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JULY 2011

A SEARCH FOR SIGNIFICANCE

Architecture as an expression of cultural and civic values

ALSO:

Academy Awards 2011: Shortlist revealed
Scientific Review: Cancer Treatment Environments
Project report: Children's Health
Market report: Europe

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International Academy for Design and Health

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Volume 4 Issue 3

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Contributors

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The promotion of wellness, rather than the prevention of disease, should be the main focus in the design of healthcare facilities

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In *Blubberland*, Farrelly gives us an inspiring view of what could be, were we to overcome our headlong dive towards mass self-destruction

Cover Image
Trillium Health Centre in West Toronto, Canada, designed by Perkins Eastman Black (see pp16-19)
Photo: Ben Rahn/A Frame

A world in perspectives

Long anticipated, the 7th Design & Health World Congress & Exhibition in Boston, USA is upon us, and it will certainly be worth the wait. Never before has such an exciting line-up of speakers from world governments, global universities and international corporations, as well as many expert independent consultants, joined together to explore the critical and, increasingly understood, role of design in improving human health, wellbeing and quality of life. The salutogenic perspective that focuses attention on factors that support health, rather than risk factors and the treatment of disease, has been pushed long and hard and with great effect by the International Academy for Design & Health, as the organisers of the World Congress and the publishers of this journal. And now is the time for North America as our hosts to take the lead, in collaboration with colleagues from Asia, Africa, the Middle East and Europe, to explore how to implement these ideas. We particularly welcome the Ministers of Health from South Africa, Iraq and Malaysia in a special session dedicated to exploring salutogenic design perspectives (p8). We also look forward to announcing the winners of the 2011 Design & Health International Awards (see shortlisted submissions on pp9 & 44-55) at the Gala Awards evening, when some Eastern-inspired designs from Asia and the Middle East have a chance to break the West's hegemony. See you in Boston!

Marc Sansom
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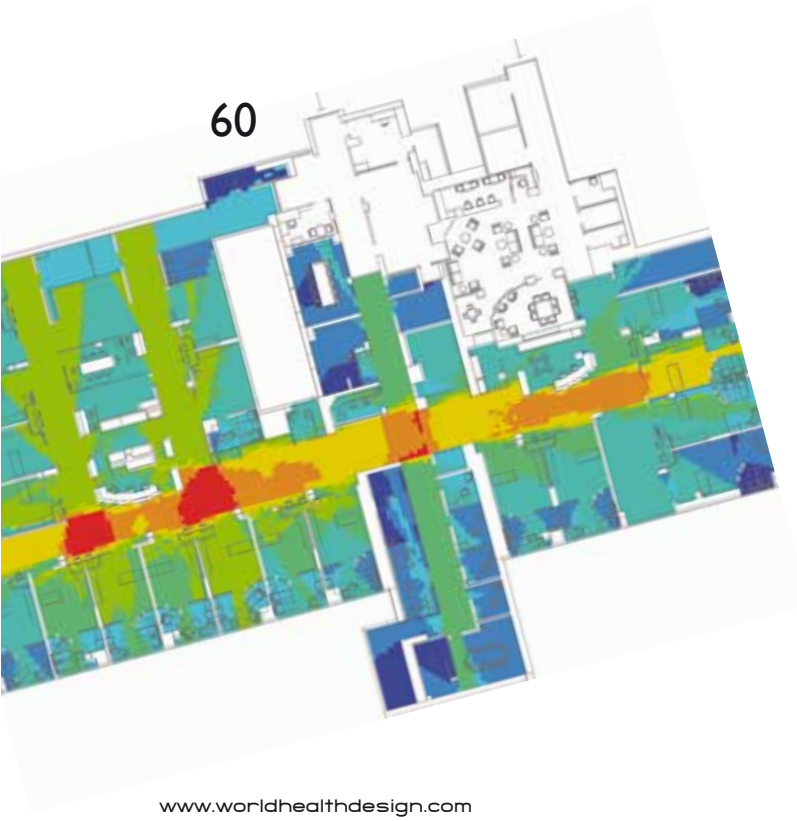

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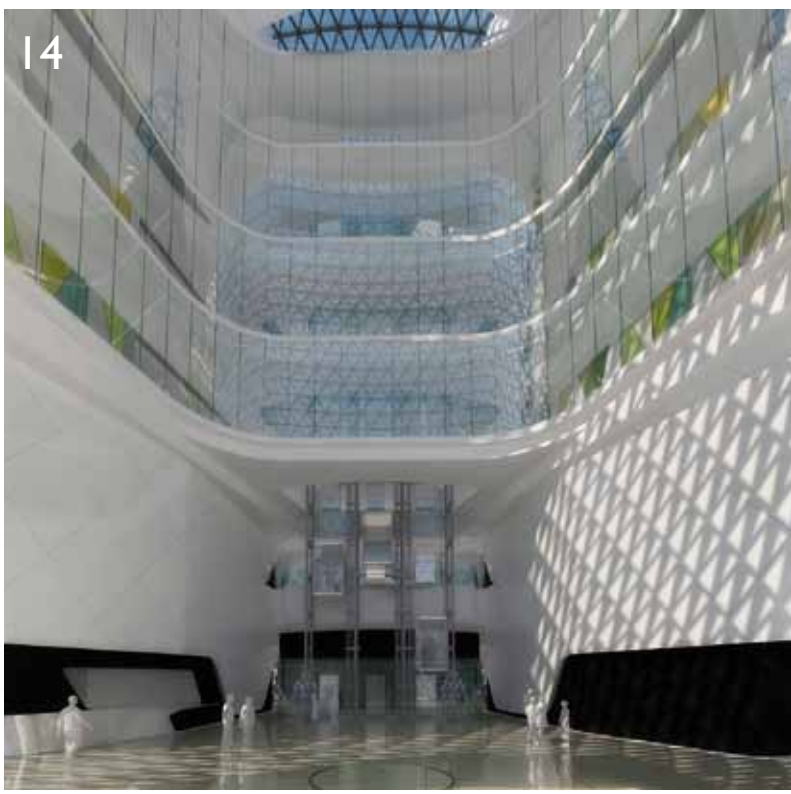


Ministers of Health join World Congress

The Marriott Copley Place, Boston July 6-10, 2011
Design & Health
7TH WORLD CONGRESS & EXHIBITION

Three Ministers of Health and their advisors from the emerging economies of South Africa, Iraq and Malaysia will participate in a special session dedicated to Ministries of Health at the 7th Design & Health World Congress which will be held in Boston, USA, 6-10 July 2011.

The session, which will be chaired by Lord Nigel Crisp of the UK's House of Lords, and Prof Alan Dilani, director general of the International Academy for Design & Health, will explore the role of design and the physical environment in promoting health in poorer countries of the world, as well as seeking ways to transfer knowledge with and between richer countries.

The panel discussion will form the final session of the World Congress, taking place from 16.30-18.00 on Saturday 9th July, and is anticipated to be the best attended session of this year's inaugural World Congress in the USA.


Mrs Datuk Rosnah binti Haji Abd Rashid Shirlin


Dr Majeed Amin Jamal


Dr Aaron Motsoaledi

The full line-up for the session, includes:
Chair: Lord Nigel Crisp (UK) and Prof Alan Dilani (Sweden)
Dr Aaron Motsoaledi, Health Minister of South Africa
Dr Massoud Shaker, Senior Advisor to Health Minister (South Africa)
Dr Majeed Amin Jamal, Health Minister of Iraq
Dr Rang Shawis, Senior Advisor to Health Minister (Iraq)
Mrs Datuk Rosnah binti Haji Abd Rashid Shirlin, Deputy Health Minister of Malaysia
Dr Abdul Rahim Mohamad, Director Planning & Development Division, Ministry of Health (Malaysia)
Dr Aki Linden, CEO, Helsinki and Uusimaa Hospital District (Finland)
Mr Cliff Harvey, Project Management, Ministry of Health and Long Term Care (Canada)

IFMA partner for FM forum

A pre-congress session, developed in partnership with the International Facilities Management Association (IFMA), will be held at 15.00-17.00 on 6 July at the Design & Health World Congress in Boston.

The session, chaired by Arup's global head of healthcare, Phil Nedin will explore how the interaction of facilities management and design processes can impact on the efficiency of operations, and improve health outcomes.

Presented by the IFMA Healthcare Council, the global forum will also feature David Hanitchak, director of planning & construction/project executive at Partners Healthcare Real Estate; Steve Cockerham, vice president of planning, design & construction at BJC HealthCare; and Paula Quan, executive director of capital planning & design at the Children's Hospital Boston.

Vischer honoured by ASID

Dr Jacqueline Vischer has been awarded the 2011 Nancy McClelland Merit Prize by the American Society of Interior Designers (ASID) in honour of her "contribution to improving the environment for humanity through design-related activities, or projects, oriented toward affecting the global human environment and benefiting the community at large".

The ASID commented: "As a pioneer in the development of an empirical-based methodology to measure the parameters of a building-in-use, Dr Vischer has consistently provided thought leadership on the topic, guiding architects, engineers and interior designers in the improvement of the functionality of a business to make people more effective at their jobs, specifically developing the Building-in-Use assessment system, a program based on her own experience solving various environmental problems that affect workspace buildings."

The award will be presented at ASID's national conference at NeoCon 2011 in Chicago on 13 June.

Corrections and clarifications

In the market report on North America on pp24-31 of the last issue of WHD, Alice Liang was reported on p29 as being from Perkins Eastman – she is an architect with Montgomery Sisam Architects (MSA), and the quote attributed to her on that page should have been attributed to Bob Davies, principal in charge of the Sister Margaret Smith Centre project at MSA. The Sister Margaret Smith Addictions Treatment Centre, pictured on p27, was designed by Montgomery Sisam Architects. Also on p29, Women's College Hospital was designed by Perkins Eastman Black and its joint venture partner IBI Group Architects.

Academy Awards 2011 shortlist looks East

John Wells-Thorpe, UK, Awards chair

In a challenge to North America and Europe's pre-eminence in healthcare design, the shortlist for the Design & Health International Academy Awards 2011 includes two projects from Singapore, one from Iraq and two from Australia. The Khoo Teck Puat Hospital in Singapore has been shortlisted in both the International Health Project (over 40,000 sqm) and the Sustainable Design categories; the Brain and Mind Research Institute – Youth Mental Health Building in Australia, has been shortlisted in the International Health Project (Under 40,000sqm); the Ballarat Acute Mental Health Facility in the Mental Health Design category; and The Children's Hospital, Kurdistan in northern Iraq, and the National Heart Centre in Singapore in Future Health. The shortlist was announced following a two-stage judging process involving more than 25 world-renowned interdisciplinary judges.

The Academy will also present a Lifetime Leadership Award to a leader and visionary who has shown an ongoing commitment to enhancing the health, wellbeing and quality of people's lives through the creation of healthy environments. The final prizes will be announced at a ceremony on 9 July in Boston, USA during the 7th Design & Health World Congress. For images and descriptions on each shortlisted submission, see pp44-55.

Susan Black, Canada

International Health Project (over 40,000sqm)

Khoo Teck Puat Hospital, Singapore, submitted by CPG Consultants
Central Manchester Hospitals PFI, UK, submitted by Anshen + Allen part of Stantec Architecture
Forth Valley Royal Hospital, UK, submitted by Laing O'Rourke
Lunder Building, Massachusetts General Hospital, submitted by NBBJ

Sponsored by NOA

John Cooper, UK

International Health Project (under 40,000sqm)

Seattle Children's Bellevue Clinic and Surgery Center, USA, submitted by NBBJ
The Waldron, UK, submitted by Henley Halebrown Rorrison
Brain and Mind Research Institute – Youth Mental Health Building, Australia, submitted by BVN Architecture

Sponsored by HDR Architecture

Blair Sadler, USA

Future Health

Glenside Campus Redevelopment Health Facilities (Precinct 1), submitted by MAAP
National Heart Centre, Singapore, submitted by Broadway Malyan
The Children's Hospital, Kurdistan, Iraq, submitted by Make Architects
Seattle Children's Phase 1 Expansion, USA, submitted by ZGF Architects

Sponsored by Farrow Partnership Architects

Phil Nedin, UK

Sustainable Design

Khoo Teck Puat Hospital, Singapore, submitted by CPG Consultants
Forth Valley Royal Hospital, UK, submitted by Laing O'Rourke
Portadown Health and Care Centre, submitted by Avanti Architects

Sponsored by Arup

Annette Ridenour, USA

Patient Environment and Art

Dept of Psychosocial Oncology and Palliative Care at the Princess Margaret Hospital, Canada, submitted by ARK
Chesterfield Royal Hospital NHS Foundation Trust, UK, submitted by Artinsite

Sponsored by Perkins Eastman Black

Colum Lowe, UK

Interior Design

Dept of Psychosocial Oncology and Palliative Care at the Princess Margaret Hospital, Canada submitted by ARK
Emergency Department, The Hospital for Sick Children (SickKids), Canada, submitted by Stantec Architecture

Sponsored by AIA – Academy of Architecture for Health

Chris Liddle, UK

Mental Health

Ballarat Acute Mental Health Facility, Australia, submitted by Billard Leece
Sister Margaret Smith Addictions Treatment Centre, Canada, submitted by Montgomery Sisam Architects
Rose Lodge Assessment and Treatment Centre, UK, submitted by MAAP

Sponsored by HLM Architects

Luigi Ferrera, Canada

Product Design

EndoAlpha Technical Panels, submitted by Olympus
PR 3 Secondary Barricade Override, submitted by Primera Life
Compass System, submitted by Herman Miller Healthcare

Sponsored by World Health Design

Paul Barach, Australia

International Research Project

From Pre-design Research to Post-occupancy Evaluation of Cancer Treatment Environments
Zhe Wang, PhD, RA, LEED AP, EDAC; Michael Pukszta, AIA; Natalie R. Petzoldt, AIA, LEED AP, EDAC; Jennifer Hendrich Cayton, LEED AP
Stay Connected in Decentralized Nurse Stations: The Impact of Nurse Station Typology on Nurses' Informal Communication and Learning
Hui Cai, PhD Candidate, MA (Arch); Craig Zimring, PhD, Professor, College of Architecture, Georgia Institute of Technology, Atlanta, Georgia

Sponsored by MAAP

Staying ahead **of the curve**

Australasia's health status paints a happier picture than in many regions, and it is building world-class hospitals. But only action at a more local level will overcome chronic disease and increase efficiency. Design & Health Australasia 2011, held in Melbourne in May, offered a multi-sector platform for debate. ***Emily Brooks*** reports

Fiona Stanley Hospital in Western Australia: a model for flexible, future-proof health facilities

If there was philosophy or idea at Design & Health Australasia that kept reappearing, it was that of community. It appeared in myriad contexts and across many disciplines at the Melbourne symposium, from a plea for mental health funding to be diverted away from acute beds and into on-the-ground preventative programmes, to the inspired reimagining of our cities as community-focused, mixed-use places that encourage social interaction and physical activity.

This recurring theme is a measure of a shift in thinking about healthcare, away from hospitals that cure disease and towards the immense potential of the well-designed everyday environment to sustain wellness. In this context, as opening speaker Dr Liz Paslawsky observed, health should be on the agenda of every government department – not just health or planning but also in education, agriculture and beyond – as well as uppermost in the mind of every individual. Self-empowerment is a huge part of this message: the ability of the individual to access knowledge, make informed decisions and feel ownership, or as Dr Paslawsky puts it, to "be the CEO of your health".

These are not just forward-thinking ideas, but critical ones to maintain Australasia's future good health. Even with some of the best global health outcomes, it faces similar challenges to the rest of the developed world, including an ageing population and rising obesity and diabetes, which its economies will not be able to sustain. Although there was consensus at the symposium that bigger hospitals and more beds are not the answer – and from an economic perspective, quite impossible – there was also a sense of frustration that current systems are too slow and complex to start turning the ship around. In other words, by the time new facilities have been built, they can already feel outmoded.

Investing in the future

An international panel of speakers brought with them a global perspective on healthcare, helping to put into context Australasia's challenges and offering their own experiences as subjects for debate. Mark Johnson of Denver-based urban designer Civitas outlined some of the transformative projects he has overseen in some of America's most deprived areas, where the creation of new urban communities is challenging the idea that cities and poor health are intrinsically linked. Deborah Roundtree, who heads up arts consultancy Roundtree Visuals, presented amazing possibilities for digital artwork in healthcare environments, not just for enhancing patient and staff experiences but also as a way to pull in local communities and attract donors. UK-based architects John Cooper and Sunand Prasad brought with them several decades of insight, between them having created numerous world-class, hugely influential healthcare facilities.

Australasia is currently in the midst of a once-in-a-generation programme of investment in its healthcare infrastructure (AUS$7.3bn was spent on Australian capital health projects last year, with the same expected every year for the next decade), and is building its own world-class facilities. And if lack of knowledge-sharing across this vast region was cited as a problem, the Melbourne symposium helped to redress that balance, with Morag Lee of Silver Thomas Hanley speaking about Western Australia's Fiona Stanley Hospital, a plausible model for the flexible, future-proof healthcare facilities that are now in demand; BVN Architecture's James Grose on the Youth Mental Health Building at Sydney's Brain and Mind Research Institute, a 'translational' health space that successfully fosters collaboration between clinicians and researchers; and John Breguet of Woods Bagot discussing his firm's multi-sector approach, which freely allows architects to cherry-pick the best ideas from airports, shopping centres and the workplace to create better healthcare buildings. Both Grose and Breguet touched on another major theme of the symposium, that of patient experience (and more broadly, the experience of all a facility's users). It is acknowledged that hospitals are too insular, too focused on their own performance indicators. Yet here were examples of facilities that made patient experience a priority. For Grose, it's a formula: "Intimacy, tactility, humanity, materiality: these are the things that make people associate with a building, get a sense of belonging", while John Cooper expressed the same as the ability to "design kindness into a building".

