of certain design features on the sense of community. For example, a study in Atlanta, Georgia reported a negative association between land-use mix and sense of community.

Growing trends in community development, such as New Urbanism, Smart Growth and Neo-traditional Development all advocate walkability as a guiding principle. The US Green Building Council released the LEED for Neighbourhood Development (LEED-ND) rating system to help guide the development of sustainable and walkable communities. The City of New York released Active Design Guidelines for promoting physical activities through design. Recent market studies have also shown growing demands for walkable communities. In practice, an increasing number of communities are using ‘design’ in addition to ‘programmes’ as the means to promote physical and social health. However, the actual health impacts of such design interventions are understudied.

Study design
This study addresses these knowledge gaps by conducting a case study of Mueller; Austin, Texas to examine its impact on residents’ physical and social health.
Mueller is a LEED-ND certified mixed-use community designed to support walking and other outdoor activities. Based on the previous literature, a conceptual framework (Figure 1) is developed for the hypothesised mechanisms of such impacts:
1. that the increase in community walkability will promote residents’ physical activities and social interactions and cohesion both directly and indirectly (by improving relevant personal attitudes and social support—the mediators), and
2. that the resulting increases in physical activity and social interactions and cohesion will mutually reinforce each other.

This study explores whether residents had significant increases in their physical activities and social interactions and cohesion after moving to Mueller and, if yes, how these behaviours changed in terms of types, locations and frequencies. Based on findings from this study, a follow-up analysis will use structural equation modeling to examine the whole model to better understand underlying mechanisms for such behaviour changes.

Study setting
Mueller is the first exemplary project by the City of Austin to use a series of innovative policies to create a model for walkable, sustainable and equitable communities. Developed on the former airport site near downtown, Mueller is planned to house 10,000 residents and 10,000 employees. It includes many activity-friendly design features, such as high-density, mixed-land uses, well-connected street networks with sidewalks, and rich and diverse natural resources and open spaces distributed throughout the community (Figure 2 and Table 1). It is also a mixed-income community with over 25% of the housing units being affordable and indistinguishably incorporated into the community with market-rate units. Table 2 illustrates Mueller’s socio-demographic and environmental characteristics, compared to those of the City of Austin. As of May 2013 when this study was conducted, Mueller had about 40% of its property developed, with about 3,500 employees and about 900 single-family households.

Method
Mixed methods, including a focus group (n=13) and an online survey (n=148), were used to triangulate research results in this study. A focus group was conducted first to obtain information about Mueller residents’ physical activities and social interactions and cohesion before and after moving into Mueller, and to gain in-depth understanding of the reasons that lead to changes in those behaviours. Focus group results were also used to guide the development of the survey instrument in the following phase. Thirteen participants were recruited at a Mueller Neighbourhood Association meeting. The participants first discussed a series of topics raised by the facilitator, including reasons of moving to Mueller, and comparisons of community environments and behaviours before and after the move. After the discussion, the participants were given a map of Mueller, and asked to use coloured stickers and notes to identify destinations they went to for physical and social activities, and places that caused concerns. Content analysis was used to analyse the focus group data.

The online survey was designed for an adult from a household to answer questions about himself/herself and the oldest child in the household, if there was one. It asked about the respondent’s physical activities and social interactions and cohesion (i.e. the outcome variables) and the child’s physical activities (which were not included in this study), as well as personal, social and built environmental factors that may have influenced these outcomes, before and after moving into Mueller. Most of the questions were retrieved from previously validated questionnaires and several new questions were added based on the focus group results. Pilot tests (n=6) were conducted and led to minor revisions of the questionnaire. The finalised survey took 20-30 minutes to complete.

The subjects were recruited through email invitations to Mueller residents (sent by the developer through its listserv) and online messages posted on the Mueller Community online forum.
Table 1: Mueller’s activity-friendly environmental features

<table>
<thead>
<tr>
<th>Activity-friendly location</th>
<th>Activity-friendly neighborhood pattern</th>
<th>Activity-friendly housing</th>
</tr>
</thead>
<tbody>
<tr>
<td>A central urban location with good connections to public transit and other urban amenities</td>
<td>High density and mixed land uses: Civic/institutional buildings, offices, commercial areas, town centre, parks, open spaces and diverse housing within walkable distances</td>
<td>Eg front porches and rear garages; garden courtyards; vertical mixed use with offices/shops at street level and living units above; access to parks and open spaces; various types of housing</td>
</tr>
<tr>
<td>Parks and open space: Easily accessible, well-connected and evenly distributed park system (140 acres) with 13 miles of hike/bike paths/lanes</td>
<td>Streets: Grid-like, hierarchical and well-connected, with complete sidewalks, buffers between sidewalks and streets, traffic calming, and good maintenance, visual quality and surveillance</td>
<td></td>
</tr>
</tbody>
</table>

Reminder messages were posted on the Mueller Community online forum one and two weeks after the initial invitation. Email reminders were not sent out as the developer limits such use of its listserv. After the survey results were collected, valid and complete surveys were included in the analyses using SPSS 19. Descriptive statistics was examined first, and then t-tests were used to examine the pre-post move differences in outcome variables. Pearson correlations matrix was examined to see if there is any significant correlations between changes in physical activities and changes in social interactions and cohesion.

Focus group results

Thirteen subjects (eight females and five males) participated in the focus group session that was carried out in 2013. Three were over 65 years of age; two were in the 50–65-year age group; seven were in the 30–50-year age group; and one was in the 20–30-year range. In terms of ethnicity, there were one African American, one Asian and eleven white participants. Two participants had young children. Residents’ durations of living in Mueller ranged from one month to four years. The content analysis showed increases in physical activity and social interactions and cohesion after moving into Mueller, and the role of some environmental factors in facilitating such changes.

Physical activities. The majority of the participants reported increased physical activities. They reported that environmental features such as complete and well-connected sidewalks, various parks and open spaces, convenient bike routes, diverse destinations, and safety (eg good street lighting for jogging early in the morning) supported diverse outdoor activities, such as walking, bicycling, jogging, golfing (in a golf course nearby) and flying kites, among many others (Figure 3). Several participants reported walking more since moving to Mueller; and one older lady mentioned walking two or three times more since the move. The participants identified many places to walk to, including parks, greenways, business areas, friends’ homes, block parties, mailboxes and the hospital in the community. One participant worked in the community and said she walked to and from work. Two residents liked bicycling and one biked to and from work. Several other residents used public transportation or private cars (with much shorter commute distances now and some carpooling with neighbours) to travel to work. Two participants reported a ‘no driving in Mueller’ rule in their household, and another participant reported a yearly saving of US$1,200 in gasoline for vehicles after moving to Mueller.

Most of the residents were looking forward to the opening of HEB (a chain supermarket), and plan to do grocery shopping without driving. In addition, the back alleys (see the upper right photo in Figure 3) were often used as shared spaces among a small group of neighbours, and were perceived as safe places for children to play in. A young father proudly said that his four-year-old son learned how to ride a two-wheel bicycle in the back alley. He said that the alley had very little through traffic and was safe, which led him to choose this place for teaching his child how to bike.

Social activities and cohesion. Participants also reported increased social interactions and cohesion due to the changes in community environments. Communal facilities such as community mailboxes were reported by several participants as popular places for social interactions. One resident’s parents liked to go to the mailbox every day and often came back with stories about new friends they made and news in and around the community. Another woman enjoyed the location of her house being close to mailboxes, because that’s how she knew a lot of her neighbours. Several participants reported that smaller backyards encouraged them to use front porches and community outdoor space more often, and thereby have more opportunities to interact with neighbours. Back alleys also played an important role, as they became semi-public areas with multiple functions: the residents hold block parties there, and children also play in the alleys.

Focus group discussions revealed that Mueller has become a close-knit community even with the current partially completed development status. One participant called it “a sun city with diversity”, welcoming people of all ages, ethnicities, income levels, and religions. More importantly, people in Mueller know and help each other. They often share news and exchange favours (eg borrowing tools) with neighbours, pay attention to what is happening in the community, and report concerns, whenever there is any, which had helped to build a safer community.

Map of activities and concerns. Eleven participants used the maps and coloured stickers that were provided to identify their homes, most-liked places for physical and social activities and places of concern.
Table 2: Physical environment and population characteristics of Mueller and the City of Austin

<table>
<thead>
<tr>
<th>Variables</th>
<th>Features</th>
<th>City of Austin</th>
<th>Mueller community</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical environment*</td>
<td>Population density (unit: persons/acre)</td>
<td>Mean: 6.8 (SD: 3.7)</td>
<td>14</td>
</tr>
<tr>
<td>(Mueller’s environments represent a departure from typical community developments in the area)</td>
<td>Land-use mix</td>
<td>Mean: 0.45 (SD: 0.24) (range: 0–1)*</td>
<td>10,000 employees; 130,000 residents; 366,000 square feet of retail space</td>
</tr>
<tr>
<td></td>
<td>Street connectivity (unit: intersections/100 acres)</td>
<td>Mean: 19.7 (SD: 11.3)</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>Sidewalk coverage (unit: %)</td>
<td>Mean: 23.7 (SD: 13.7)</td>
<td>Close to 100</td>
</tr>
<tr>
<td></td>
<td>Parks and open space coverage (unit: %)</td>
<td>Mean: 8.9 (SD: 9.6)</td>
<td>20 (each household has greenspace within 600 feet)</td>
</tr>
<tr>
<td>Population*</td>
<td>% of Hispanic or Latino (of any race)</td>
<td>31.4%</td>
<td>35.1%</td>
</tr>
<tr>
<td>(Mueller’s population is representative of the Austin population)</td>
<td>White (one race)</td>
<td>68.3%</td>
<td>71.4%</td>
</tr>
<tr>
<td></td>
<td>Population under the age of 18</td>
<td>22.1%</td>
<td>21.9%</td>
</tr>
<tr>
<td></td>
<td>Mean household income</td>
<td>$68,659</td>
<td>$66,923</td>
</tr>
</tbody>
</table>

* Physical environmental measures for the City of Austin were based on the authors’ previous measures of 74 neighbourhoods (defined as the public elementary school’s attendance area) in Austin.

b The land-use mix measure describes the evenness of land use distribution based on square footage of residential, commercial and office land use. The value ranges from 0 (single land use) to 1 (a perfectly even mix).

The population information was obtained from the 2010 Census and the 2005–2009 American Community Survey.

Popular places for physical and social activities included parks, trails, walking paths, waterfront, pool, restaurants, bank, friends’ homes and the community central activity areas (eg the hangar for farmer’s market). The business area with both big-box retail and small shops received mixed opinions. Commonly mentioned places of concerns were traffic-related. Participants pointed out places that needed safer walking paths and crossing (especially for children), more traffic lights, more speed control and better visibility. A resident stated his safety concerns about the large surface parking in the retail area. One mentioned that big-box retail may not be the type of business they need in Mueller. Another resident thought the community park, Lake Park, should be better maintained.