Sydney's Youth Mental Health Building: fostering collaboration

The role of user consultation also stimulated debate. "I come from a generation where engaging with users is habitual and instinctive," said Sunand Prasad. "It's not just about being nice; it's about recognising that the user has knowledge that we need." Cooper's opinion was that, while user groups are useful for informing a community about what's going on, they are less good for getting a good design result, and that things work better if there is a tight-knit group of highly dedicated people driving a project: "The user group process is not necessarily the best way to achieve innovation."

Drivers for design

Achieving innovative healthcare buildings was also a subject up for debate during a session dedicated to procurement and in particular, PPP/PFI. While Dinah Rowe Roberts and Paul Clifford from PwC Australia explained how Australasia fitted in to the global pattern of private finance and where it might lead next, Tony Lubofsky from the Department of Health Victoria, who has overseen three successful PPP projects, said that he felt that the resulting buildings were "miles ahead" of anything that would have been created via traditional procurement methods, in terms of innovation, with the caveat that this can only be achieved with a strong and assured brief. The architectural community present were less sure. Apart from voices expressing concern at the wastage created by the bidding process, it was felt by those who had worked on PPP bids that any innovation somehow got lost along the way and that the nature of the process made the risk of a project, rather than innovation, the dominant driver of design.

One of Australia's most pertinent healthcare issues is that of serving the needs of its rural citizens, against a backdrop of tight budgets and a critical shortage of health professionals. At the sharp end of this problem is Patrick Turnbull, deputy CEO of the Western District Health Service, who described the refurbishment of his outmoded operating theatre to incorporate high-definition technology, and how it had improved patient outcomes. The bigger picture regarding e-health and telehealth was provided by Brendan Lovelock of Cisco, who outlined a vision of healthcare that is faster, more connected and freed from geographical constraints.

Emily Brooks is architectural writer

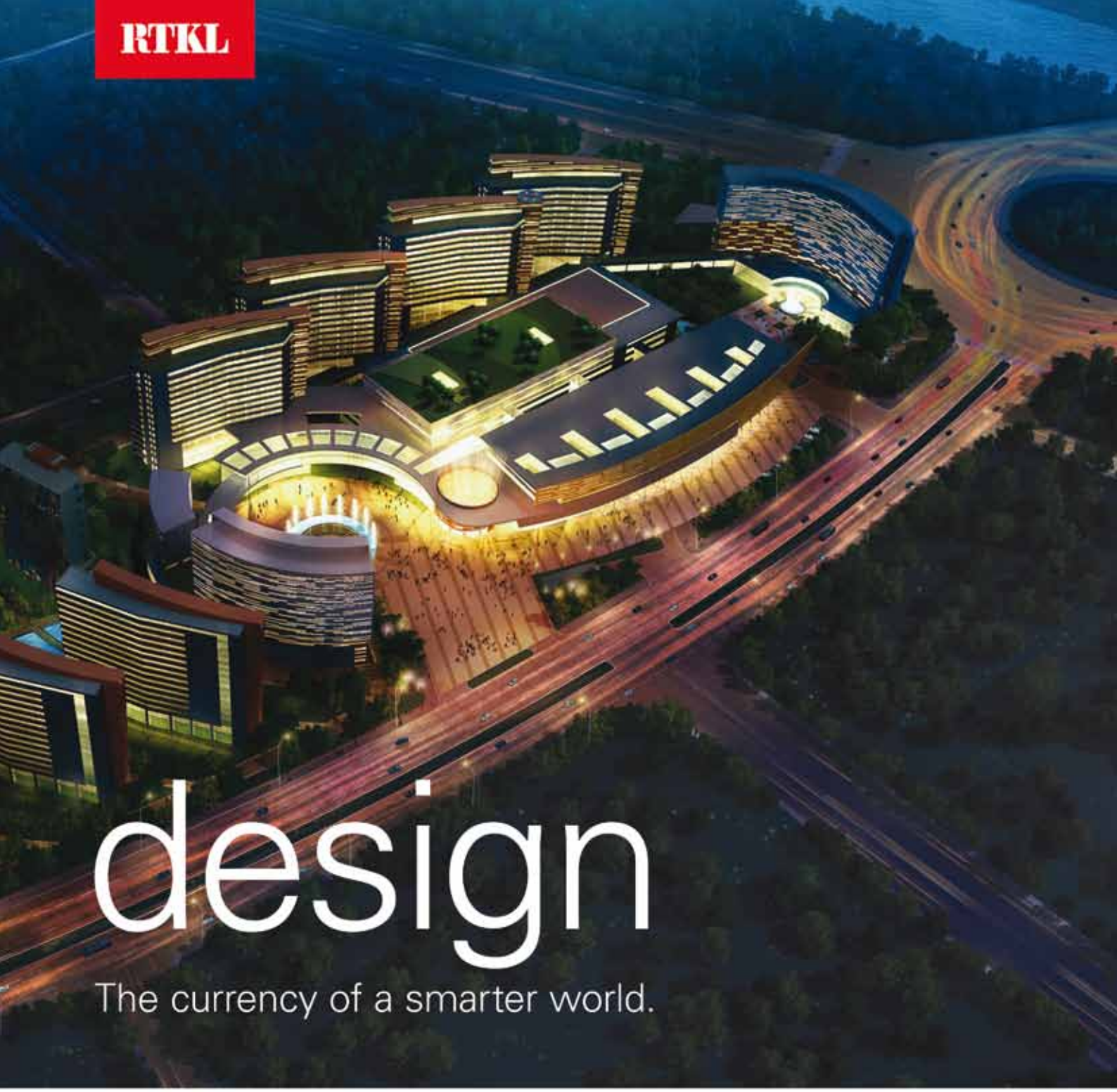
John Cooper, director of John Cooper Architecture, UK

Liz Paslawsky, international health business consultant, Australia

James Grose, principal of BVN Architecture, Australia

Tony Lubofsky, project director at the Department of Health Victoria

Deborah Roundtree, creative director for Roundtree Visuals, US



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In our hands

Health facility designers should be focusing on wellness rather than the prevention of disease, urges *Dr A Ray Pentecost III*

There is a difference between architecture that tries not to make one sick – architecture that focuses on the risk factors that prevent illness – and architecture that tries to improve one's health by introducing 'wellness' as a factor, an approach which is psychosocially supportive. Dr Aaron Antonovsky studied salutogenesis, or the origins of health. His research focused on what he labelled the 'sense of coherence', which has three elements: comprehensibility, manageability and meaningfulness. When a design compromises these elements, it creates a vulnerability to disease for the individual.

Comprehensibility means that the users can quickly, easily and, with a high degree of confidence, understand the structure and organisation of a facility. A design that is difficult to understand can cause stress, which compromises the sense of coherence and can make an individual vulnerable to disease. In good design, building elements work together to create a highly comprehensible facility that minimises personal stress. Ease of spatial orientation, central corridors, simple axial circulation and building massing that is easily understood as one approaches the building are examples of designing for greater comprehensibility.

Manageability refers to the ease with which one is able to manage one's affairs, navigating around the environment with little or no dependence on others to help. We should empower individuals in every facility to have the best possible degree of independence and mobility. Vertical circulation elements that are easily located, accessibility standards liberally and appropriately applied, especially for challenged population groups, and signage that allows users to navigate through the building with a minimum of assistance and uncertainty are examples of manageable designs.

Meaningfulness references the intangible but highly personal message that the building conveys to facility users: that they matter; that their lives have great value and purpose; and that, to the fullest extent possible, they are appreciated. Examples of design treatments that reinforce the meaningfulness of the individual include the selection of furniture that provides for individual (rather than bench seating), high-quality finishes, an entry portal that gives the message that those who arrive in the facility are important, high-quality art and accent pieces, and perhaps some kind of 'wall of honour' for the building's primary users.

From Antonovsky and others we have come to understand that salutogenic design holds the potential for a beneficial impact on health. A number of researchers have suggested that opportunities for design to positively impact on health logically parallel the dimensions of the whole person – physical, emotional, intellectual and spiritual wellbeing.

The design community must help lead this transformation in design theory

A range of design features can have a favourable impact on these four dimensions of personal health. This includes designs that:

- provide appropriate ergonomic support, including both respect for human performance limits and opportunities to exercise and strengthen those limits;
- introduce opportunities for social interaction, especially those that are spontaneous, while respecting the need for privacy and the dangers of overcrowding;
- offer access to nature, both as a compatibly element to daily life and as an escape, or positive distraction, from the rigours of work and the need for focused attention;
- give occupants access to natural light – and control of the access to natural light;
- use colours and scents that appropriately impact on users, either to stimulate or calm them;
- incorporate noise reduction strategies to reduce stress and improve coping capabilities, and music where appropriate, to promote health and reduce stress;
- use art to help viewers achieve balance in behaviours heavily influenced by stress.

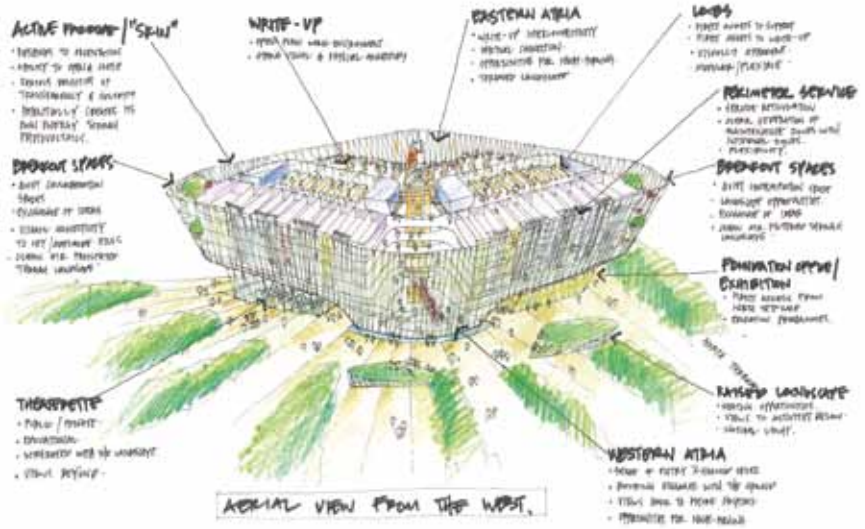
The design community must help lead this transformation in design theory. Doing so means acknowledging the difference between a pathogenic design orientation focused on avoiding or preventing disease, and a salutogenic design that promotes health and improved human performance.

Dr A Ray Pentecost III, DrPH, FAIA, FACHA, LEED AP, is director of healthcare architecture at Clark Nexsen

In the plaza

Collaboration is at the heart of the new South Australian Health and Medical Research Institute (SAHMRI), designed by Woods Bagot. Set in the Adelaide Parklands, the cutting-edge facility will bring built form and landscape together, with a variety of public and private open spaces which promote a flexible and healthy environment for staff, visitors and the general public. Atriums and bridges will help to foster collaboration between research modules, providing a visual connection between floors, while the articulated façade creates a healthier internal environment through increased natural daylight and enhanced external views to the broader precinct. The SAHMRI façade has been developed as a 'living organism' whose sun shades respond to their location and orientation to provide the most efficient protection against sun and heat. To encourage public interaction, the building form is raised above ground level, creating an open public plaza.

Housing up to 675 researchers, the landmark SAHMRI building will include fully flexible laboratory space organised into nine research modules, as well as a vivarium, a cyclotron, cafes and retail stores. It is due to open in December 2012.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BOARDROOM SPACES
BOARDROOM SPACES
THEATRETTE
WESTERN ATRIA
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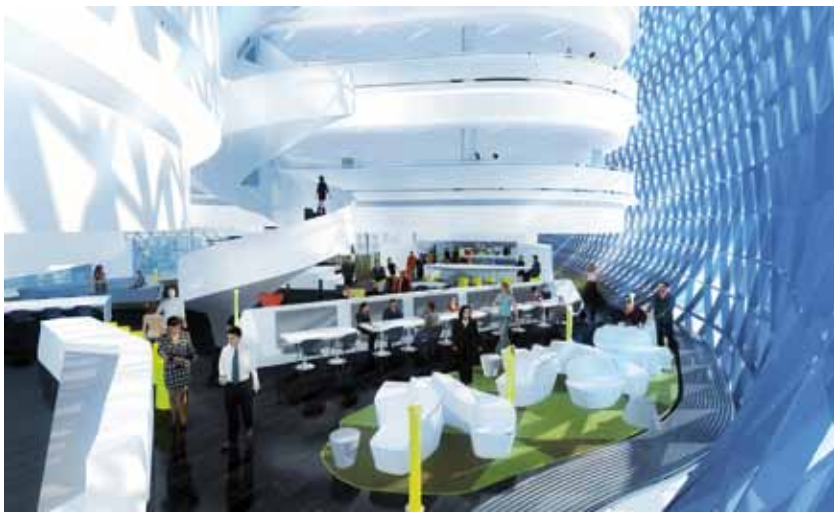


A search for **significance**

As more and more healthcare projects are funding through public-private partnerships around the world, ***Susan Black*** examines what criteria will make a building truly significant

Various iterations of public-private project (P3) delivery are happening all over the world. Structured within a process for the planning and delivery of major projects, infrastructure renewal is generally delivered on time and on budget, with project governance achieved in part through risk transfer to the private sector. The stage is global. International partners, including large construction firms, are entering competitions worldwide, either because they are familiar with the 'game' or they anticipate widespread application of the procurement process in their home ground, such as the US.

While selection criteria include a requirement to be design-compliant, the most creative financial package – in short, the lowest net present value – is the successful driver. At the same time, cultural projects are often funded similarly, as in Toronto by the Cultural SuperBuild programme, which received approximately one-quarter of the funds that went to province-wide healthcare, in recognition of the importance of these projects to urban revitalisation and tourism.

Often, these competitions are weighted on design excellence, have heavy subsidies from public and private sources and are not chosen based upon the lowest bid price. Consequently, cultural projects attract celebrity shortlists resulting in signature solutions. Healthcare design, considered of critical importance in the internal planning, does not garner similar expectations architecturally.

Unfortunately, public-private competition is an expensive and often redundant process, but it is producing real projects under a procurement method which takes some of the onus off the public sector. We need to work together to find answers.

Architecture is the most visible expression of cultural and civic values. There was public outrage at Libeskind's winning proposal for the Victoria and Albert Museum in London, with complaints that the overlapping trapezoids represented disorder and an offensive jumble of collapsed random boxes. This concept, unrealised, seems to be an identikit to what has been constructed for the Royal Ontario Museum (ROM) in Toronto. Some people are conflicted about the façade of the ROM and its non-relationship to the historic museum to which it appends – and, apparently, only a genie of a curator can hang exhibits. However, the dinosaurs do not seem to mind the irregular grandiose spaces and the edifice, surely an example of *signatecture*, is creating a 'wow' factor on Bloor Street.

Thorsell, former director and CEO of the ROM, commented that the design "created a landscape of desire inviting people to come in". Of all building types, the museum, with its less complicated layout, can be easily manipulated into inquisitive shapes with little, if any, repercussions to humankind or Paleozoic creatures.

Image: © ROM. Photo: Sam Javanrouh, 2009

The Michael Lee-Chin Crystal at the Royal Ontario Museum creates a 'wow' factor

Urban spaces

Cities can also thrive on a diversity of building types and uses. Venturi has said that "two incongruities next to each other create their own truth". But, that said, there must be truth found in the urban spaces in between. The revitalisation of our neighbourhoods, and the welcome spaces inside and outside our buildings, should be a prerequisite regardless of project type, budget, brief or client. So why, on balance, do healthcare facilities stand alone, either as a fortress to medicine or as ambiguous incremental buildings which do little to reinforce our collective needs?

Specialised medical space and even repetitive clinical and in-patient spaces cannot logically be accommodated into tilted curves and random boxes. But function and efficiency, flexibility and expandability, with particular consideration for life-and-death diagnostic and surgical

Women's College Hospital's pink pavilion makes a clear declaration of the hospital's identity (designed by Perkins Eastman Black/IBI Group Architects)

services have dominated hospital design without any consideration of salutogenic attributes since the mid-twentieth century. It is no wonder that the Rubic's cube complexities in designing for hospitals, including consequential blocking and stacking options, along with best practice guidelines, knowledge of highly technical equipment and ever newer codes and changing trends, have persuaded many architects to aspire to greater commissions like museums!

That a hospital should be designed from the inside out is almost a singular understanding – but with a determined holistic approach, a higher ambition for the project can be found. Perhaps for this reason some signature architects have embraced this specialised profession but with varied outcomes. In 1963 Corbusier based a design for a hospital in Venice (unbuilt) on a series of squares linked together as part of the city – he was considered radical at the time.

Architecture is the most visible expression of cultural and civic values

In Las Vegas, Gehry has created the Lou Ruvo Center for Brain Health, a stark white Alzheimer patient clinic and research block appended to a convoluted Gehryesque formation complete with exposed metal shards, dedicated to social fundraising initiatives for Alzheimer's research and available for patient programmes. Sadness overcomes me at the severity of the tower, perhaps a budgetary concession in favour of the 'social' space which creates personal anxiety when looking at the photos of a structure seemingly reflecting tortured intelligence, yet dedicated to finding a cure for brain diseases. Where is the sensitivity, the placemaking, the feeling of safety in light-filled spaces devoid of threatening metal points looming over your head? There is no soul, only what is probably a lucrative environment to attract donations. It is in Las Vegas and would no doubt make a neat retail venue with adjacent apartments.

A marriage of vision

Correa has given us hope. In Lisbon, Portugal he has created a visionary environment for the Champalimaud Foundation's Centre for the Unknown. This centre for research in neuroscience and

cancer, which includes clinical facilities, was designed with the medical planning expertise of RMJM. This is not an example of signature architecture of the virtuoso kind, totally unrelated to any identity of the institution, but a project where a marriage of physical and psychological requirements has been carefully considered. Perhaps Correa discovered, through layers of planning and design collaboration, how the mystique of the site, the vision for the centre and the complex needs of the facility should be expressed. He has found the potential from the site, the programme and the people to engender a facility with its own signature, one of significance.

Gehry's Guggenheim Museum in Bilbao literally put the city on the map – a titanium mirage along the river, a wondrous surprise when viewed between the historic buildings of the town. Visitor numbers alone give credence to the architecture. And this is only one building in one town – what about the opportunity for the multiplicity of hospitals in every community, which can contribute to the bottom line by reinforcing wellness in practice and environment as they revitalise the community? Is there a complimentary Bilbao effect possible in healthcare architecture, one that is based on inner significance rather than outward signature, which in translation may help us achieve loftier goals for wellness in our cities?

When a building's design is good, we grasp it intuitively

What makes a building a great place to engage in is hard to measure. However, it seems that when a building's design is good, or even considered great, we grasp it intuitively. With the exception of conscientious evidenced-based design validation which, for example, concludes that natural light, views of nature and specific colours have a positive effect on wellbeing, science cannot tell us definitively 'why' we react one way or another. But we need to find out.

We need to add healthcare design to our curriculums. We need to encourage more women to find their place in architecture. We need to become active in devising measures of design quality applicable to healthcare buildings (Susan Francis, UK). We need diversity in our judging panels. We need to extol the 'sexier' possibilities in being a healthcare designer. We need to expect more of ourselves – yes we can!

Transforming a sea of asphalt

Trillium Health Centre has been undertaking a total transformation of its 1950s West Toronto site into an innovative mix of ambulatory services, kick-started as a result of a recent public-private partnership engagement with Infrastructure Ontario in Toronto, Canada.

Photo: Guggenheim Museum Bilbao

The Guggenheim Museum in Bilbao,Spain sits in contrast with the town's historic buildings

Acute care hospital buildings resulting from incremental growth over the years were set in a proverbial sea of asphalt and organised in a confusing maze of corridors. There were some 'good bones', however, and a found opportunity to extend the mandate to masterplan a whole new neighbourhood predicated on wellness.

Our starting point was to base both the indoor and outdoor planning on a familiar time-tested urban element: the street. We extended a partial perimeter road into a complete loop, coordinated with separate entrances toward the inner sites for health services, reserving development sites for housing and, for related health services on the flanking, unused parcels of land. Once inside the rejuvenated new and renovated structures, a dramatic new pedestrian street winds through and between the buildings becoming the major reference point for orientation, the internal connection to services and the defining new

identity for the Trillium neighbourhood.

Threading this pedestrian path from key east-west vehicular drop-offs through the scattered existing buildings was one of the important design ideas that unlocked the potential of the facility and the site, while confirming an enduring social infrastructure supporting inevitable change and growth. Trillium's new external image is carried deep into the pedestrian street as oversized virtual vines lead you inside to meld with real hanging gardens. See how their garden grows!

A building that says "Women's"

For Women's College Hospital in Toronto, our design-build-finance-maintain consortium (Women's College Partnership) respected the requirements of the project specifications but, importantly, strove to meet the challenge toward creating an architecture and environment which inherently works for and says: "Women's." The hospital has been shaped by a history steeped with accomplishments, struggles and innovations reflecting healthcare, medical research and education. The compliance scheme offered an introverted rectangular doughnut form, enclosing a six-storey atrium topped by a glass ceiling. But Women's stands for ground-breaking ideas and intends to accomplish an inspired environment which reflects their achievements and their future.

Occupying a dominant position at the pinnacle of the Discovery District in downtown Toronto, it was important to achieve an understanding and expectation of wellness from the very approach to the site. At once, clarity is evident in a strong 'L' shaped building which embraces a lower transparent pavilion on the south-west. Just as 'new thinking' is the mantra of the organisation, so must its physical environment push the boundaries, as it heralds their significance.

Photo: Ben Rahn/A Frame

The Perkins Eastman Black-designed Trillium Health Centre in West Toronto was transformed into a garden of wellness, planned around a time-tested urban element: the street

We designed the pavilion as a light-filled welcome 'box' – clean and simple with one addition: we have taken a functional element on the second level and glazed it in the strongest pink. Overflowing with tall trees, it will be a statement of conviction, an unmistakable marker and a gift to all who venture near – and, considering the travails of women in reaching this juncture, not a glass ceiling in sight!

The heart of the pavilion becomes a sanctuary inspired by '1,000 women' with its sense of softness and organic forms. The 'L' shape is like the opening of arms, a confident stance speaking to integration and collaboration with the immediate neighbourhood and the larger community of healthcare. Participatory planning resolved immediate and future functionality with integral design ideas and interventions that reflect their spirit.

There is no recognisable celebrity imprint on this project but innovative ideas which emanate from the soul of the organisation. Perhaps the 'pink box' was mine for a fleeting instant – but now, indeed, it belongs to Women's College Hospital.

Susan Black is a founding partner of Perkins Eastman Black Architects and a director of Perkins Eastman Architects

Keeping it in the family

The latest wave of children's healthcare facilities reveals ever greater skill and commitment being dedicated to reassuring and inspiring not just young patients but also their families and the wider community. ***Veronica Simpson*** reports

Building a children's hospital is a once-in-a-generation activity, says Alastair Gourlay, the programme director of estate development for Guy's and St Thomas's NHS Foundation Trust in London. Gourlay's team, through Hopkins Architects' designs, helped kick off a new generation of children's healthcare facilities with the light-filled, inspiring Evelina Children's Hospital, which opened in 2005. At the time, it was one of a welcome new global wave of children's hospitals that put the patient experience at the heart of the design. Six years on, how is this new generation evolving?

Judging by the most recent crop of children's hospitals, it seems that this more humane approach has evolved considerably. Through planning, architecture and artwork, the latest children's hospitals place a strong focus on engaging not just with patients and their families but occasionally with the whole neighbourhood – and even beyond – in an effort to de-stigmatise the medical experience and rebrand children's hospitals as the community assets they are.

Ellerbe Becket (now part of AECOM) recently completed a major refurbishment and expansion programme for the Minnesota Children's Hospital. The project is unique in the degree to which it embraces not just visitors and families but the local community as well. Set within an area of urban deprivation, on a traffic-heavy avenue, the new specialty care facilities have been built opposite the main hospital, linked via an inspiring glazed walkway, dubbed the 'skybridge'. Open and welcoming glazed frontages onto both entrances, plus a new public healing garden and art works benefit visitors, families and neighbours alike.

A major public art programme enhances the aesthetic value of the facility and the streetscape. Local artists worked with Ellerbe Becket/AECOM from a very early stage, in order to maximise thematic synergies between the building and its art works. Most prominent of all the artworks are six 'healing stones' created by Dallas-based artist Brad Goldberg. There are three of these granite blocks on each side of the street, around 2m wide by 1m high, containing solar panels which power the light display around and inside them, animating that part of the avenue both day and night. Ellerbe Becket design principal Mic Johnson says: "The healing stones became a symbol of nature and birth. They are in the shape of eggs. Some are whole and some are broken. Kids are just in awe of them, because of the scale and size. They want to stand on them and crawl over them. It became an important part of our way of thinking about the architecture in the urban environment, in the same way that the skybridge embraces the public realm."

Minnesota Children's Hospital's welcoming entrance

The use of art in children's spaces has become much more sophisticated, moving away from brightly coloured sculptural play features or ceiling mobiles towards a thought-provoking range of integrated visual stimuli that delight all ages. It has also, where appropriate, become more targeted. At the younger end of the spectrum, art and design consultancy Artinsite's work at London's St Thomas's paediatric nuclear imaging facility saw them create two enchanting animation films, addressing the fears of the first-time child visitor, especially those too young to understand the medical context. One, 'Mike has a scan', can be viewed in the waiting room and is aimed at reassuring children about the procedure beforehand. While in the scanner, another animation called 'Looking Up' shows playful and calming scenes of balloons, birds and kites against a blue sky backdrop (this and other elements of Artinsite's St Thomas's work won them a Building Better Healthcare award in 2010 for 'best use of art in healthcare').

Supporting social networks

The Teenage Cancer Trust (TCT), a UK charity established in the early 1990s to create dedicated facilities that are tailored to teenage developmental requirements, has perhaps done more than any other healthcare specialism to create environments that welcome and include not just family but also friends. The TCT quickly realised that maintaining connections with the outside world, specifically their all important friendship groups, could have a big impact on teenagers' sense of self-esteem, as well as their motivation for recovery.

Typically, a TCT unit includes spaces where families can relax while their children receive treatments as well as generous facilities for teenagers to indulge in peer-group socialising at table football, on computer games or watching TV together in 'the den' or 'chill-out zone', whether with other patients or their own friends. Kitchenettes where family and friends can cook and eat together and comfortable rooms where parents can stay over, if need be, are all par for the course now within the TCT's 17 units around the UK. Mostly created by refurbishing existing ward space, the design of these units is appealing and non-institutional, using colour, texture and even domestic lighting to reinforce a sense of normality.

Research recently conducted on the TCT's behalf by The Futures Company identified the key psychological drivers of the TCT design: greater personal control (over lighting, ambience, activities), greater comfort, a range of appropriate stimulation, personalisation (whiteboards by beds can be plastered with pictures, photos and imagery, as the patient desires) and connectivity to friends and the world beyond. It also revealed how these factors reduce stress for all concerned and lead to teenagers engaging more actively in their treatment and recovery (which also benefits staff) and interacting more with each other.

The Futures Company's *Impact of the Built Environment* research summarised: "The presence of all these factors helps to retain a sense of normality. That sense of normality helps in encouraging patients in seeing this episode as a 'comma' rather than a 'full stop' in their lives, helps them to visualise their emergence at the other side of it, and keep connected with life goals."

That sense of normality also helps prevent patients from "defining themselves by their illness". The research concluded: "There is little

The Children's Hospital, Erbil, Kurdistan, Iraq

Kurdistan's first children's hospital was designed by Make Architects with five individual wings, extending out from the circular, three-storey main building in radial form and containing three operating rooms, an emergency department, imaging, specialist outpatient clinics, a paediatric and neonatal intensive care unit and a women's hospital. The central atrium space in the three-storey main building has five triangle steel roof sections, inspired by a 'tree-of-life' motif, which echo the geometry of the plan. Colourful wall graphics in the atrium are replicated on the exterior and at the ends of each wing to enhance identity and wayfinding. Wards all face out onto the quiet rural landscape, which will be enhanced with gardens and parks.

Client: Mr Rang Shawis on behalf of the Kurdistan Regional Government
Architects: Make Architects
Size: 27,000sqm
Cost: US$40m
Contract type: A local design-and-build contract
Schedule: Construction from September 2011 to late 2013
Consultants: Planning and operational advice from Sheffield Children's Hospital, UK
Structural engineering: Albert Kara Taylor
Contractor: Vins Construction

doubt that, relative to standard wards, Teenage Cancer Trust units contribute hugely to improving the experience of all of those who come into contact with them."

Simon Fuller, the TCT's director of services, has seen a real shift in attitude from within the NHS since the TCT units began (another 13 are planned over the next five years). Thanks in part to the Futures Company research, but also through witnessing its impacts, the NHS establishment has come to embrace its programme, even working with the TCT to schedule units into major hospital builds, therefore covering structural costs within their own NHS budgets – though that won't be happening now that its capital budget has been slashed.

By working with architects who don't have any healthcare track record, the TCT, says Fuller, has been able to "challenge the whole principle of what is appropriate for healthcare design". Innovations Fuller is particularly proud of include: "Touch-screen lighting controls that can be easily wiped clean; hiding bins in a way that means they can still be accessed but their bright yellow covers don't dominate the room; no touch taps – just the most basic things."

He has also seen how good design can convert "cynical healthcare professionals, who didn't really believe in the process". He says: "When they see how it raises morale and how the (patients) engage with the treatment and with each other, then they get it."

Client: Southern Health and Social Care Trust
Architect: Donnelly O Neill
Consultant architect/health planning: MAAP
Size: 850sqm (excluding courtyard)
Cost: £1.8m
Contract type: Partnering contract
Opened: August 2010

Carrickore Children's Home, Newry, Northern Ireland, UK

Carrickore is a purpose-built, eight-bedroom residential home in Newry, County Down, for children and young people with challenging behavioural needs. Opened in 2010, Belfast-based Donnelly O Neill Architects' aim was to design a building that would help carers create as normal a living environment as possible. The architects brought MAAP in for help with health planning. Bedrooms and a small private living room look south and west onto groves of native trees. Access to bedrooms is located around an internal sensory garden. Low-level windows in the surrounding walls have built-in seats to create quiet spaces, and cosy 'snugs' have been created by cutting angled corners into the main corridor space. A shared living space, which can be subdivided with a folding sliding screen as required, opens onto a kitchen, multi-sensory room, treatment room and soft playroom, as well as the sensory garden and an external play area to the west.

Children's Hospitals and Clinics of Minnesota, Minneapolis, US

Children's Hospitals and Clinics of Minnesota has just completed a major renovation and expansion project, designed by Ellerbe Becket (part of AECOM) to transform the healthcare experience of those who visit the campus. The new Specialty Care Center, which houses haematology and oncology clinics as well as an outpatient pharmacy and retail centre, is connected to the existing hospital via a glass skybridge. Glazed extensively at street level, the new building allows ample daylight into interior public spaces and views out to the street. More than 9,000 sq ft of the roof canopy is covered with planting. A public plaza connects this building to new 'healing gardens', which pedestrians, as well as patients, can access.

Client: Children's Hospitals and Clinics of Minnesota
Architect: Ellerbe Becket/AECOM
Size: 169,500 sq ft (Children's Specialty Center); 597,695 sq ft (hospital construction and renovation)
Cost: Confidential
Contract type: Design assist
Opened: December 2010
Civil engineers: Loucks
MEP engineers: Harris Mechanical & Hunt Electric
Structural engineers: Ericksen Roed & Associates
Landscape architect: Close Landscape Architecture+

Bellevue Clinic and Surgery Center, Seattle Children's Hospital, US

The Seattle Children's Bellevue Clinic and Surgery Center offers outpatient surgery, imaging, urgent care and over 15 specialty services. Designed by NBBJ, the 30,000 sq ft, US$30m centre features a simplified floor plan that allows one-turn access to examination rooms, while specific hallway colours clarify navigation throughout. Each exam room has two entry points – one for patient and family and one for the clinician. In this way, the designers were able to separate back-of-house functions from patient areas, allowing for an optimised staff work area without compromising the patient experience. A sky-lit recovery area is divided into two clusters so that one can be shut if volumes are low, thereby economising on lights and heating. Most significantly, induction rooms have been connected to operating rooms, allowing patients to stay with children for longer.

Client: Seattle Children's Hospital
Architect: NBBJ
Cost: US$75m
Area: 80,000 sq ft
Contract type: IFOA (integrated form of agreement) – multi-party contract between owner, architect and general contractor
Completion: 2010
Structural engineer: PCS Structural Solutions
Landscape architect: SiteWorkshop

Client: TCT and Birmingham Children's Hospital
Architects: Lifschutz Davidson Sandilands
Area: 400sqm
Cost: £2.2m
Opened: 2010
Contract type: JCT standard building contract 05/XQ revision 1 2007 with bespoke amendments
Structural engineer: Heyne Tillett Steel
Main contractor: Vinci

Teenage Cancer Trust, Birmingham Children's Hospital, UK

Lifschutz Davidson Sandilands' Teenage Cancer Trust (TCT) unit at Birmingham Children's Hospital is a tube of metallic-clad profiled steel, with acid-green highlights on window surrounds and end walls. Accessed via a long corridor from the children's first-floor oncology ward, visitors are greeted with 'the den', featuring cut-out seats lined in green polyurethane fabric and supergraphic wallpaper depicting scenes of nature. This space leads to a sky-lit nursing station at the heart of the unit, overlooking a four-bed ward which can be adapted into two two-beds. There are two single rooms for acute patients. On the far side is a dining and social activity area, including kitchenette, billiard table, jukebox and colour-change ceiling lights.

Creating a national facility

Every ounce of this appreciation of aesthetics, environment, identity and community value can be applied to healthcare design outside of the affluent West, as Make Architects discovered when asked to design a children's hospital for Kurdistan. In this case, Make was asked to dream up a hypothetical children's hospital long before a site or the funding for the hospital were in place. The project was driven by a leading Kurdistan-born paediatric surgeon, Rang Shawis, to whom Make was introduced by the CEO of Sheffield Children's Hospital (where the practice has been creating a masterplan).

"A lot of our time initially was spent trying to develop a brief, using the expertise they have in Sheffield for area requirements," says Make associate Gary Rawlings. "In this sort of situation, you normally do an analysis of the demographics of the region, to see what size of hospital is wanted."

But Shawis pointed out that there is currently no children's hospital in the whole area – neither in Kurdistan nor in Iraq. "He told us whatever we put there will be better than what they've got, because they have nothing."

A huge amount of thought has gone into making the environment as welcoming to patients, families and the community as possible – with a dramatic, central atrium space that is intended to act like a mini-Soukh, offering food, gift and book stalls and dining space shared between patients and staff. Why? Because, says Rawlings: "There is no nursing culture in Kurdistan. People tend to keep ill children at home. So it was important to accommodate family as much as possible in the space."

Corridors feature break-out spaces for families, visitors or patients to sit together. Each bedroom is big enough to accommodate a parent or carer sleeping alongside the patient. There is also a hotel on the site.

Which brings us back to Gourlay and his reflections on what the new generation of children's facilities must achieve. He reflects: "I think having places where the whole family can be together within children's hospitals is actually much more important than we had previously made allowances for."