Survey results

A total of 148 valid responses were collected from the online survey, yielding a response rate of 16.4%. The sample included 67% of females and 11% of Hispanics, and had a mean age of 44. In terms of education level, 5.4% had doctoral degrees; 8.8% had professional degrees; 32.0% had master’s degrees; 46.3% had Bachelor’s degrees; and 7.5% had other types of lower education. The household incomes were diverse, with 7.5% in the $200,000 or more category, 12.5% between $150,000 and $199,999, 28.3% between $100,000 and $149,999, 8.3% between $80,000 and $99,999, 12.5% between $60,000 and $79,999, 20.8% between $40,000 and $59,999, and 10% in the $39,999 or lower category. Compared to the 2010 Census information for Mueller, female and non-Hispanic populations were somewhat over-represented in this study.

Physical activity: After moving to Mueller, 70.5% of the respondents had much or somewhat higher levels of physical activity, and 51.6% reported much or somewhat better health. Details about specific types and frequencies of physical activities are listed in Table 3. T-test results showed that all physical activity variables, except the number of days per week with at least 30 minutes of physical activity and time spent on biking per day, had significant (p<0.05) increases after moving to Mueller. Meanwhile, time spent in a car reduced by 90 minutes per week. It is worth noting that the time spent on walking in community after moving to Mueller had a mean of 123 minutes (29 minutes per day and 3.9 days per week), which is already very close to the public health guideline for the level of physical activities needed for adults to obtain significant health benefits – at least 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity aerobic physical activity per week, or a combination.

The locations of physical activities were examined for their percentages of use and the corresponding pre-post move differences (Figure 4). Neighbourhood streets and sidewalks were the most popular places for physical activity in both pre-move communities and Mueller. About 80% of Mueller residents used them for physical activities. Compared to those in previous communities, the percentages of Mueller residents using neighbourhood streets and sidewalks, parks or trails/paths in a park, greenways/trails/paths not in a park, homes, and natural green spaces or places near water features for physical activities were higher by 18%, 43%, 38%, 22% and 10%, respectively. In contrast, the percentage of residents using gyms or fitness facilities for physical activities was 18% lower, likely because of the rich outdoor venues that are freely available in Mueller.
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Social interactions and cohesion: Results also showed that social interactions and cohesion increased significantly after the participants moved to Mueller (Table 3). They ‘say hello to neighbours’, ‘stop and talk to neighbours’, ‘socialise with neighbours in home or restaurant’, and ‘ask for help from or exchange favours with neighbours’ for 10.1, 7.4, 2.5, and 2.9 more times per month, respectively. Their perceptions of being in a ‘close-knit neighbourhood’ and neighbours being ‘countable to help in case of need’ were 3.3 and 2.1 points higher respectively, on a five-point scale.

Correlations between increases in physical activity and increases in social interactions and cohesion: The increase in walking in community correlated significantly with the improved perception rating for ‘neighbours being countable to help in case of need’ (correlation=0.243, p value=0.012) and with the increase in the frequency of ‘saying hello to neighbours’ (correlation=0.315, p value=0.001).

Conclusion
This study has several limitations. First, the survey was conducted online and may not have reached some of the residents who do not use computers and internet frequently in their daily lives. Second, the sample size was relatively small and subject to non-response bias (eg female and non-Hispanic populations being over-represented; residents who were more interested in this topic being more likely to respond to the survey). Third, the pre-move data were collected retrospectively, and were limited to possible recall errors. Finally, the analysis in this paper was limited to bivariate tests, and did not explore the impacts of multi-level factors on changes in physical activity and social interactions and cohesion.

Despite these limitations, this study contributed important knowledge about the ‘actual’ health impacts of moving to a walkable community on residents’ physical and social health. This is an important yet understudied area with significant policy implications. The results from this study provided solid evidence that residents did improve both physical activities and social interactions and cohesion after moving to the walkable environment in Mueller, Austin, Texas. Increased walking in the community correlated with improved social interactions and the perception of social cohesion. This is an important yet understudied area with significant policy implications. The results from this study provided solid evidence that residents did improve both physical activities and social interactions and cohesion after moving to the walkable environment in Mueller, Austin, Texas. Increased walking in the community correlated with improved social interactions and the perception of social cohesion. The findings also showed a significant reduction in driving among residents, suggesting important environmental benefits that walkable communities can bring by reducing fuel consumption and environmental pollution.

These findings also provided preliminary results that can guide the next step of this study, which is to run a full structural equation model to test the hypothesised mechanisms about how environmental changes influence physical activity and social interactions and cohesion, directly and indirectly through improving relevant personal attitudes and social support.