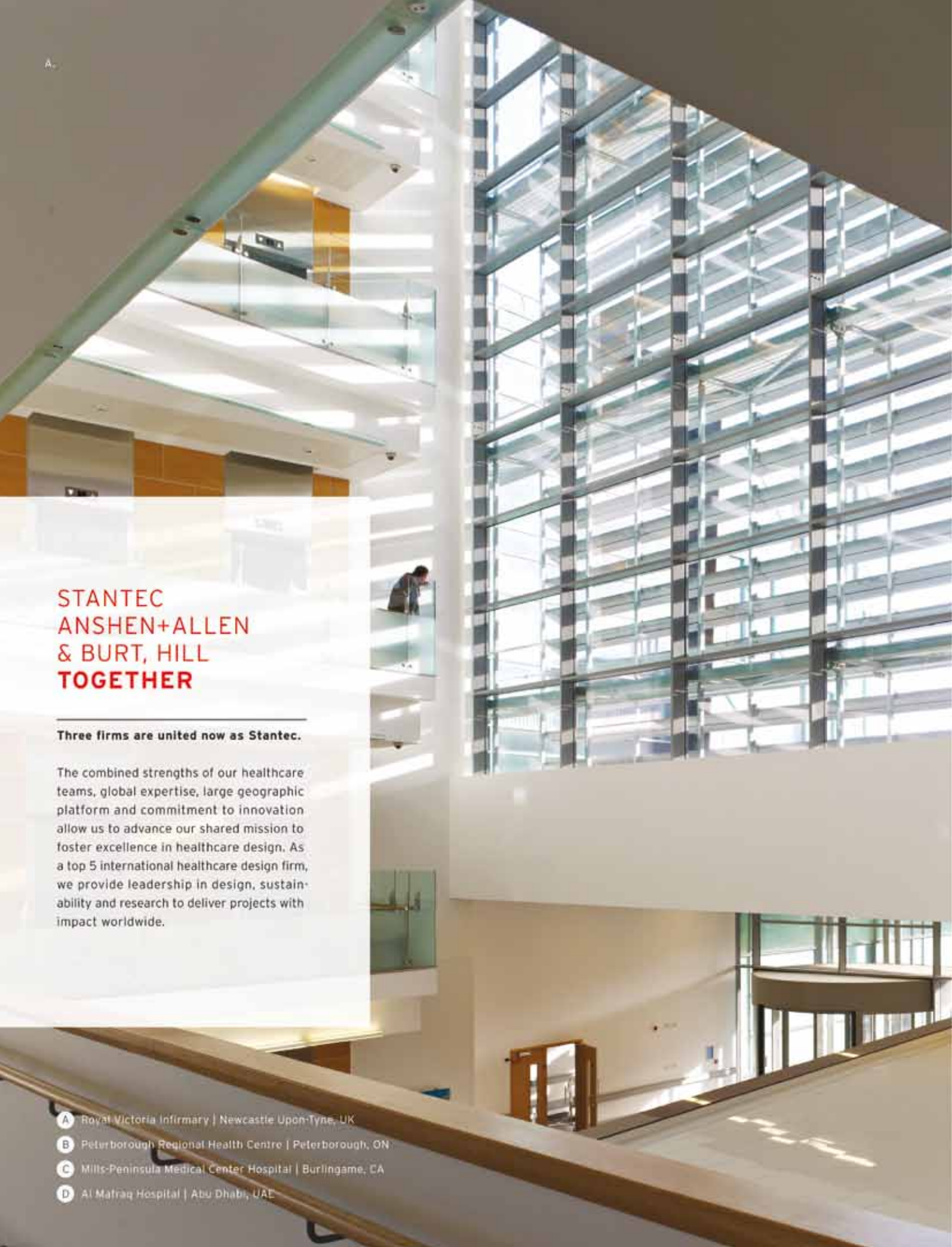
Judging by these examples, with luck and a following economic wind, the kind of children's hospital that focuses not just on the child but also on harnessing his/her entire support system, could become the norm.

Veronica Simpson is an architectural writer

Building Hope, Seattle Children's Hospital, US

With the largest geographic coverage of any paediatric hospital in the US, Seattle Children's has been operating at or near full capacity for many years. To create space for additional beds, the hospital asked ZGF Architects to develop a campus master plan to guide growth for the next 20 years. Phase one will add 80 new beds (rising to 192) in a new 330,000 sq ft facility, called Building Hope. A series of stakeholder workshops identified solutions for enhancing both efficiency and care. Outputs included a 'care team porch', designed to sit outside patient rooms to house medical supplies, charts, equipment and medication and the reconfiguration of wards to maximise caregiver sightlines to patients and other staff. Patient and family amenities will be upgraded to include a spacious and airy family lounge, in-room accommodation for families, and a 'docking' area for phones, iPods, PlayStations and computers.

Client: Seattle Children's Hospital
Architects: ZGF Architects LLP
Area: 330,000 sq ft
Cost: Not disclosed
Schedule: Construction start: May 2011; completion: April 2013
Contract type: Fast-track GM at risk
Construction: Sellen Construction
LEAN consultant: Joan Wellman & Associates
Structural/civil engineer: Coughlin Porter Lundeen
Mechanical contractor: McKinstry
Landscape architect: SiteWorkshop



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No butterflies **please!**

Kurt Wege describes how the Sears Cancer Clinic at Toronto's SickKids Hospital provides an environment that treats children and their families with maturity – and a sense of fun

Do butterflies belong on the walls of a hospital oncology clinic? Stantec Architecture's recent work at Toronto's Hospital for Sick Children (SickKids) unintentionally investigated this notion* in its March 2011 post-occupancy evaluation of the Sears Cancer Clinic, the oncology outpatient clinic at SickKids which opened in January 2010.

The haematology and oncology programme is one of the busiest clinical services at SickKids, delivering services on an outpatient and inpatient basis within a large catchment area in Ontario, Canada and internationally. Services and programmes are organised to treat leukaemia/lymphoma, neuro-oncology (brain tumour), solid tumour, blood and marrow transplantation, and haematology. The oncology programme offers services on an outpatient basis to children ranging in age from infants to teenagers. The clinic in its former and new state consists of two components: the scheduled visit clinic exam function that monitors treatment response, progress and health condition; and the related and adjacent day hospital that supports treatment and therapy regimes and protocols.

The clinic occupies about 15,000 sq ft on the eighth floor of the existing Elm Wing of SickKids Hospital. A projected outpatient caseload of over 20,400 clinic visits became the programme target for the planning and start-up of operations. The key design objectives were to provide a comfortable and efficient clinical environment for paediatric patients and their families through a treatment process that is at times lengthy in duration (years), and fraught with anxious moments for patients, family and staff alike, while supporting staff who are dealing with significant patient volumes.

The Sears Cancer Clinic was created through the renovation of existing space, within a former research laboratory. The new programme space was adjacent to the existing haematology and oncology programme, functioning within the physical confines of an inpatient unit plan configuration – somewhat unsuitable for supporting the function and operation of a major outpatient programme of the hospital.

The existing space offered some clear constraints and opportunities. After eliminating room elements from its prior inpatient incarnation, the remaining floor plan consists of approximately one-third of the available floor area on the north

side of fixed core elements (shafts and stairs) and two-thirds on the south side. These existing features are the natural organising framework for the proposed clinic design. Existing circulation pathways to the Atrium Wing of SickKids (north and eastwards) via a pedestrian link and its termination at the principle elevators for Elm Wing are the central access points for the new clinic.

Depth and maturity

The nature of paediatric oncology is one of immense emotional reaction – for the patients, families and caregivers. The impact of life-threatening illnesses on innocent children and the life-altering treatment regime and protocols on the entire family of a sick child are difficult to say the least. In addition, the daily activities for many patients and their families are far from routine. Normal clinic visits can end up being day-long ordeals involving blood tests, x-rays and long waits to ascertain the next steps in treatment plans as the health of patients ebbs and flows.

A paediatric design response needs to provide for a wide variety of ages

During the project's design process, at a meeting with representatives of the SickKids Hospital Children's Council, a former patient made the poignant statement that became a guiding principle for our work: "Please give us something more to think about than just putting butterflies on the walls of the clinic." To the design team, this provided valuable insight into the state of mind of many of the young patients, who have grown more wise and mature than is represented by their young ages. Out of this discussion, a principle design cue was established to infuse the treatment environment with a degree of depth and maturity – indicative of the child's, and their family's, psychological state of mind.

The core goals for the new clinic were to support and provide for:

- a patient-focused, family-centred approach that provides privacy, dignity, space for visitors and staff, and adequate support areas;
- an effective wayfinding system for patients, staff and visitors;
- the achievement of maximum operational flexibility to be able to manage the potential peak workloads in a flexible, efficient and sensitive manner;
- work areas in close proximity to treatment areas;
- anxiety-reducing and distracting activities for patients and their families through the course of their treatment duration;
- an efficient and activity-supporting layout to minimise lengths of travel within the clinic for staff;
- the fostering of a multidisciplinary work environment in support of treatment, education and research.

To kick off the design stage, research visits of exemplar clinics were conducted, including the Memorial Sloan-Kettering in New York City and the Texas Children's Hospital of Houston. Both facilities include strong design responses to provide diverse and focused lounge and activity areas that support young and older children, and small and large families, for a variety of entertainment and activity functions.

A paediatric design response needs to provide for a wide variety of patient ages, from the parent-supported play of infants to the solitary gaming and homework-based work room for teens.

The clinic solution was organised naturally around the two major available space zones of the Elm Wing floor. A reception, family wait/lounge and support zone to the north integrating with arrival from the elevator core and arrival/connection via the pedestrian link with the existing Atrium Wing. The second zone to the south was the larger clinic zone organised as four shared clinic modules, identical in composition and function, that could support different clinics on a scheduled or dedicated basis.

Workflow processes for various types of clinic visits involving patients, families and staff were tested through the use of 'spaghetti diagrams' – to help staff visualise the concept plan in terms of 'sneaker impact'. Some observed long travel distances were then targeted to see if an alternate plan solution could be provided, or if different protocols and workflow processes could be created so that sneaker time could become treatment time.

The north side reception/family wait and lounge is the fun zone within the clinic, where needle pricks can be quickly forgotten through a

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Playful, entertaining elements help to reduce anxiety

variety of age-responsive, group or individually focused activity zones or amusement events.

The south side of the floor is the heart of clinical services programme. Each of the four clinic modules is uniquely coloured, with the oval-shaped weigh-in area acting as an intuitive landmark and wayfinding element within the principle clinic circulation corridor. Art work created by the kids receiving treatment in the clinic is displayed through glazed corridor and room dividers. The wood-finished display system and corridor divider also functions as a natural wayfinding and clinic-organising element within the larger floor plate.

At the hub

An integral component opposite each clinic module is a multidisciplinary Hub Room, where primary clinic staff can consult and interact with other colleagues on issues relating to a patient's treatment. Hub Rooms each correspond in colour to their co-located weigh-in area and are beehives of activity throughout the day.

The result is a new clinic that is organised into two distinct precincts: the more public north side, and the clinic and treatment zone of the south side. The public zone supports a good variety of activity responses – something for everyone. Materials, furniture, room configuration and built elements are playful, entertaining and intended to reduce anxiety and stress as a counterpoint to the clinic zone. The clinic zone is a maturely developed and appointed business area that, through the display of artwork, clearly denotes the patient population. Strong and clear wayfinding, circulation and distractive elements make multiple clinic visits a serendipitous experience. Contrary to industry goals of same-handed layout and design, each exam room is a one-of-a-kind room in arrangement and display opportunity.

User feedback from a post-occupancy evaluation provides the typical response when moving from a completely inappropriately designed space in to a new one: the new clinic is vastly better! The overall response is a high level of user satisfaction. We believe this achievement can be attributed to the consensus-built approach, ownership and decision-making process adopted by the entire design team from the conceptual stages of the project. However, while the new clinic has ended up being a very popular destination for staff, other parts of the existing hospital do not deliver the same kind of supportive work environment and, as a result, multidisciplinary staff who are required to drop in, consult and have a huddle with their colleagues about a patient, end up staying the entire day. Hub Rooms can at times become too much of a hive of activity at times when clinic staff need to focus and concentrate.

Post-construction, the butterflies have made an inevitable arrival within the clinic, as it is inconceivable to imagine being without such precious, fragile and life-affirming representatives – much like the kids of the clinic.

Key innovations that have been achieved centre on the separation of the clinic into two distinct areas: public reception and waiting, and the clinic exam clusters. The development of the lounge and waiting area into a diverse amusement zone for kids of all ages (including adults) that offers distraction, respite and the ability to maintain a semblance of normal, daily living through play, school work and employment activities helped to diffuse the stigma and anxiety of treatment. In addition, the clinic environment is bright, stimulating and supportive – one that clearly belongs to all of the kids, even with the butterflies on the walls.

Kurt Wege, OAA, MRAIC, AIA (International Associate), ACHA, LEED AP, EDAC, is an associate of Stantec Architecture

* The Stantec design team included: Colm Murphy (project principal), Kurt Wege (project architect), Olivera Sipka (project designer), Taeko Rhodes (interior designer), and Victor So (project job captain)

Waiting rooms offer a wide range of age-responsive activities

A broader horizon

Landscape architecture can play a key role in creating healthier communities. ***David Kamp*** describes five projects that support our sense of self-awareness and possess life-affirming qualities

Inviting exploration in the Elizabeth and Nona Evans Restorative Garden

Design is a kind of inspired problem solving. It can add enjoyment to the necessities of life by extending our senses and, therefore, our consciousness. Well-designed environments can help us live more deliberately – not as leaves on the sea, but as sailors engaged.

The word proprioception, along with the word exteroception, means an awareness of oneself in space. A properly designed environment aids in that awareness. We are more comfortable and self-assured in properly designed settings, both private and public. What starts with a nest-building instinct evolves into a world of designed places that help sustain us as individuals and, collectively, as part of communities.

This is simply a part of human nature – to seek an awareness of where we are, a connection to place and time. It is fundamental to our wellbeing and, therefore, our health. In this light, all design, and certainly environmental design, is related to health. The particulars relating to healthcare design are more effective when they too encompass this broader environmental perspective.

Healthcare used to be associated with the extremes and the specifics of isolated symptoms. But the spectrum has broadened. There is a realisation in medical research that a 'reductionist' approach to illness (finding a single causative agent) holds only part of the answer. The idea of 'complexity' has re-established itself in healthcare research.

This idea has implications for healthcare design by recognising the organic connectedness we all have with nature. So too does the awareness that health – like nature – is a continuum. It is not only the extremes, but also the daily ebb and flow of health that require regular attention, both for individuals and for communities. Such thinking reaches well beyond the traditional confines of the healthcare community to all levels and scale of design.

Another important realisation for designers is that the designed environment must not only be healthy, but must also be perceived to be healthy. Like the distinction between actual safety and perceived safety, this perception helps put people at ease and gives individuals and communities a mandate to maintain themselves, suggesting that we all must be aware, engaged and participating in health.

Landscape architecture in this expanded context, serving health, can help us live more fully with nature. In its broadest sense it is the mediator between the natural environment and the built environment, between natural systems and built systems – it is more than a curb-appeal amenity.

The future of landscape architecture, it is hoped, will concern itself with problem solving responses to the entire array of efforts to design with nature as our partner – from the most intimate and

Using landscape to strengthen social, economic and environmental connections to the larger community at Stamford Hospital

personal of spaces, to site planning at the institutional and community level. It can also help create awareness for, and enhancement of, regional and global systems and their effect on planning at all scales.

Several projects have been selected to illustrate this broader idea of health in design. Each tackles a particular aspect of designing with nature, and collectively they suggest the continuum that exists between individual and communal needs.

Designing accessible spaces

When designers turn their attention to special needs populations, there is a temptation to focus on particular, often restrictive, aspects of the project rather than explore the expanse of possible experience. Health and ill health are a continuum. Some of us have severe restrictions (like a wheelchair-bound person with cerebral palsy); others have temporary problems (like a broken foot) or progressive decline (as with Alzheimer's disease or ageing), or minor restrictions (like a baby stroller). When we design accessible spaces, it should mean accessible spaces for everyone, not just people with disabilities. It is this context, thinking about the full spectrum of human health, that inspired the Elizabeth and Nona Evans Restorative Garden within the Cleveland Botanical Garden (CBG).

When we design accessible spaces, it should mean accessible spaces for everyone

This environment is a seamless addition to the CBG and is part of a cohesive experience, not separate or special. The result is a garden that fits effortlessly into its larger surroundings.

Design considerations for it were based upon a simple objective: to provide opportunity and choice for each visitor to engage with nature in one's own way, on one's own terms and at one's own pace – not unlike an individual's experience of nature. The task was to balance very specific needs with simple pleasures, and by those considerations, extend a sense of welcome for every individual, regardless of ability. Nothing is designed to look forced or obvious. Subtle details, like poems in Braille mounted to the back side of railings, are easily overlooked, except by those who need them.

Perhaps the most important point for this essay is the dynamic solution achieved here in balancing very private needs within a very public setting. This seamless integration of private and public is a lesson that has broad implications in our modern healthcare facilities.

Located in rural upstate New York, the Center for Discovery serves children and adults with profound

Above: Natural systems and building systems merge to create a cohesive scheme at Brockholes, UK
Left: Reconnecting to the region's agricultural heritage at the New York Center for Discovery

neurological and developmental impairments. The new health centre, a 27,000 sq ft diagnostic and treatment facility, was designed by Robin Guenther and Guenther 5 Architects. The project restored the site's water quality and natural watershed through careful planning, which included a series of new and rejuvenated natural ponds. This strategy benefited the centre's adjacent 600-acre organic community-supported agricultural (CSA) farm and also set the framework for a yet more ambitious landscape initiative.