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E matthew.skeen@aurecongroup.com
### Table 3: Descriptive statistics of and t-test results about the pre-post move differences in physical activity and social interactions and cohesion

<table>
<thead>
<tr>
<th>Variables</th>
<th>Descriptive statistics</th>
<th>Results of t-test for pre/post differences (Post-move value – pre-move value)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-move mean (SD)</td>
<td>Post-move mean (SD)</td>
</tr>
<tr>
<td>Days/week with 30+ minutes of physical activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Travelling in private car</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Days/week</td>
<td>3.6 (1.9)</td>
<td>3.5 (1.7)</td>
</tr>
<tr>
<td>Minutes/day</td>
<td>60.1 (6.6)</td>
<td>5.7 (1.6)</td>
</tr>
<tr>
<td>Minutes/week</td>
<td>40.8 (25.0)</td>
<td>27.8 (17.7)</td>
</tr>
<tr>
<td>Total biking</td>
<td>253.4 (178.9)</td>
<td>163.9 (120.2)</td>
</tr>
<tr>
<td>Days/week</td>
<td>0.5 (1.16)</td>
<td>0.9 (1.5)</td>
</tr>
<tr>
<td>Minutes/day</td>
<td>34.7 (18.2)</td>
<td>30.9 (17.2)</td>
</tr>
<tr>
<td>Minutes/week</td>
<td>15.2 (37.4)</td>
<td>28.8 (58.4)</td>
</tr>
<tr>
<td>Total walking</td>
<td>3.4 (2.1)</td>
<td>4.35 (2.21)</td>
</tr>
<tr>
<td>Days/week</td>
<td>27.0 (1.45)</td>
<td>29.1 (14.5)</td>
</tr>
<tr>
<td>Minutes/day</td>
<td>74.7 (97.4)</td>
<td>140.0 (115.5)</td>
</tr>
<tr>
<td>Walking in community</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Days/week</td>
<td>2.4 (2.2)</td>
<td>3.9 (2.2)</td>
</tr>
<tr>
<td>Minutes/day</td>
<td>27.0 (1.45)</td>
<td>29.1 (14.5)</td>
</tr>
<tr>
<td>Minutes/week</td>
<td>74.7 (97.4)</td>
<td>140.0 (115.5)</td>
</tr>
<tr>
<td>Times of social interaction per month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Say hello to neighbours</td>
<td>10.9 (9.2)</td>
<td>21.1 (9.8)</td>
</tr>
<tr>
<td>Stop and talk to neighbours</td>
<td>5.6 (6.7)</td>
<td>13.2 (9.1)</td>
</tr>
<tr>
<td>Socialise with neighbours</td>
<td>1.9 (3.9)</td>
<td>4.9 (5.9)</td>
</tr>
<tr>
<td>Seek help from and exchange favours with neighbours</td>
<td>1.5 (2.1)</td>
<td>4.0 (5.2)</td>
</tr>
<tr>
<td>Social cohesion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neighbours could be counted to help in case of need</td>
<td>2.3 (8.9)</td>
<td>4.4 (0.9)</td>
</tr>
<tr>
<td>This is a close-knit neighbourhood</td>
<td>0.8 (12.3)</td>
<td>4.3 (0.9)</td>
</tr>
</tbody>
</table>

*The online survey collected information about the number of days per week (continuous variable) and the number of minutes per day (categorical variable with ranges of 1–10, 11–20, 21–30, 31–40, 41–50, 51–60 and 60+) spent on each type of activity. The number of minutes per week was calculated by multiplying the number of days per week with the midpoint value of the time range (or a value of 65 for the ‘60+’ category) for the number of minutes per day.*

*b Social cohesion variables were measured on a five-point Likert scale, by asking the respondent about how much he/she agreed or disagreed with the statement (1 = strongly disagree, 5 = strongly agree).
Gardens in healthcare facilities: Steps toward evaluation and certification

Restorative outdoor spaces are desirable in healthcare facilities, but there is no consistent approach to their definition or evaluation. This paper charts the move towards formalisation and certification.

Clare Cooper Marcus, Hon ASLA, MA, MCP, University of California, Berkeley, and Naomi Sachs, MLA, ASLA, EDAC, Texas A&M University

Landscapes that promote health and wellbeing, often referred to as ‘healing gardens’, are increasingly being incorporated into healthcare facilities throughout the world as an essential design component. This is due in no small part to a growing body of evidence on the health benefits to patients, visitors and staff, as well as the financial benefits to the organisation. Along with empirical research on the efficacy of such spaces, there is also sufficient evidence to inform decisions about design specifics, such as what elements, configurations and programming in outdoor spaces can elicit the best possible outcomes.

Unfortunately, this information often does not make it from research to practice. While acceptance of the need for restorative gardens and other ways to connect people with nature shows great progress, the implementation – how gardens are designed, constructed and maintained – has been accomplished with varying degrees of success. In order to bring about the best outcomes, decision makers need tools that can help them translate existing research into good design. A set of design guidelines in a forthcoming publication by Cooper Marcus and Sachs will help to educate and inform practitioners. The guidelines will also become the basis for: 1) development of a set of essential components to be incorporated into a standardised evaluation, in the form of an audit tool, of existing spaces, and 2) a certification programme comparable to the US Green Building Council’s (USGBC) LEED for Healthcare. The objective of this paper is to present a set of necessary steps that will lead to a potential evaluation process and certification of restorative gardens, and to discuss why at this time such a process should be considered.

Some definitions

Professionals and lay people use many different terms for outdoor spaces that promote health and wellbeing. Though ‘healing gardens’ is the most commonly used, others include landscapes for health, restorative landscapes, therapeutic landscapes, restorative gardens, therapeutic gardens, wellness gardens and rehabilitation gardens. For this paper, the authors use the term restorative garden(s) and healing garden(s) interchangeably, which they define as ‘an outdoor (and sometimes indoor) space designed for a specific population, a specific site and a specific outcome’. The authors also use the term ‘access to nature’, which they define as any type of sensory contact with nature. Access to nature includes both visual (being able to see elements of nature from indoor and outdoors) and/or physical (touch, smell, sound, taste) contact. Use of the term ‘access to nature’ asserts the need for all members of a design team, and not just the landscape architect, to design for nature contact throughout the entire project.

Acceptance of restorative gardens

Restorative gardens and other means of connecting people with nature – via outdoor gardens, views of nature, indoor plants and gardens, natural materials and other forms of biophilic design – have long been considered ‘the icing on the cake’: amenities that often were either not included at all, or were the first thing to be eliminated from a project when the budget began to tighten. In a short
period of approximately 20 years, people’s opinions of gardens in healthcare facilities have evolved from a general, intuitive sense that ‘nature is good for us’ to increased acceptance, based on both quantitative and qualitative evidence, that the inclusion of opportunities for nature contact is an essential design element.

Decision makers at myriad facilities recognize that connection with nature increases not only positive health outcomes for consumers (patients and their families) and staff but also for the facility’s bottom line. In surveys conducted by the Center for Health Design, one-third of respondents reported that they ‘always’ implemented healing gardens in their designs.3,4

Beyond self-regulation

In the US, provision of access to nature and restorative gardens has now evolved beyond action taken by individual stakeholders. The Green Guide for Health Care (GGHC) was the sector’s first sustainable design rating system, a toolkit that integrated health principles and practices into the planning, design, construction, operations and maintenance of healthcare facilities. The 96-credit GGHC system includes credits such as SS-9.1, ‘Connection to the Natural World – Outdoor Places of Respite’, and SS-9.2, ‘Exterior Access for Patients’. The GGHC was accepted by the USGBC, reformatted as a LEED product, and launched in 2011 as LEED for Healthcare.5 Like the GGHC, the Sustainable Sites Initiative (SITES) was modelled on the LEED rating and accreditation system. SITES focuses on general outdoor environments. The programme creates voluntary national guidelines and performance benchmarks for sustainable land design, construction and maintenance practices. From its inception in the early 2000s, SITES recognised the salutary value of landscapes through its Human Health and Well-being credits.

The intent of the guidelines, adopted by 42 of the 50 US states, is to identify the minimum requirements for the design of new or renovated healthcare facilities. The authorities having jurisdiction (AHJs) use the guidelines as a basis for design approval. Drawings are only approved, and the project can only go forward, if the guidelines’ minimum standards are met. Other regulations are following suit. For example, in the latest Recommended Standards for Newborn ICU Design, ‘Access to Nature and Other Positive Distractions’ is standard number 25: ‘When possible, views of nature shall be provided in at least one space that is accessible to all families and one space that is accessible to all staff. Other forms of positive distraction shall be provided for families in infant and family spaces, and for staff in staff spaces.’6

But what about quality?

Clearly the message is getting through about the restorative benefits of nature. This is an important and exciting step. But now new issues and question arise: What kind of nature? What kind of restorative gardens? What sorts of spaces, and elements within those spaces, will be the most beneficial for patients, visitors, and staff? Sadly, designers and clients are often unaware of the research available suggesting what is essential if a garden is to be truly restorative. Outdoor spaces designated as ‘healing’ often lack such basic necessities as shade, comfortable seating, places for privacy or enough greenery to even be perceived as a garden. Components that have become popular, such as labyrinths, are incorporated without consideration for their appropriateness to the site, understanding of their meaning, or potential users’ ability and energy levels.

One of the most frequently recurring reports by garden users about why they visit a garden, and how they feel about it, is that it offers an opportunity to ‘get away’. It serves as a much-needed contrast to an indoor environment that is often sterile, alienating and frightening. And yet all too often, the outdoor spaces provided do not offer the escape that people so desperately need.

One assumes it would not occur to a designer of a cancer care clinic or a new emergency department not to consult the latest evidence-based design literature, or at least the minimum standards. In fact, in most cases it would not be awarded the contract unless it had done so. In the case of healing or restorative gardens, this is generally not so. A designer may be hired because she or he has previously created successful parks, office plazas or corporate headquarters – and it is assumed that a healthcare garden is not very different, despite that fact that it may be serving a user group with very specific needs, such as those with cancer, post-traumatic stress disorder or Alzheimer’s disease. Some
Success of restorative gardens is critical for many reasons. First, a well-designed, well-constructed and well-maintained garden promotes the best health outcomes. Second, such a garden will bring a positive image to the facility and all of the stakeholders involved. Third, every successful restorative garden is powerful testimony to restorative gardens, and access to nature, as a whole. On the other hand, an unsuccessful restorative garden – whether it was not well designed or has fallen into disrepair – conveys the message that provision of access to nature is not something worth spending precious budget dollars on.

The next step: guidelines
The world is in the midst of a giant healthcare design and construction boom. There is a critical need for evidence-based, or research-informed, guidelines to aid in the design of outdoor spaces that facilitate health. Design guidelines for restorative gardens appeared first in the late 1990s with the publication of Clare Cooper Marcus and Mami Barnes’ Healing Gardens: Therapeutic benefits and design recommendations and Martha Tyson’s The Healing Landscape: Therapeutic outdoor environments. The culmination of recent work by Cooper Marcus and Sachs will appear in a co-authored book, Therapeutic Landscapes: An evidence-based approach to designing healing gardens and restorative outdoor spaces. The heart of the book is a set of design guidelines. While there is not a vast amount of research on restorative gardens based on post-occupancy evaluations (POEs), there are sufficient repeated findings from these – as well as from less formal evaluations, plus existing audits and best practice – to suggest what is essential in the design of a successful outdoor space in a healthcare facility. In Therapeutic Landscapes, one chapter features a comprehensive set of design guidelines applicable to all types of healthcare facilities. This is supplemented by guidelines in the eight following chapters on facilities for particular patient groups.