For many developmentally disabled individuals, medical visits are a source of fear and stress. This stress affects a clinician's ability to effectively diagnose the myriad physical and psychological issues inherent to this population. We saw the landscape as an effective tool to address that obstacle and establish a sense of community and belonging.

The 350-acre campus (incorporating housing, education, therapy, and medical treatment facilities) had been developed over decades with little organisation as to building linkages and cohesive open spaces. While its agricultural heritage was largely gone, remnants were still visible. This echo of a lost agricultural heritage was the design inspiration for using landscape as an organising tool to create a sense of place. Three elements were chosen: hedgerows to define large-scale circulation patterns, while also establishing a more intimate scale of experience – places that celebrate those who pause; working fields to bring the local agricultural rhythm into the daily life of the campus; and orchards to complement the working fields, frame distant views and add another scale of experience – from the intimacy of a single blossom to the expanse of an entire grove.

In the overview, this newly created vernacular landscape re-established a connection to the region's agricultural heritage and created an organisational framework for the campus. Daily routines were connected to seasonal rhythms and the day-to-day life of an agrarian community. Patients, staff, visitors and the surrounding community have all benefited from this idea of making the site healthy.

Taking the health of the city seriously

Often, hospitals exist as islands within the urban fabric of the city. Stamford Hospital's multi-phased expansion and replacement project in Connecticut integrates the hospital site, adjacent community and city at large through a natural greenbelt. Working with Charles Cadenhead and WHR Architects, the project incorporates several challenges, including a site surrounded by disparate and challenging (economically depressed and contentious) neighbourhoods and a number of water quality issues.

Our concept here was to use landscape as a community organiser to re-establish the community fabric and link the hospital to the surrounding neighbourhoods. This involved close collaboration between the hospital and the city to address immediate needs and long-term goals.

The plan incorporates a number of landscape amenities throughout the hospital campus, including rooftop gardens, terraces and green open spaces. But of critical importance was the interface between the hospital, the surrounding community and several economic and environmental initiatives. We wanted to engage the larger ecological community by looking at the city's storm water management and water quality problems. How does the

Micro-climates as vertical organising elements, part of a comprehensive water management programme

hospital fit into the community-wide watershed? How might bio-swales reflect not only water movement but also pedestrian and vehicular movement through the campus and beyond? Could they connect uphill areas in the adjacent neighborhoods, through the hospital campus to the river below?

We also looked at larger social and economic issues, using landscape strategies to strengthen social connections and invigorate the surrounding business community. One strategy was to create a green linkage along the main street – a river of grass that connects the river park, the hospital and a nearby elementary school. A second one used streetscape improvements to link the hospital to the adjacent commercial district and the city's revitalisation efforts there, while a third created a green portal, linking the hospital's open spaces to a new adjacent public housing project.

Important community partnerships were enhanced with these landscape strategies. Collectively, they established a connection to nature and a sense of place, which strengthened social and economic ties. And together they helped the city and encompassing region address large environmental issues.

Healing the land

Here is a proposed reclamation project that seeks to heal an unhealthy site and turn itself into an environmental education centre. Located in the UK, Brockholes is a former gravel quarry located in the floodplain of a river within surrounding farmland. This large territory needed not only an organising framework but also something more basic: soil. It had none. Therefore, instead of an organisation of fixed plantings, the land was worked over a five-year period to support a succession of plant rotations to build up nutrient levels and biomass production. Starting with groundcovers to fix nitrogen levels in the early soils, naturalisation and succession brought in a variety of shrubs for biomass production. Pioneer trees then stabilised the process to create an organising element. In conjunction with the development of the fields, a new watershed and drainage system was created to work with the adjacent river and the existing on-site pond. The drainage systems are ultimately expressed in the site development, melding built form with landform to create a cohesive scheme. The goal is a long-term plan that will maintain a healthy site, through the continual process of cleansing water and building soil.

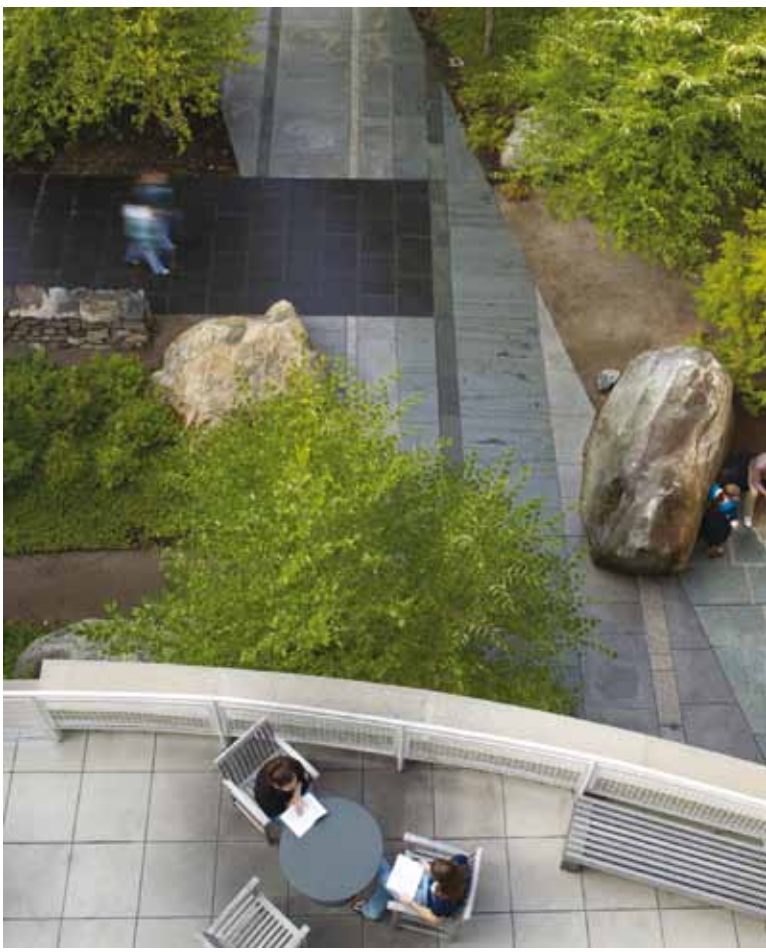
There are many additional examples and some with spectacular results – like the Eden Project in Cornwall, UK, which transformed an abandoned china clay quarry into a very popular environmental education centre and global garden. Another opportunity for landscape architecture to help strengthen our communities has been our participation with developers to create responsible high-rise office and residential projects that create a vertical greenbelt. With a series of roof-top environments, they become good neighbours by reducing the polluting effects brought on by poor water drainage management.

For design to succeed in this broadened horizon, collaboration is necessary. The European Centre for the Environment and Human Health and the University of Virginia Center for Design and Health, are but two agents for establishing effective collaborations between designers, planners and health professionals. Efforts such as these are strengthening our approach to exploring the interconnections between the environment and human health.

Conclusion

By necessity, this essay is an overview, articulating today's design challenges thanks to a widened awareness of environmental interconnections. It is hoped that this introduction may serve as an illustration of the ways in which landscape architecture can become an effective partner in planning for healthier settings, both private and public – bringing real benefits in living.

David Kamp, FASLA, LF, is founder and president of Dirtworks Landscape Architecture. He is also co-founder and member of the Executive Committee for the University of Virginia Center for Design and Health



Time and place: successional native plants and pavement representing the site's geologic strata in the Natural Science Center Courtyard, Keene State College

The CF Møller-designed New University Hospital in Aarhus, one of Denmark's five new 'super-hospitals', has been designed with landmarks for easy wayfinding

On the **continent**

Kathleen Armstrong takes a tour of European healthcare, where integration and modernisation are taking health delivery in new directions

There is change afoot in Denmark. Local hospital services are being merged into five new 'super-hospitals' which will provide acute care services at a regional level. Smaller units which formerly served the local community will be converted into health centres, as part of the country's 10-year plan to restructure and rationalise its health services. Work has already started on the first of the super-hospitals, the New University Hospital in Aarhus – a 400,000sqm facility that has been designed to provide landmarks for easy wayfinding like a city, says architect Julian Weyer from CF Møller. "It is a simple scheme which deals in a high level of complexity," Weyer comments. "The idea was to create an intuitive approach with streets and squares, tall buildings in the centre, gradually dropping off into the landscape."

The hospital will have its own ring road system, enabling patients to enter the complex where they need to, entering at ground level and travelling a short distance to the part of the hospital they need to access. Views of the 'city' and landscape from inside the buildings also help with orientation. Wards will be clustered in six-bed groupings around a small square.

"It's all about small scale in the patient's immediate surroundings," Weyer says.

The 100% single-room hospital was designed using lessons gleaned from research and from previous projects the firm has worked on, particularly the recently completed Akershus Hospital in Norway, which itself is undertaking a major programme of health infrastructure development.

In Sweden there is also a large-scale remodelling of infrastructure to increase capacity including a series of hospitals in Stockholm and in regional centres around the country. CF Møller has recently delivered a new emergency and infectious diseases unit in Malmö whose circular design and wedge-shaped rooms incorporate security without appearing too institutional (see p38).

Healthcare in Scandinavia is publicly provided and development of new infrastructure government funded, unlike

many countries in Europe which have embraced public-private partnerships (PPPs).

Programme of redevelopment

One of these is France, which is nearing the end of a major programme of redevelopment and renovation throughout the country, some funded through design-build, others through PPP. The programme includes the development of new regional hospitals of 600-1,000 beds as well as range of smaller units of around 200-250 beds. The strategy aims to provide more outpatient and day hospital services where patients do not have to stay in hospital and to share resources between units within regions.

Although there are some private clinics, all healthcare in France is provided free to the population. Almost all hospitals also now have 100% single rooms.

"In France, there is a feeling of privacy, so we like single-bed rooms," comments Antoine Buisseret from architectural firm Groupe-6, which has worked on a range of projects around the country, including regional hospitals and health clinics.

They include the 565-bed Centre Hospitalier Universitaire (CHU) Estaing, which sits on the site of a former Michelin tyre factory in Clermont-Ferrand. The €233m hospital forms one of CHU Clermont-Ferrand's three sites in the city, providing acute care services and state-of-the-art research facilities.

Italy has also used PPP to fund a range of redevelopments around the country where, as in France, healthcare is 100% publicly provided. Integration is at the heart of the strategy for larger hospitals, moving away from the departmentalisation of specialties to designs that enable integration, a sharing of services and innovation.

The country's first PPP project was the Hospital Angelo in Mestre near Venice, designed by Studio Altieri (see p41). Altieri has also worked on a 'green system' of

Forth Valley Royal Hospital

Infrastructure and flexibility are at the heart of the design of the new 850-bed Forth Valley Royal Hospital in mid-Lothian, Scotland. The facility brings together services from two hospitals, in an innovative design that provides patients with a space free from the noise of moving trolleys and other back-of-house activities. The hospital also features the first fleet of robots in a UK hospital to deliver food and transport linen and medical supplies – operating within their own dedicated network of corridors underneath the hospital.

Surrounded by mature woodland, ponds and landscaped gardens, the hospital has gone into partnership with the Forestry Commission Scotland to appoint a community ranger to maintain the environment and protect the wildlife that inhabits it.

Client: NHS Forth Valley
Completion: August 2010
Area: 96.000sqm
Cost: £293m
Procurement method: PFI
Architects: Keppie Design
Project manager: Laing O'Rourke

Photo: Joergen True

Photo: Joergen True

Emergency and Infectious Diseases Unit, SUS, Malmö, Sweden

Malmö's new 51-bed isolation facility provides both a high level of infection control and a feeling of openness for patients. The wedge-shaped rooms, laid out around the periphery of the circular building, provide patients with natural light and views of the surrounding city. Inner circle rooms also benefit from the daylight that streams in from the central, open atrium. Patients can be wheeled directly into the isolation wards from the outside via a glazed top-floor corridor, while an airlock maintains the partial vacuum necessary to control ventilation and prevent the spread of infection.

Client: Regionservice Södra Skåne
Completion: September 2010
Area: 24,000sqm
Cost: SEK863m
Architects: CF Møller Architects in collaboration with SAMARK Arkitektur & Design
Project manager: Regionservice Södra Skåne
Main contractor: PEAB AB
Landscape architect: CF Møller Architects

hospitals in Tuscany – four hospitals of 400 beds each in Lucca, Pistoia, Prato and Massa, each offering the same services as well as an individual specialisation complementing that offered in the other three, and incorporating into their design materials local to each location.

On a much larger scale is the Pietro Confortini in Verona which opened in November 2010. Linked to the city's university, it comprises 33 operating rooms and a large day surgery department with 7-8 operating rooms. Altieri says, given the size of the facility, particular attention was paid to the patient journey, from the emergency department to clinic to ward, integrating disciplines to bring distances close together.

In Spain the current focus is on the development of specialist facilities such as Alzheimer's or paediatric units. While the Ministry of Health has primary responsibility for the delivery of healthcare, the actual implementation of the strategy is up to each region – and this, says architect Rubén Garcia Rubio, can create some inequities: "This is reflected in the design because there are not only national design laws but also regulations that apply to each community – as well as local laws – so design can vary slightly from one region to another."

A good example of design is the award-winning Day Centre for People with Alzheimer's Disease in Benavente (featured on p17, WHD January 2011), designed by architects Rubén Garcia Rubio and Enrique Juanes Martin and due for completion in 2012. The centre uses colour and layout to help create a sense of place for residents, while large windows not only provides them with a vista over the surrounding green space but also helps them with their daily pedagogy as many of its users are from rural communities.

Bringing in the market

The private sector plays a significant role in healthcare in the Netherlands and is destined to play much more of a role in future. Hospitals are owned and managed by the private sector and healthcare is paid for by private insurance. However, the government has recently suggested that it would like to see 70% of all treatments priced by the market, which, says architect Maurits Algra from de Jong, Gortenmaker Algra (dJGA), is likely to change the thinking of hospital directors and their organisations.

"They will want to be treated like companies – to make

Photo: L Boegly

Photo: L Boegly

The Centre Hospitalier Universitaire Estaing in Clermont-Ferrand, France provides state-of-art acute care and research facilities

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profits and hold enough reserves," he comments. "This was not possible before."

Algra predicts that that hospitals will be forced to form alliances in order to give them some power against the insurance companies and to create stronger corporate identities to attract patients. This may lead to the development of a new type of facility in future. However, currently, the focus has been more on specialist facilities, including a proposal for a children's oncology centre which will bring the services currently distributed across seven separate academic centres into one specialist facility.

"This will be an interesting project, as it is focusing on what is really needed to provide a good environment for children and adolescents, bringing in research by psychologists," Algra says.

Financial squeeze

Discussion about the privatisation of the health sector has also been the subject of public debate in the UK as the Coalition government, which was elected in May 2010, attempts to push forward its proposals for healthcare reform. These include increased involvement of the private sector in healthcare provision, although the government has stated that healthcare will continue to be free at the point of care.

While the debate on the future structure of the health sector has stalled plans somewhat, the major impact on the sector has been the tightening of budgets for NHS trusts as a result of the global financial crisis. As a result, plans for many developments have been scaled down or put on hold.

"The focus is on value, doing more with less, recycling existing estate," says Jonathan Wilson from Anshen + Allen, part of Stantec.

This applies to projects funded both through the private finance initiative (PFI), Britain's equivalent of PPP, or directly by NHS trusts. However, a number of interesting projects have recently been completed, including the 513-bed Pembury Hospital in Kent, southeast of London, which opened in January this year. Designed by Stantec Anshen + Allen, it was the first public hospital in the UK to have 100% single rooms. The architects worked with researchers from Kings College London and the National Patient Safety Agency (NPSA) to develop the design which Wilson describes as both "modular and flexible".

The Central Manchester Hospitals PFI project, shortlisted for the Design and Health Awards (see p44), brought five of the trust's hospitals together onto one hospital campus. The Stantec Anshen + Allen design is centred around a hub called 'the Boulevard' which helps with navigation, as well as opening the site to the city. Each unit within the campus has its own identity and the site contains the second largest park in Manchester.

Primary care has also been a focus of the government's healthcare strategy and a number of health centres have been built around the country, bringing GPs and other services together under one roof. The Waldron, designed by Henley Halebrown Rorrison Architects and also shortlisted for the Design and Health Awards (see p47), brings four GP practices together with a community dentistry, sexual and reproductive health and multifunctional clinical, a child and family suite for Guy's and St Thomas' Hospital, with staff and administrative facilities on the top floor. The centre has been designed to stand out in its busy London setting, while creating a peaceful environment for patients to set them at ease when they enter the building.

Photo: Moreno Maggi

Ospedale dell'Angelo, Mestre, Veneto, Italy

The 'Hospital of the Angel' was designed by Studio Altieri to have two distinct elements: the Slab, which comprised two floors above ground and one below, and the six-storey hospital built above it, separating technical and clinical areas. The design incorporates terraced gardens and areas shaded by overhangs. The hospital's 'commercial piazza' includes a bank, travel agency and post office, making it more than just an urban landmark.

"It was a new concept of green design," explains Giulio Altieri. "The hospital has become a social and commercial space within the city."

Client: ASL 12 Veneziana – Veneta Sanitaria Finanza di Progretto
Completion date: November 2009
Area: 84,980sqm
Cost: €200,841,000
Procurement method: PPP
Architects: Studio Altieri

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The Henley Halebrown Rorrison-designed Waldron health centre in South East London

Regional reshape

Health policy in the UK is managed, and funded, independently in each of the four home countries: England, Scotland, Wales and Northern Ireland. Funding constraints have hit particularly hard in Scotland where progress on the government's strategy for a major restructure of the way healthcare is delivered has been pulled back. The strategy aims to concentrate acute care in a lesser number of acute facilities and downsize the smaller local hospitals into community care. However, regional health boards are now looking at how they can reshape their projects and stagger their spending.