Guidelines are an important step in aiding designers and clients to make good decisions. However, are they enough? There is a need for designers and clients to be more accountable for what they provide. Two important and related tools are needed now, and both can easily grow out of the guidelines already created and the research upon which they were based: first, a tool for systematic evaluation, and second, a certification programme.

Evaluating restorative gardens
It is important to consider why and how some healing gardens succeed and others fail. Landscape architecture, like other design professions, has been lax in evaluating built work. Unless this happens in a consistent way, designers cannot learn from past mistakes and the profession cannot move forward. It is true that a systematic evaluation costs money. This suggests the need for a line item in the budget for a garden that covers an evaluation – and fine-tuning – one to two years after implementation. Evaluation is an opportunity to learn, to improve an existing space and to add to the fund of knowledge about design.

Post-occupancy evaluation
There are several ways of evaluating the success (from the users’ perspective) of a therapeutic healthcare outdoor space, regardless of whether or not it is specifically labelled a healing or restorative garden. The most comprehensive method is a diagnostic POE, where the goals of the original design and how they were translated into physical form are compared with how the space is now used (or not used). Use (by whom and for what) is recorded by an objective measure such as activity mapping, stop-frame filming and the like. The users’ feelings about the space are recorded via subjective measures such as interviews or surveys to find out...
what they like or don’t like, how often they visit, impediments to use, recommendations for change and so on. The use of multiple methods to provide reliable findings is essential. A diagnostic POE – the most in-depth form of POE – is ideally carried out by a team consisting of one or more social scientists familiar with the methods and one or more healthcare garden designers, but not the designers of the garden being studied or anyone responsible for it in any way. This avoids possible bias. Together these two basic categories of data – behaviour-mapping providing objective information about use, and interviews providing subjective information about motivation and feeling – offer a good overview of the success and/or shortcomings of the garden being studied.

An unbiased evaluation of a restorative garden two or three years after construction can document how well the intent of the garden and the needs of its users were understood, how well the original goals of the design were translated into physical form, how well the garden serves the users it was intended for (as well as those it was not planned for), how well the planting is doing, how well the space is being maintained, and what changes in physical design, maintenance, or policy need to be implemented. Ideally, the results of any kind of POE are compared with the designer’s and client’s original intentions, maintenance or construction changes since the garden was opened, changes to the use of adjacent buildings, and changes of policy regarding who may use the garden, hours the garden is open or similar issues. Particularly important would be the evaluation of a garden based on evidence-based design with specific desired outcomes. A series of POEs of similar types of gardens can provide valuable information on exemplary gardens that can serve as models of user-oriented design, as well as outdoor spaces intended to be therapeutic that have failed to live up to their promise.

To date, some of the most useful POEs of hospital gardens have been conducted by landscape architecture or psychology students as research at masters or PhD level10–12 or by academics.13,14 Very few have been conducted or commissioned by the designers or clients. The usual reasons are that the POE is time-consuming, there is no line item in the budget to cover the cost, or the designer does not have the skills to carry out such a study. A less comprehensive and less costly POE, referred to as an indicative POE, can be conducted in a short time span (a few hours to a few days) and can include interviews with the staff and/or the designers and a walk-through evaluation.15 Of all of the types of POEs, the indicative POE is the closest to an audit.

Audits: an alternative to POE
Audits are, in general, less expensive and less time-consuming than POEs. An audit tool is a scored checklist of elements and qualities that should, ideally, be incorporated into a restorative garden. Unlike a POE, an audit is a process for evaluating only the finished built work and whether it meets minimum standards. This form of evaluation can reveal a great deal about how well design details have been implemented – including suggesting areas in need of change – but reveals nothing about who uses the space or their motivations or the initial goals of the client, designer, and other stakeholders. An audit is usually conducted by three or four individuals who are knowledgeable about therapeutic garden design, but who were not involved in the original programming, design, and construction process. They evaluate the garden separately and then their scores are averaged to avoid any bias.16

Cooper Marcus first developed a simple audit tool in 2006 for students on field trips to hospital outdoor spaces. Elements that were considered potentially important were organised and worded so that students could focus on one feature after another as a way to make their visit more instructive than a random wandering through and taking pictures. This initial attempt was followed in 2008 by a more systematic, research-based Alzheimer’s Garden Audit Tool (AGAT) for gardens at dementia care facilities,16 and later by audits for evaluating gardens for the frail elderly, gardens at children’s hospitals and at general acute care hospitals. In the latter case, Cooper Marcus and Barnes were hired by a Chicago area landscape architecture firm (Hitchcock Design Group) that specialises in healthcare design. The firm wanted to know how well its designs were functioning. Existing research for each of these types of outdoor space was drawn upon to create a series of qualities and features that, theoretically, should be present. These elements and qualities were scored in each of six gardens being evaluated on a 5-point scale: 0 – Not applicable; 1 – Feature not present or quality missing; 2 – Feature or quality poorly provided; 3 – Feature or quality moderately well provided; and 4 – Feature or quality very successfully provided.