The Central Manchester Hospitals PFI designed by Stantec Anshen + Allen

Scotland had in the past made less use of PFI than England but more recently has used its own version of PFI, placing a cap on profits that any party can make out of the contract. The recently completed Forth Valley Royal Hospital, designed by Glasgow-based Keppie Design, was a £293m PFI project which has received praise from patients for its calm environment – thanks to the segregation of waste and other 'backroom' functions from clinical areas (see p37).

Keppie is also working on the first hospital in Scotland to have 100% single bedrooms – the Royal Victoria, part of the Western General in Edinburgh. The hospital will provide care for the elderly and sits in a very tight space on the existing hospital's campus. In order to provide the least disruption, the hospital is being built in a factory environment in modules, also reducing the length of time needed to deliver the project.

Scotland has also recently begun to implement a PPP route for community care. Known as Hub, it mirrors the Local Improvement Finance Trust (LIFT) programme which has been running in England since 2000. Health boards and local authorities are being encouraged through the programme to rationalise estate and create multiagency facilities which will bring health services together under one roof with libraries, council offices and other services.

Across Europe, the shape of healthcare is changing. But while the strategies vary from country to country, some priorities remain the same across boundaries. Integration and rationalisation are driving health policies but the creation of patient-focused facilities remains at the centre of design.

Kathleen Armstrong is a health journalist

Community campus

The Central Manchester Hospitals (CMH) redevelopment is one of Europe's largest PFI healthcare schemes. A landscaped public boulevard links the facilities and re-knits the campus to the wider community. It is the second largest green space in Manchester. CMH includes four new hospitals placed under one unifying roof, each with their own individual entrance, sky-lit atrium, outpatient and ward facilities. Each hospital has its own central courtyard and terraces to give users access to outside places. A local school helped to design one of the courtyards, as part of an extensive arts programme reflecting Manchester's diverse population and involving local artists and the wider community. There are also interactive works, wall-mounted and moving image works, three-dimensional and tactile, works on glass and large- and small-scale installations.

Central Manchester Hospitals PFI, Manchester, UK
Shortlisted in: International Health Project (over 40,000sqm)
Submitted by: Anshen + Allen part of Stantec Architecture

Top marks

This issue's Design Solutions features the projects shortlisted for the 2011 Design and Health Academy Awards which will be presented on 9 July 2011 at the Design and Health World Congress in Boston. Judged by an international panel of experts, the shortlist encompasses projects from all corners of the world that have made a significant contribution to health, wellbeing and quality of life.

Focus on the future

The Lunder Building at Massachusetts General Hospital, designed by NBBJ, is a high-tech, flexible structure which has been designed to grow with the community over the next 100 years. The 535,000-square-foot building includes a 150-unit bed tower, and new emergency and radiation oncology units. The massing of the building is split into two components – a base of procedural programmes and an upper bed tower. The bed tower is anchored with gardens at each corner of the site; the garden facing east is a five-storey atrium located next to the main circulation core which acts as a segued entry into all patient floors.

Lunder Building, Massachusetts General Hospital, Boston, US
Shortlisted in: International Health Project (over 40,000sqm)
Submitted by: NBBJ

An Asian garden

Singapore's Khoo Teck Puat Hospital has been designed as a 'hospital in a garden, garden in a hospital'. The garden courtyard forms the heart of the hospital, serving as an orientation device, alongside tactile paving and big signage. The use of photovoltaic, solar thermal energy and rainwater harvesting/recycling are among the strategies for sustainability incorporated into the design. Fruit and vegetables, grown by local residents in rooftop gardens, are used both by the hospital and the community. The hospital is also collaborating with three national agencies to extend its urban farming efforts beyond its boundaries.

Khoo Teck Puat Hospital, Singapore
Shortlisted in: International Health Project (over 40,000sqm) and Sustainable Design
Submitted by: CPG Consultants

In the flow

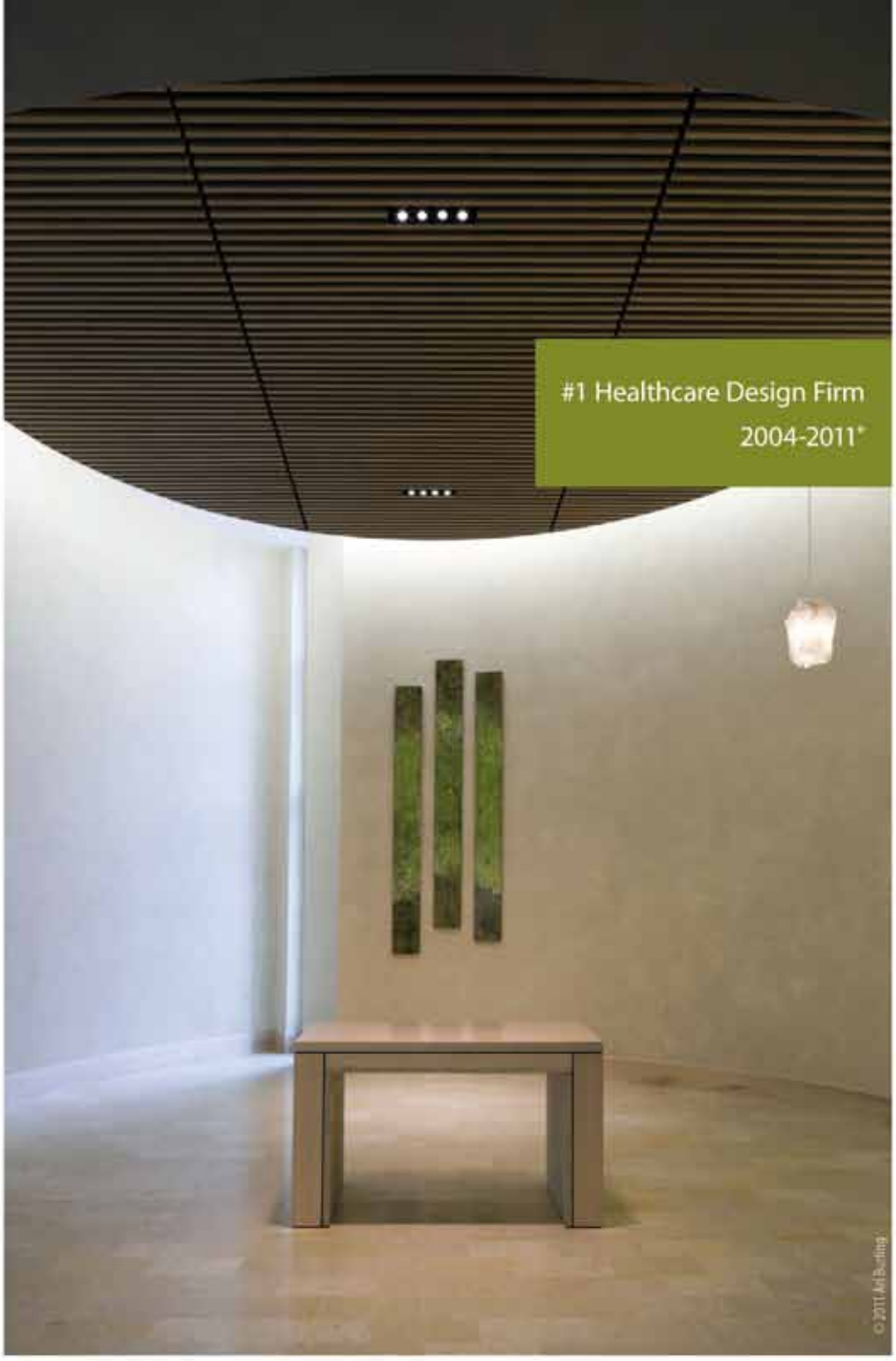
The patient journey is at the heart of Scotland's Forth Valley Royal Hospital. The design concept is a collection of distinct buildings which house separate clinical specialisms, connected to a series of public streets and squares. Twin clinical workflows are mirrored by separate and distinct patient journeys, which are additionally segregated from facilities management flows. Surrounded by hills and woodland, the design includes long-term conservation and land management strategies and is 'future-proofed' for flexibility with land available for expansion and new buildings. The Forth Valley Royal was a true collaborative partnership between NHS Forth Valley, Forth Health, Serco, Laing O'Rourke and the Keppie Design-led design team.

Forth Valley Royal Hospital, Larbert, Scotland, UK
Shortlisted in: International Health Project (over 40,000sqm) and Sustainable Design
Submitted by: Laing O'Rourke

Light and airy

Portadown Health and Care Centre stands out as a local landmark in its setting along the River Bann in Northern Ireland. The compact triangular three-storey building in planned around a central atrium which allows natural daylight to flow into surrounding rooms. Detailed daylight and thermal modelling was used to assist in the development of the window and facade design and the ventilation strategy, and the majority of rooms are naturally ventilated. The atrium is served by an underground labyrinth which provides it with tempered air and natural ventilation in the rooms that overlook it. Air flow in the atrium is controlled by automatic high-level louvres around the edge of the rooflight. The health centre, designed by a design team led by Avanti Architects, provides a one-stop shop for primary and community care services in Portadown.

Portadown Health and Care Centre, Northern Ireland
Shortlisted in: Sustainable Design
Submitted by: Avanti Architects



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Eyes of the child

As one of the top-rated paediatric hospitals in the US, Seattle Children's Hospital specialises in treating the physical and emotional needs of patients. Its new Bellevue Clinic and Surgery Center, designed by NBBJ, supports this philosophy through a variety of design features which help to reduce anxiety, including the use of plentiful daylight/skylights, views of rooftop gardens, limiting exposure to intimidating medical equipment and installing artwork that appeals to all ages. The journey from waiting to surgery, which can be a traumatic experience for children, was made more comfortable using a computer simulation process that right-sized the lobby to reduce waiting times, and creating a design that minimises stretcher turns and blind corners. Interior artwork reflects the flora, fauna and landscape of the Pacific Northwest region, helping to create a comfortable, engaging and positive experience for patients.

Seattle Children's Bellevue Clinic and Surgery Center, Bellevue, Washington, US
Shortlisted in: International Health Project (under 40,000sqm)
Submitted by: NBBJ

Five steps

The quality of patient experience and staff workplace set the direction for the design of The Waldron health centre in South London. The design sought to simplify the patient journey into five steps – from the new public square, into a light filled central hall, along door-free day lit cloisters, into waiting rooms overlooking landscaped gardens to the clinical rooms. Generous roof terraces were provided adjacent to offices and staff facilities on the top floor of the building. The Waldron's clinical clusters accommodate four GP practices as well as a range of other health and social care services. The health centre was designed by Henley Halebrown Rorrison.

The Waldron, London, UK
Shortlisted in: International Health Project (under 40,000sqm)
Submitted by: Henley Halebrown Rorrison

Warming elements

A 'sliding glass box' tops the Youth Mental Health Building (YMBH), part of the Brain and Mind Research Institute (BMRI) at the University of Sydney. The translucent glass planks provide diffuse daylight to the laboratories which make up the top two floors of the facility throughout the day, resulting in very low energy consumption. The BVN Architecture-designed building is also stepped toward the north to allow sunlight into the neighbouring houses. The lower two floors, which sit behind the heritage façade, provide a welcoming clinical space where young and mentally vulnerable people can come without feeling intimidated. Timber warms the concrete and steel of the main structural elements, creating an informal, casual 'drop-in' feel.

Brain and Mind Research Institute – Youth Mental Health Building, Sydney, Australia
Shortlisted in: International Health Project (under 40,000sqm)
Submitted by: BVN Architecture

Credit Valley Hospital, Mississauga, Ontario, Canada. Photo credit: Tom Arban

How do we use design as a catalyst for health?

Now that the cost of coping with chronic diseases has become unsustainable, we must design our way to health. All around us we see opportunities to re-think the built environment as a means to promote health rather than support illness. Let's work together to raise our expectations for design as a powerful catalyst for health.

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Tree of life

Kurdistan's first children's hospital, designed by Make Architects, will provide state-of-the-art services and international standards of clinical care for the whole Kurdistani region. Located in the capital city of Erbil, the complex includes a 120-bed main building with 56 single rooms, four six-bed bays and 20 VIP rooms. Extending out from the circular, three-storey main building in radial form are five individual wings, containing three operating rooms, an emergency department, imaging, specialist outpatient clinics, a paediatric and neonatal intensive care unit and a women's hospital. Wards all face out onto the quiet rural landscape, which will be enhanced with gardens and parks.

The Children's Hospital, North East Erbil, Kurdistan, Iraq
Shortlisted in: Future Health
Submitted by: Make Architects

Heartbeat

The Singapore Ministry of Health's vision for the new National Heart Centre (NHC) is to establish a world-class facility of excellence for national and regional referral in cardiovascular diseases with sustainability at its foundation and a 'placing people first' philosophy. Courtyards, gardens and other open spaces are integrated throughout the building to help accelerate healing through natural light, ventilation and air purification, as well as encouraging socialising and interaction.

National Heart Centre, Singapore
Shortlisted in: Future Health
Submitted by: BroadwayMalyan

Stepped care

The improvement of mental health services and integration with the local community are at the heart of the redevelopment of the Glenside Campus in South Australia. Bringing key mental health services together on one site, the facility will provide a new stepped pathway of care, ensuring patients will have access to the appropriate care when they need it and closer to where they live. The buildings for the 129-bed facility are arranged in a 'village' configuration around a common shared 'healing' garden, accessible to both patients and the public.

Glenside Campus Redevelopment Health Facilities (Precinct 1), Adelaide, South Australia
Shortlisted in: Future Health
Submitted by: MAAP

Building Hope

Seattle Children's has been operating at or near full capacity for many years. To create space for additional beds, the hospital asked ZGF Architects to develop a campus masterplan to guide growth for the next 20 years. The strategy incorporates lean management and continuous performance improvement principles, as well as a range of innovative solutions identified in a series of stakeholder workshops.

Seattle Children's Phase 1 Expansion, Seattle, US
Shortlisted in: Future Health
Submitted by: ZGF Architects LLP

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Tseung Kwan O Hospital, Hong Kong, China

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Discovery

The emergency department is often a crucible of emotions. This is even more evident in a paediatric emergency department where the patient, parent and staff all experience stress and anxiety. To help counter these emotions, the design approach for SickKids Emergency Department is rooted in the idea of discovery and innovation. The intention is to create a pleasant and fun distraction for the children, allowing them to explore and discover their environment, through stimulation and interaction with universally appealing elements, images, shapes, textures and colours. 'Discovery boxes' open out in the waiting room, inviting exploration, some containing images and natural elements such as flowers, others interactive and tactile.

Emergency Department, Hospital for Sick Children (SickKids), Toronto, Canada
Shortlisted in: Interior Design
Submitted by: Stantec Architecture

Glimpses from a train

The design strategy for the Department of Psychosocial Oncology and Palliative Care at Princess Margaret Hospital In Toronto (Phase 1: Harold and Shirley Lederman Palliative Care Centre; Phase 2: Al Hertz Centre for Supportive and Palliative Care) employed an innovative art palette to clad the hospital walls with a syncopated rhythm of large-scale transparencies of the earth as if seen from a train – glimpses and incomplete views, like fragmented memories. The design integrates nature and art in the architectural experience: the circulation route through the 16th floor sees the earth in seasonal transition throughout the year, representative of the philosophy of the hospital's psychosocial oncology programme, which regards cancer treatment as a journey and frames care in a socio-psychological context.

Department of Psychosocial Oncology and Palliative Care at the Princess Margaret Hospital, Toronto, Canada
Shortlisted in: Interior Design and Patient Environment and Art
Submitted by: ARK

Rural scenes

A key part of the design strategy for the new £10m acute ward block of Chesterfield Royal Hospital NHS Foundation Trust was the selection of artworks that would not only appeal to the mainly rural and ageing local community but also integrate into the building's contemporary design. Colours and artworks were taken from the local landscape, which patients said they loved, while the three levels of the building explore the different topographies found in the region. Artworks were integrated into the building with colour on the glass mullions in the connecting corridor, applying colour to the wall surfaces and window reveals, large-scale wall graphics, over-bed images, laminated images on doors and printed whiteroc in the shower room.

Chesterfield Royal Hospital NHS Foundation Trust, UK
Shortlisted in: Patient Environment and Art
Submitted by: Artinsite

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The hospital design is a low rise two and 3 storey building which will create a non institutional and patient focused therapeutic environment which reflects the clinical priorities inherent in the brief and simultaneously provides a welcoming, stimulating, and efficient workplace for staff and visitors. The building is designed to maximise the opportunity for natural light and ventilation to all habitable rooms and offer external views to all patient rooms towards the surrounding landscape and mountains and to create a human scale which will create reassurance and amenity in a manner which accelerates the healing process.







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Windows of hope

The Sister Margaret Smith Addictions Treatment Centre was designed to support the core values of the St Joseph's Care Croup which are: compassionate and holistic care, dignity and respect, faith-based care, inclusiveness and truthfulness and trust. This is most evident at the main hall of the building known as the Hall of Recovery which organises the three main components of the programme in a dignified, calm, welcoming and comforting setting. Three large round windows, looking to the heavens, represent the Windows of Hope – one for each of the mind (therapy rooms), body (gymnasium) and soul (spiritual space). The building has been arranged around two landscaped courtyards, which can be used as part of therapy.

Sister Margaret Smith Addictions Treatment Centre, Thunder Bay, Ontario, Canada
Shortlisted in: Mental Health
Submitted by: Montgomery Sisam Architects

At home

The creation of pods and the use of warm, natural materials helped transform the Ballarat Acute Mental Health Facility into a home-like environment for mental health patients. The zoning of lounge spaces reflect a culture of quiet, positive healing and safe environment. Once hidden from the community behind a high, solid fence, a new entrance with an open timber fence allows the facility to present a more open, engaging presence to the wider community. The facility maintains an open front gate during the day and a welcoming, accessible front yard provides an outdoor recreation space for lower-risk patients. The 'secure' backyard, with glazed brick facade, uses soft colours and landscaping to instil a sense of fun.