Four people evaluated each garden separately and the results were averaged to avoid bias. The 2008 consultant report on the post-occupancy evaluation of six Hitchcock Design healing gardens resulted in some elements being eliminated from the audit tool since they were too difficult to evaluate (for example, ‘The garden is culturally appropriate’). In 2012–13 the AGAT tool was adapted and improved by Alzheimer’s Australia, and its Dementia Therapeutic Garden Audit Tool will be tested...
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Potential audit tool: acute hospitals

The authors are now working with colleagues to refine the audit tool developed in 2008. It is organised under two broad headings, similar to the guidelines in Therapeutic Gardens: What is essential (required), and what is desirable but not essential (recommended). At this point it seems appropriate to create such a tool for evaluating a healthcare outdoor space that serves the broadest possible variety of users – an acute care hospital with a range of patient types, staff and visitors. Once this tool is tested, others could be developed for more specific populations and spaces.

The added benefit of a standardised audit tool is that, as audits are performed and information is gathered, we begin to build a database and a collection of case studies of existing built works, something that is sorely lacking in the scholarship of healthcare design. The more that healthcare gardens can be evaluated and documented, the more examples will be available for clients and designers to use as models.

The audit tool is at a preliminary stage of development. It will be developed around a scoring system consisting of two parts: benchmarks (essential features or qualities supported by research and/or best practice) and credits (elements that are desirable but optional, supported by extensive observation, best practice and common sense, but not yet by research evidence).

Organisation of the audit tool will likely be in the following categories:

- **Visual and physical accessibility**: for example, garden is visible from well-used indoor spaces such as lobby; waiting room; doors and thresholds to garden are easily navigable
- **Safety, security, and privacy**: for example, clear boundaries or sense of enclosure; places for people to retreat on their own or with others; adequate lighting
- **Emotional and physical comfort**: for example, covered seating area at garden entry; comfortable seating throughout the garden; mitigation of extreme weather; quiet location
- **Nature distraction/engagement**: for example, high ratio of greenery to landscape; rich sensory details; seasonal interest; sight and sound of water; wildlife

The essential next steps will be to refine the audit tool by testing for validity and reliability among people using it, as well as across various different sites and to propose the weighting of various elements. Then, compare this with other audit tools developed for different kinds of indoor and outdoor spaces. These will include the Seniors Outdoor Survey for Staff (SOS-1) and Senior Outdoor Survey for Research (SOS-2) developed by Susan Rodiek17; the US Department of Transportation Walkability Checklist; and the three audit tools described by Ian Forbes in the April 2013 issue of this publication: the Achieving Excellence Design Evaluation Toolkit (AEDET), A Staff and Patient Environment Calibration Toolkit (ASPECT) and the dementia Evaluation Audit Tool (EAT). Sachs is conducting a literature review to locate other existing audit tools that could potentially be used as models.

The third step will be to consider how the proposed audit process can become the basis for the certification of restorative gardens. Testing the audit tool will likely reinforce the original Therapeutic Landscapes guidelines. In other words, this is not a one-way process, but rather an iterative series of steps that will lead to the best method(s) to both guide and assess healing gardens. At the same time that the audit is being developed and tested and the guidelines are being refined, a certification programme will be developed. While guidelines, evaluations and audits can help designers and clients understand what they should do (or should have done), only certification can hold designers and healthcare facilities to certain (minimum) standards.

Steps to certification

The logical procedure culminating in a viable restorative garden certification programme should follow a sequence of: research • evidence-based design guidelines and standards • audit tool • refine guidelines as needed • certification. Ideally, research will continue to be conducted throughout the entire process.

A secondary benefit with certification would be the validation of the initial guidelines. As certification carries more weight than recommendations, it has the potential to reinforce design guidelines. One informs and strengthens the other. Furthermore, once guidelines are tested through an audit process and formalised...
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into a certification programme, they can be incorporated as details for other certifying and regulatory bodies such as LEED, SITES and the Joint Commission.

At this point, the issue of certification, which will most likely be voluntary, raises many questions: Does the same group of people develop both the audit and the certification programme? How will both be developed, tested and implemented? Who will administer the certification process? What is the incentive for a client or designer of a restorative garden to have it certified? Will it encourage a design-to-a-minimum or checklist mentality? Should certification be a one-time event or should it be renewed?

Despite all these challenging issues, it is clear that healthcare facilities are used to being credentialed and may welcome a method for evaluating their gardens. Staff and patients are attracted to facilities with high-quality environments, including outdoor spaces, and a credential document will give designers a common language as to what are healing or restorative gardens. A useful first step may be to institute a healing or restorative garden award category to be added to those administered by the International Academy for Design & Health (IADH) or by the American Society for Landscape Architects (ASLA). This would help to focus attention on what is good design in this important component of the healthcare environment. While we certainly do not have all the answers regarding these steps towards a consistent approach to evaluation and certification, it is time for us to carry the hard work that has been done thus far to the next level to ensure the best possible outcomes for all involved.

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References
17. Rodek S. Seniors outdoor survey for providers (SOS-R). Seniors outdoor survey for researchers (SOS-P); Seniors outdoor survey for researchers (SOS-R). College Station, TX: Center for Health Systems and Design; 2013. Available from www.accessatnature.org/resources.html

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Art in hospitals rarely excites much media interest but in April 2013 a burst of publicity exploded around two installations at the newly opened £35m Montefiore Hospital in Hove, on the UK’s south coast. Newspapers and broadcasters gushed over the arrival of rock and ambient music star Brian Eno’s sound and art installations in the reception area and in a dedicated ‘Quiet Room’ in the basement. “Brian Eno is helping to improve the nation’s health,” declared The Independent newspaper.

In fact, these sensory installations are part of a broader intention to generate a feeling of welcome and serenity throughout this hybrid building. A handsome late Victorian furniture depository turned 1970s insurance company office building, it has been given yet another incarnation by architectural firm IBI Nightingale, as a flagship private hospital for client Spire Healthcare, the UK’s second biggest private healthcare provider.

**Welcoming patterns**

Eno’s ‘77 Million Paintings for Montefiore’ is encountered in the plush, thickly carpeted lounge area of the reception and enhances the intended impression of being in a boutique hotel or luxury spa lobby rather than a hospital. An ever-shifting pattern of sound, images and colours drawing on hundreds of Eno’s past sketches and paintings plays across eight rectangular flat-screen panels with simple white wood frames. These are clustered together in a diagonal and asymmetrical pattern against the wall. The images on the screens are mostly abstract – Aboriginal-style finger paintings or simple geometric-shape arrangements – but occasionally decorative patterns reminiscent of Islamic art emerge. Generative software ensures an almost infinite variety to the display (you’d have to sit there for 100 years in order to see the same arrangement, apparently). Sometimes the pictures and colours overlap, giving the appearance of richly layered batik textiles, but always the hues shift and evolve at a slow, meditative pace – around 10 seconds per image – accompanied by the gentle ‘ping’, ‘tinkle’ and ‘bong’ of the ambient soundtrack.

Downstairs in the Quiet Room, a much more minimalist version awaits. Eno has been quoted as saying: “Music does something to you that says ‘be quiet and listen’.” He uses this power to dramatic effect in this darkened room, filled only with four comfortable armchairs, a lamp and one large screen, on which a fixed Mondrianesque outline of one square and two rectangles plays host to a series of very gradual colour shifts, while Eno’s soundtrack slowly chimes and bloops in the background.

It’s his use of space and tone that really sets Eno apart from other ambient music doodlers – the way he allows each note to resonate, drawing out the qualities of sound as it fades in a way that heightens attention but quietens the mind. And his light paintings do much the same. The wash of light and colour and the slow choreography of hues with sound are viscerally affecting. During a BBC Radio 4 news recording for the Today programme, a patient was encountered emerging from this Quiet Room.

Images from Brian Eno’s ‘77 Million Paintings for Montefiore’ in the hospitals reception area shift at a slow, meditative pace, accompanied by an ambient soundtrack.
He had been in there to reflect on his diagnosis with a severe form of cancer, and yet there he was, enthusing about the calming effect of this room: “It’s instant,” he said. “Every place should have one. It’s wonderful.”

There were plenty of challenges in converting this tricky structure, with its staggered floorplates, steep internal ramps and fixed service cores, into an ergonomically efficient and welcoming hospital and one intended to work particularly well for staff as well as patients. But many of the problems posed by the building’s past have been turned into assets, resulting in ample, high-ceilinged and substantially daylit bedrooms, surgeries, consulting rooms and reception area. Project architect and studio associate director Richard Ager embraces the idea of the building as ‘serene’. He says: “It’s a simple way of describing the calm, tranquil spatial experience we were hoping to evoke. The Brian Eno artworks accentuate this intention exceptionally well.”

The Eno connection actually emerged from IBI Nightingale’s efforts to involve Spire staff quite intensively in the consultation process. One of Spire’s leading surgeons, Robin Turner, had encountered Eno’s original ‘77 Million Paintings’ installation at the Brighton Festival when Eno was its guest director in 2010. Turner witnessed the calming effect it had on its viewers – some of whom remained in the gallery for hours – and it occurred to him how beneficial such installations could be in hectic healthcare settings. He happened to know Eno’s manager lived nearby, and it was during design consultations for the Montefiore that the connection was made. Eno, for his part, welcomed the commission. His interest in using music to beneficially impact on stressful environments is well documented, following the release of his Music for Airports album, which has actually been transmitted over the sound system at New York’s La Guardia and elsewhere.

Patients and staff both seem delighted with the resulting scheme. Consultant surgeon Sandeep Chauhan says: “It’s an incredibly efficient building and genuinely nice to come to. I’ve never been in an environment before where the inpatients don’t want to go home.” He and other staff regularly come to the tranquil reception area for quiet chats and meetings. Robin Turner (who admits to unwinding between patients by playing Eno’s smartphone app Bloom) likes to simply sit and contemplate the art and soundscape when he can. “It’s much more restful having sound with vision – which is in effect just colour and light. It’s almost deconstructed. There’s nothing to focus on. It focuses on you.”

Living elements

These installations feel almost like living elements, in the way that they gently morph and glow and pulse. With one at the most public part of the building and one hidden away, deep in its core, they convey a sort of enduring heart or ‘spirit’ to the building, a calm, uplifting physical presence that lives on in your memory for days after a visit. What this could mean in terms of reducing anticipatory fear and anxiety to people having to make repeat visits to the facility – for cancer treatment or physiotherapy after hip or knee replacements – is worth investigating. In fact, the hospital is planning a piece of research into the physiological effects of these artworks, working with Diane Waller, professor of art psychotherapy at Goldsmiths University.

Jacqueline Poncelet, an artist with a strong track record in healthcare arts, as well as a current commission from Oxford’s John Radcliffe Hospital, says it would be impossible to compare what an art work like this could achieve in the calm of a well-funded private hospital with the impact it might have in a busy, cash-strapped, state-funded one: “You would be doing everyone a disservice to compare the two,” she says. But she does think what this artwork says about how art can contribute to wellbeing in healthcare settings is “very exciting”.

Veronica Simpson is an architectural writer
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