Ballarat Acute Mental Health Facility, Ballarat, Victoria, Australia
Shortlisted in: Mental Health
Submitted by: Billard Leece Partnership

Safe and secure

Rose Lodge is a new-build assessment and treatment centre for working-age adults with learning disabilities and mental health problems. Located within a maturely landscaped site and designed around a large therapy courtyard, the building offers generous access to outside space. The 5.2m-high courtyard wall allows for a 2m-high service walkway within the roof space; this allows all services to be maintained off-ward, minimising disruption to the running of the unit. In addition, signage depicting local environment features and landmarks is used in different colours to assist wayfinding.

Rose Lodge Assessment and Treatment Centre, Hebburn, Tyne and Wear, UK
Shortlisted in: Mental Health
Submitted by: Medical Architecture

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Module magic

Compass is a modular system of interchangeable components that can be used to create applications for patient rooms, exam rooms and other clinical spaces. Different configurations provide storage for patient belongings, work surfaces, storage for caregivers or even space for families to work and visit. Designed to accommodate change, Compass components are easily assembled, removed, rearranged and refreshed. Infection control challenges were met head-on with the covering of primary surfaces and edges of tiles and storage modules with Durawrap, eliminating the seams created by edge banding. In addition, a specially designed sink has the drain offset from the tap to minimise splashing and reduce the spread of infection.

Compass System
Shortlisted in: Product Design
Submitted by: Herman Miller Healthcare

High definition

Olympus' ENDOALPHA Technical Panels are the only technical wall panels for operating rooms (ORs) that are available as approved medical products and at the same time are optimised for aesthetics and usability in glass-wall equipped surgical operating rooms. The technical panels have been designed as building parts to fit seamlessly into most modern integrated ORs. Feedback from patients, users and service technicians was used to improve the design of the panels, whose screens range from 42-inch or larger main screens for viewing images from the high-definition cameras of endoscopes to 20-inch touch screens for the manipulation of OR products. Interviews with users have underlined how the concept of glass-walls and glass panels in the OR creates an aesthetically optimised working environment which helps to improve staff motivation, as well as reducing infection risk.

ENDOALPHA Technical Panels
Shortlisted in: Product Design
Submitted by: Olympus Surgical

Easy access

Primera's 'PR3' Secondary Barricade Override mechanism is an anti-barricade feature which prevents a patient from taking any action that would deny clinical staff access to the patient's room. It allows staff to gain access even when the key-way has been deliberately blocked (e.g. by gum or paper) or where a key has snapped in the lock in panic. Without such a mechanism, efforts by clinical staff to intervene would be slower and possibly too late – and very expensive if the door needs to be broken into.

Primera PR3 Secondary Barricade Override
Shortlisted in: Product Design
Submitted by: Primera

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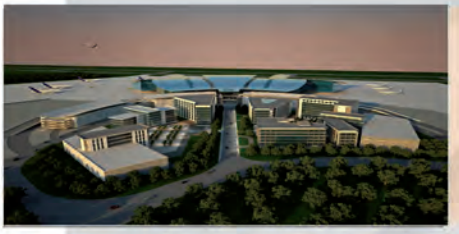

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STRATEGIC CONCEPTS MASTERPLANNING HEALTHCARE DESIGN

This new mental health, drug and alcohol care facility in Adelaide, Australia, continues Medical Architecture's focus on creating healing environments. Glenside Campus Redevelopment is designed in partnership with Swanbury Penglase Architects and currently under construction.

Arranged as a small village around a central healing garden, the design provides a positive message for a sometimes stigmatised patient group.

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Design & Health Scientific Review
Your judgement counts

Dr John Zeisel is chair of the international advisory board of the International Academy for Design & Health and president of Hearthstone Alzheimer Care

In last issue's Scientific Review I wrote: "Readers have three responsibilities in interpreting how evidence-rich an article is: determine what type of research project the article represents, be aware of the qualities that determine a successful research presentation of that type, and evaluate the actual quality of the evidence itself." I described how I would assess three very different evidence-based articles – which three major criteria I would use – and at the end of each I stated: "Whether this article reflects these principles well is up to the reader to decide."

While some readers may interpret such pronouncements as negatively critical, this is not necessarily the case. In fact, two of the research articles in last issue's Scientific Review were particularly interesting; however, the other lacked methodological and analytical rigour.

It is the reviewer's role to provide the reader with the appropriate tools for critical analysis, and to challenge you to read carefully and critically. Then it is up to you to make a final judgement about whether or not you believe the research-evidence has validity, will stand up to scrutiny and can ultimately be applied in practice.

The two Scientific Review articles in this issue of World Health Design raise similar questions, but this time about methods and analysis. Cai and Zimring base their analysis of, and recommendations for, nursing station design primarily on plan analysis employing space syntax, buttressed with literature review, systematic observations of behaviour, called behaviour mapping, and a questionnaire to nurses about their awareness of other nurses, from which answers are recorded on plans of the intensive care unit. The carefully collected data are triangulated and analysed and design recommendations reported. The analysis is complex. The two units being compared are actually two sides of the same ICU – one 14 beds and one six. Some of the plan analysis data maintain the separation between the two sides, and some consider the unit as a whole.

Wang, Pukszta, Petzoldt and Cayton are similarly detailed in their methodology, analysis and design suggestions for ambulatory-based cancer treatment infusion centres. They gathered pre-design data employing surveys, interviews and focus-group discussions, and post-design evaluation data employing a questionnaire and systematic observations of both behaviour and environmental cues. Their analysis focuses on choice and control, privacy and social support, and positive distractions.

Both of these articles deserve careful reading. Ultimately, however, it is up to the reader to critically analyse the research and decide where they are strong and where they are not. It's your judgement that counts.

60-67
Nursing Culture and Performance: The impact of nurse station typology on nurses' informal communication and learning
Hui Cai, PhD Candidate, MA (Arch), Craig Zimring, PhD

68-74
Cancer Treatment Environments: From pre-design research to post-occupancy evaluation
Zhe Wang, PhD, RA, LEED AP, EDAC, Michael Pukszta, AIA, Natalie R Petzoldt, AIA, LEED AP, EDAC; Jennifer Hendrich Cayton, LEED AP

Nursing Culture and Performance:
The impact of nurse station typology on nurses' informal communication and learning

This study examines the impact of decentralised and centralised nurse stations on the way nurses communicate with each other

Hui Cai, PhD Candidate, MA (Arch),
Craig Zimring, PhD

This study aims to re-examine, in a more precise way, the impact of decentralised nurse stations on nurses' communication. Nurse station typologies are hypothesised to impact on the way in which caregivers interact with each other, share information and accumulate tacit knowledge in practice. Through literature reviews on nursing pedagogy and management, learning theory and organisational environment, we discover that nurses' learning is situated in the work context. The 'community of practice' can be enhanced through communications among members.

In addition to providing surveillance on patient rooms, the design of nurse stations should support better visual connections to peers' work areas to increase opportunities for interaction, awareness of peers' work and knowledge exchange. Based on the space syntax theory, we propose integration, team-base distance and peer distance as key metrics to examine nurse station typologies as interconnected spatial systems.

We develop a comparative study on two wings of the newly designed Neuron Intensive Care Unit (2D ICU) at Emory University Hospital in Atlanta to test the proposed metrics. By developing spatial analysis, behaviour mapping and peer awareness network mapping, we reveal different communication patterns related to the spatial configurations of nurse station design.

This research provides an in-depth understanding of the correlation between nurse station typologies and nurses' communication patterns. More importantly, the proposed spatial metrics of nurse station typology analysis can be used as a standard tool to conduct more rigorous evaluations and comparisons among different typologies The results can contribute to future nursing unit designs to achieve the balance between being close to patients and staying connected to peers – and, hence, facilitate informal communication and learning, help with the attraction and retention of nurses, and improve team collaboration and quality of patient care.

Photo: John Durant

Nurse station design, by Aesthetics, at the Rady Children's Hospital in San Diego

Introduction

The nurse station is one of the most important elements of nursing units. The design of nurse stations is not only related to the degree of patient care and staff satisfaction[1], but also to the possibilities of informal communication and learning. Recently, the contexts in which healthcare organisations operate have changed dramatically, such as the shift to patient- and family-centred care, a more integrated care process and collaborative care model, and the rapid updating of technology and equipment. As a result, traditional centralised nurse stations have been gradually replaced by decentralised work stations, with the potential benefits of better patient visibility, increasing direct patient care time, and reducing walking distance[2,3].

However, debates persist about the impact of decentralised nurse stations on nurses' communication and implicit learning. Some studies suggest that they may increase the perception of nurse isolation from other caregivers, thus decreasing social interaction and learning[4-6]. In a pre-post study on an intensive coronary care unit (ICCU), Dutta[7] found that the frequency and length

of communication between caregivers decreased when staff moved from the centralised to the decentralised nurse station design. Based on an explorative comparative study on decentralised and centralised medical-surgical units, Gurascio-Howard and Malloch[8] suggested a lack of registered nurse to registered nurse (RN-RN) networking opportunity in the decentralised design. Zborowsky et al[9] conducted comparative studies in three centralised and three decentralised units and discovered that consultations with medical staff and social interactions were significantly less frequent in decentralised nurse stations.

The above studies provide us with rich descriptions of how nurses used the space differently in centralised and decentralised designs. However, they fail to capture the mechanism that leads to the reduction of interactions in the decentralised designs.

To add to the complexity of the problem, the field doesn't have a consistent categorisation of nurse station typologies, which makes comparing and applying existing studies in future designs difficult. Figure 1 shows five basic components of a nurse station typology: central station, sub nurse station, pod, distributed alcoves and mobile work stations. In practice, there is an infinite number of combinations of those components. However, they are currently simplified as centralised, decentralised and hybrid nurse station typologies. Moreover, existing studies examine nurse station typologies with subjective descriptions of each component. There is a lack of study on the relationship among the components as a spatial system.

In this study, we propose a more holistic method for investigating what spatial configuration can keep nurses connected while allowing them to work close to the patients. This study reviews literatures from multiple disciplines to identify spatial variables that contribute to nurses' communication and learning. Based on the review, a schema to analyse nurse station typologies is proposed. We further test the spatial measures with observed behaviours in one intensive care unit.

Literature review

Communication in healthcare has long been recognised as important in mitigating perceptions of stressful work situations, offloading stress[10,11], enhancing social relationships and promoting individual and organisation health and performance[6], and strengthening teamwork and overall healthcare delivery[12]. Communication also has direct and indirect impacts on patient outcomes[13].

Communication and informal implicit learning. More importantly, communication plays an active role in effective learning. A nursing unit can be viewed as a 'community of practice'[14]. The repertoire of knowledge is built up through a collection of communal resources, such as examples, artifacts, vocabularies and routines that community members can draw upon[15,16]. The tacit knowledge transmits and accumulates by engaging in the 'community of practice' through communication and collaboration. It is similar to what Hutchins[17] defines as 'distributed cognition'. He claims that knowledge may be distributed across the members of a social group and the environmental structure. To construct strong social relationships, and to develop the ability to identify and go to the right person who has the specific knowledge, is important in gaining a wealth of problem-solving capacity.

In addition, the acquisition of tacit knowledge requires an immersion in the work environment that allows for both observation of peers' work and active interaction with tasks[18,19]. This type of situation-at-hand informal learning can best take place in an environment where everyone engages in problem solving, and where there is a sense of companionship[20]. The physical environment should support rich visual connections and active informal communications to facilitate knowledge transmission.

Face-to-face communication, learning and space. The communication we are interested in in this study is face-to-face communication. Despite the increasing role of technology in supporting communication, face-to-face communication still is the most important and reliable way of communication[11,21]. Most face-to-face communications are unplanned, impromptu conversations. Physical proximity and visibility are important factors in deliberate face-to-face communication. Studies have shown that the length and strength of interactions among office workers are influenced by their physical proximity[22]. Becker and Sims[23] claim that open work areas with a high degree of visual contact can support better exchange of information and knowledge.

Applying space syntax theory in hospitals. Space syntax scholars have linked spatial configuration to behaviours, including movement, physical co-presence, co-awareness, and unplanned interactions[24-27]. The basic premise is that higher integrated spaces have more natural movements. Movements can then contribute to encounters, co-presence, co-awareness and informal communications, which in turn help sustain or generate knowledge[28,29]. For example, Rashid et al[30] found that the visible co-presence was highly correlated to face-to-face communication. Penn and his colleagues[25] also discovered that seeing each other more frequently might raise the awareness of other people's contribution

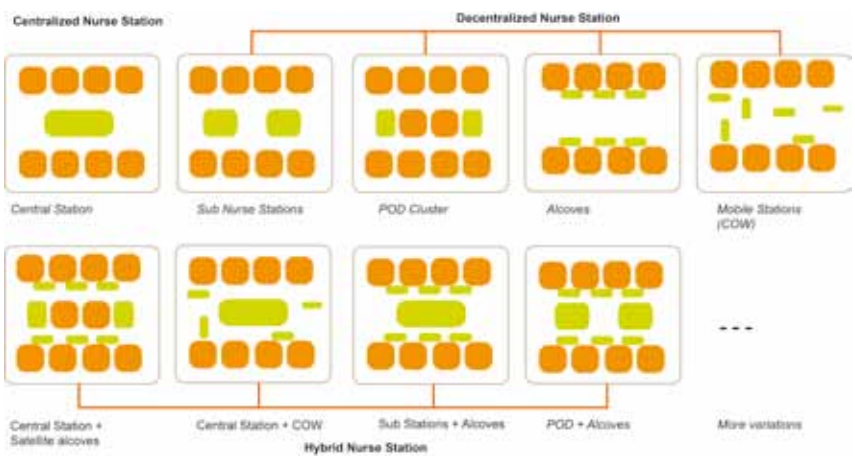

Figure 1: Diagram of nurse station typology

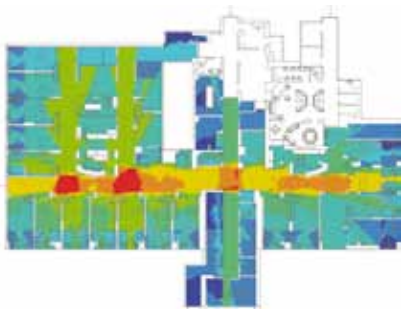

Figure 2a (left): 2D ICU East & West Wing visual integration graph

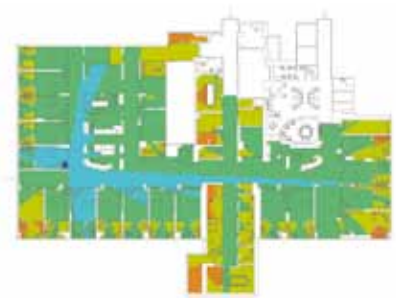

Figure 2b (right): Visual step depth graph with W3 as the origin (the value goes from low to high following the colour, changing from blue to red, light to dark)

to someone's own work. In addition, a well-connected local network where users could see and reach each other easily was usually a predictor of a strong sense of community[31]. In a recent study, Hendrich *et al*[32] use the space syntax method to re-analyse existing time-and-motion data in nursing units. They reveal that the nurse assignments with higher integration/centrality can lead to a greater frequency of nurses' visits to patient rooms and the nurse station.

Based on the previous studies, two spatial measures are key factors related to communication and learning: integration and step depth. Integration is a global value, which describes how well one space is connected to all other spaces in the system. A space with a low integration value usually is more segregated from the rest of the system. Step depth is a relational value and measures the number of turns (plus one) that needed to be transversed from the current location in order be able to see any other location within the plan[33]. Every space that is directly visible from the selected origin is counted as one step away from that origin. In other words, step depth can represent the degree of accessibility between points of interests. As physical proximity is important for communication, we also include the measure of metric step depth, which is a weighted version of the step depth, considering the metric distance from one location to another[33]. The validity of the measures is tested through a case study. The study focuses on the following questions:

1. Do the proposed measures provide more accurate descriptions of nurse station typologies?
2. Can the proposed measures explain behavioural differences, such as the frequency of interaction and the awareness of peers' work?

Setting and sample

The case study was conducted at a recently designed neurological intensive unit (2D ICU) at Emory University Hospital. The weekday staffing includes 11 RNs, one nurse manager, three nurse practitioners, one attending physician, and two to three resident physicians. Although the 2D ICU is based on the same group of caregivers operating as one whole unit, the service corridor in the middle naturally breaks it into two sub-units – 2D-West (2D-W) and 2D-East (2D-E). Each sub-unit is served by a central nurse station and several alcoves. Each alcove is assigned to one nurse who is in charge of two adjacent patient rooms. The alcoves recede from the corridor yet maintain certain visibility toward peer alcoves. Although the two wings have similar components, they are sufficiently different in configuration. The west wing is composed of 14 patient rooms with a total area of 10,840 sq ft. The east wing has only six patient rooms with a total area of 5,100 sq ft. Compared to those in 2D-W, the alcoves in 2D-E seem to be more equally related to both the central station and the peer alcoves. The two wings provide an opportunity for a natural comparative study on the effects of spatial configuration on nurses' communication. For easy reference, we assigned a name to each alcove and central nurse station. For example, the central nurse station on the west wing is coded as 'C (W)'. The alcove on the upper left hand of the west wing is coded as 'W1'.

Methodology

We applied a multi-layered approach combining qualitative and quantitative methods to examine space and nurses' behaviour. Quantitative methods included spatial analysis and behaviour mapping. The qualitative method was based on a peer awareness network analysis.

Spatial analysis. Firstly we used the program, Depthmap, to calculate integration as a generic measure of visibility (Figure 2a). Secondly, we developed two relational metrics, team-base distance (TD) and peer distance (PD) to describe specific spatial relationships between nurse station components. For TD, we set one central nurse station as the origin and calculated the step depth from the origin to each alcove in the same sub-unit. This value demonstrated how the nurse in each alcove perceived his/her distance from his/her immediate team-base. In addition, we proposed PD as another metric to depict the spatial relationship among alcoves. It was the average value of the step depth from the selected alcove to all other alcoves (Figure 2b).

We further differentiated the impact of space on the sense of community in the immediate sub-unit and the overall 2D unit with two values, local PD and global PD. The former value was calculated based on the values within the sub-unit, while the latter was based on the whole unit. For instance, the local PD of W1 was the average value of its step depth to all seven peer alcoves in 2D-W. The global PD of W1 was the average value of its step depth to all 10 peer alcoves in the 2D ICU. Both the visual and metric step depth values were calculated for all measures. In short, the TD represented the visual proximity to team work and the PD represented the visual proximity to peer alcoves. Both values might contribute to nurses' sense of community.

Behaviour mapping. Behaviour mapping was used to capture the aggregated patterns of people's distribution and interaction in the setting. The data was collected by a group of five observers over a period of two weeks. Two trained observers documented the physical locations of all those present in the ICU via a standard route at each wing simultaneously (Figure 3). Each cycle was approximately 15 minutes. The identity of people and their status of interaction/non-interaction, using/without using surface and computer were recorded. In total, 56 sets of behaviour mapping and 3,986 events

were recorded in each wing, covering an equal amount of morning and afternoon shifts. All data was input into ArcviewGIS 3.2 for analysis.

Peer awareness network mapping. In order to obtain triangulation data to supplement the observational data, we proposed a 'peer awareness network mapping'. The awareness level is a good indicator of sense of community and social support, since nurses have to be continually aware of what peers are doing to provide timely help. In this study, the awareness has two levels – the patient rooms and the location of peers. We asked the nurse to use the plan to map the rooms of which he/she is aware of their status, as well as peers for whom he/she knows their assigned alcoves (Figure 4). The awareness network was then correlated to the nurse's own assigned alcove. It would reveal how the spatial properties of the assigned alcove might impact on co-awareness and knowledge transmission. The data was obtained in four days. The final 11 sets of data cover all 11 alcoves in the 2D-ICU.

Results and analysis

Are 2D-E and 2D-W spatially different? To answer this question, we compared all key measures of nurse station typology between 2D-W and 2D-E, including the type and size of each component, whether it has barriers and a clear definition of ownership, and its spatial measures including visual integration, TD and PD (Table 1).

At first glance, 2D-W and 2D-E have a similar integration value (4.68 and 4.59). But the integration values of the 2D-W alcoves demonstrate larger variance comparing to the 2D-E alcoves (3.77-5.43 versus 4.18-4.5). This implies that some alcoves in 2D-W are located in very integrated locations, while others are located in very segregated locations (e.g. W3=5.45 and W4=3.77). We ran the step depth analysis further to calculate each alcove's TD and PD. The results demonstrate that the average TD of the west wing is larger than east wing: 1.84 (visual) and 382.13 (metric) compared to 1.66 (visual) and 294.13 (metric). That

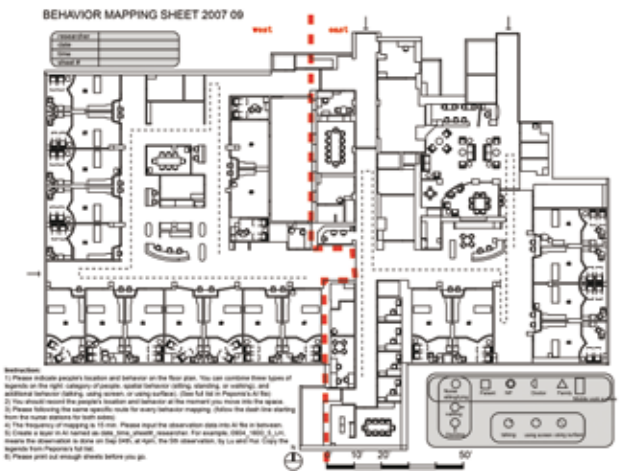

Figure 3: The behaviour mapping template

Figure 4: Peer awareness analysis for the nurse assigned in E2

Component	Type	Size	Barrier	Ownership	Integration	Team-base Step Depth		Local Peer Step Depth		Global Peer Step Depth	
						Visual	Metric	Visual	Metric	Visual	Metric
C (W)	center station	291	No	No	5.07	NA	NA	NA	NA	NA	NA
W1	alcove	33	No	No	3.96	2.15	635.95	2.02	737.62	2.39	1156.92
W2	alcove	33	No	No	4.56	1.91	328.02	2.42	508.21	2.67	918.1
W3	alcove	20	No	No	5.45	1.48	235.08	2.29	476.46	2.51	872.31
W4	alcove	20	No	No	3.77	1.98	463.23	2.46	600.14	2.37	1012.44
W5	alcove	33	No	No	4.55	1.89	288.32	2.15	481.39	2.17	862.63
W6	alcove	33	No	No	4.36	1.57	227.52	2.25	528.53	2.23	788.26
W7	alcove	33	No	No	4.35	1.86	459.89	2.57	731.02	2.46	828.5
W8	alcove	33	No	No	3.83	1.86	419.06	2.46	660.41	2.68	963.47
Wing (2D-W)	Hybrid	10,840	NA	NA	4.68	1.84	382.13	2.33	590.47	2.44	925.33
E1	alcove	33	No	No	4.5	1.50	248.17	1.81	329.47	2.39	1518.47
E2	alcove	33	No	No	4.18	2.11	422.49	2.10	346.08	3.20	1567.76
E3	alcove	33	No	No	4.29	1.37	213.52	1.99	403.43	2.48	1216.51
C (E)	center station	282	No	No	4.74	NA	NA	NA	NA	NA	NA
Wing (2D-E)	Hybrid	5,100	NA	NA	4.59	1.66	294.73	1.97	359.66	2.69	1434.25

Table 1: The nurse station typology metrics

* Type= central station, sub station, pod, distributed alcove, mobile work station

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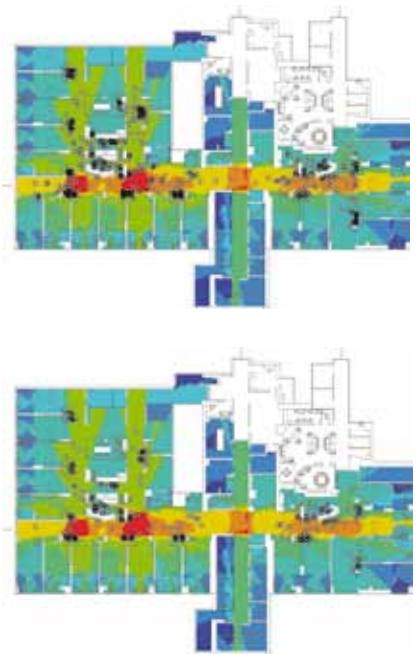


Figure 5 (Top): Overlay of nurse presence distribution pattern and integration graph; (Bottom): Overlay of nurse interaction pattern and integration graph (each circle represents one nurse)

means the visual connection from the alcoves to the central station is weaker in 2D-W than 2D-E. For the local PD, the alcoves in 2D-E also have significantly lower values than the 2D-E (for visual local PD, p=0.0143 and for metric local PD, p=0.0066). However, if we consider the whole 2D-ICU, the metric global PD of alcoves in the 2D-E is significantly larger than those in the 2D-W (p=0.0004). It shows that, although the alcoves in the 2D-E form a well-connected local network, they have a weaker connection to the overall 2D-ICU peer alcoves compared to those in the west wing.

In short, although 2D-W and 2D-E are both based on hybrid nurse station typology, they demonstrate quite different spatial characters in terms of visibility integration and the inter-relationship among the central station and peer alcoves.

Do spatial differences reflect in nurses' behaviours? Next, we overlaid nurses' behavioural data on the spatial analysis to check if the spatial differences are reflected in patterns of presence and interactions (Figure 5). The resultant data demonstrates a high tendency of clusters of presence and communications in central nurse station and alcoves in both wings. It is consistent with the nature of the ICU nurses' work, which requires them to keep close attention to their patients. A closer examination reveals different nurses' interaction patterns in two wings. The east wing displays a more evenly distributed presence and communications than the west wing. Here we use the interaction ratio to offset the different size of two sub-units. This is the number of interactions that happens in the point of interest divided by the overall number of interactions that happen in the sub-unit. The resultant interaction ratio of C (E) is 25%, while each alcove in 2D-E accounts for 10-15% of the overall interactions. By contrast, the interaction ratio of C (W) is 32% and the interaction ratio of each alcove varies from 2% to 8%. It suggests that in 2D-W, the central station is perceived as the hub of communication. The reason might be because 2D-W has a larger local PD than 2D-E, so nurses in 2D-W are more segregated from each other and have to use C (W) as the point of contact. In addition, the higher integration value of C (W) over C (E) (5.07 versus 4.59) contributes to a greater opportunity for interaction.

Another interesting pattern related to communication and learning is the co-existence of interaction and engagement with surface. Forty percent of nurses' interactions are engaged with surface use in 2D-W and 48% in 2D-E. This implies that the placement of the alcove surfaces in 2D-E can better support nurses' communications during work. While in the west wing, nurses who sit in alcoves 'isolated' from peers have to leave their alcoves at some time to interact, which generates conflict with their responsibility for the surveillance of patients. The conflict between spatial 'affordance' and organisational culture may result in a reduction of informal communication. To test that, we categorised alcoves as high, medium and low groups based on their PD values. The Tukey's test revealed that nurses assigned to alcoves with lower metric local PD have a significantly higher interaction ratio (p=0.036 compared to the high group, and p=0.0438 compared to the medium group).

Peer awareness network mapping analysis. The awareness network data further supports our hypothesis from the nurses' point of view. Interestingly, nurses are only aware of the limited number of rooms within their immediate sub-unit. In order to rule out the difference between the number of rooms in each sub-unit, we divided number-of-room awareness by the overall number of rooms in each sub-unit. The resultant room awareness ratio shows a strong negative correlation to the visual and metric local PD (R=-0.678, p=0.008 and R=-0.691, p=0.006 respectively) (Table 2). That means that nurses who sit in the alcoves well connected to peers are more likely to be recruited for help and, therefore, have a better awareness of other patients' conditions.

The peer awareness value was found to be negatively correlated to the metric global PD of the assigned alcove (R=-0.688, p=0.007). The larger the distance, the less the nurse is aware of his/her peer's location. In other words, if the nurse is located in an alcove where he/she has to both make more turns and walk longer to reach his/her peer, he/she is less likely to have a clear idea of where other peers are. The implication is that he/she may feel more isolated and poorly supported.

Conclusion

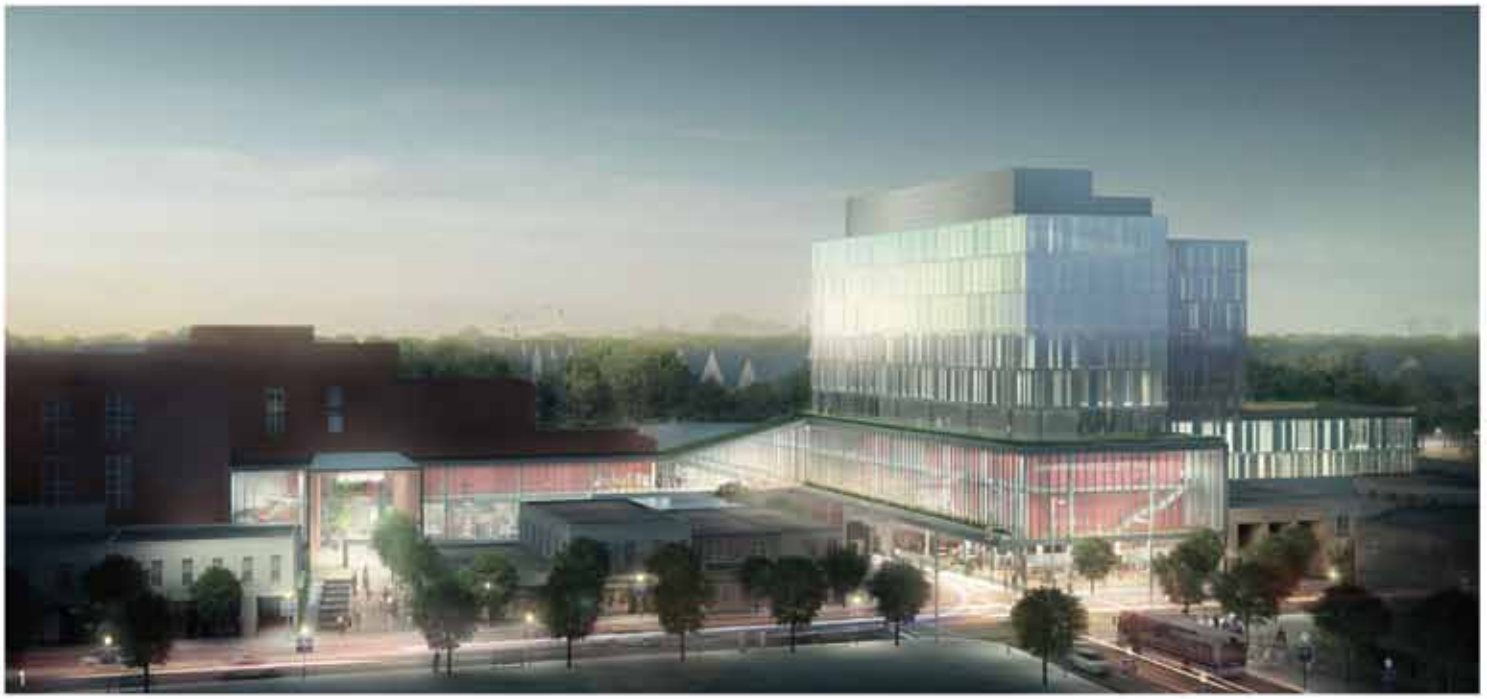
Overall, nurses' behaviours reflect the dual effects of social programme and physical environment. An effective design should strike a balance between nurses' seemingly conflicting needs, i.e. to be close to their patients while maintaining a good connection to peers to provide/get support. When design cannot sufficiently support these needs, nurses have to sacrifice one of their needs or generate workarounds, such as moving a lot to achieve balance.

In that sense, a hybrid nurse station typology seems to be a valid design which can meet all needs. The central station

	Visual Local PD	Metric Local PD
Room Awareness Ration	-.678**	-.691**

**. Correlation is significant at the 0.01 level (2-tailed)

Table 2: Pearson correlation for visual local PD and metric local PD to room awareness ratio



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provides a base for multidisciplinary collaboration and nurses' collective learning. The alcoves support the learning-in-context, while allowing nurses to keep track of their patients. They enable the possibility of simultaneous multi-tasking for nurses, which in turn increases their work productivity.

However, design has to be carefully considered in the context of the overall spatial layout, especially the inter-relationship between the central station and alcoves. Some seemingly similar designs might have fairly different spatial relationships and divergent communication patterns. Through a comparative case study in two wings in the 2D-ICU, this research provides an in-depth understanding of the correlation between nurses' communication patterns and nurse station design. Integration, team-base distance and peer distance are found to have an effect on the interaction ratio, co-awareness and, essentially, learning efficiency. These spatial metrics provide a more precise way of documenting and analysing nurse station designs and can be applied as a standard tool to build comparable literatures in the future. Further research is needed in the correlation of spatial metrics of nurse station design with behaviour in a larger sampling universe. Also needed is the direct link between learning outcomes and the defined spatial metrics.

Photo: Patrick Ross

Nursing station at the Ellerbe Becket-designed Mary Catherine Bunting Center at Mercy, Mercy Medical Center, Baltimore Maryland

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Cancer Treatment Environments: **From pre-design research to post-occupancy evaluation**

This research focuses on patient needs in ambulatory cancer treatment environments and identifies a range of design strategies to create an environment that fosters patient care and satisfaction – including a feeling of hope

Zhe Wang, Ph.D., RA, LEED AP, EDAC, Michael Pukszta, AIA, Natalie R. Petzoldt, AIA, LEED AP, EDAC, Jennifer Hendrich Cayton, LEED AP

Each year 1.5 million people are diagnosed with cancer in the US – it is the second leading cause of death in the country. Although the five-year relative survival rate in cancer patients increased from 50% in the 1970s to 66% in 2009, quality of care and patient satisfaction need to be further improved to support this patient population[1].

Very limited research has been conducted to investigate cancer treatment environments where the typical treatment regimen is ambulatory-based. More than 50% of cancer patients receive chemotherapy[2], for which they visit infusion centres. However, findings from research studies on inpatient environments may not be applicable to these environments. For instance, while there may be compelling evidence on infection reduction with single-patient rooms, such treatment settings may reduce the ability to summon help from nurses in infusion environments[3, 4].

Credible research needs to be conducted to promote evidence-based design for quality infusion patient care and satisfaction. In our project, an interdisciplinary team systematically conducted pre-design and post-occupancy research on cancer treatment environments, with an emphasis on infusion settings. The aims of this research were: to identify the needs of patients while undergoing infusion treatment; to develop potential environmental design solutions to fulfill the needs; and to validate significant environmental design strategies for infusion patient care and satisfaction.

Pre-design research

During infusion treatment, patients are administered fluid medication intravenously, which may be associated with physical reactions such as feeling cold, nauseous and/or dizzy. Procedures for an infusion treatment session vary in length of treatment time ranging from 15 minutes to over eight hours.

Pre-design research regarding patient experiences of infusion environments was conducted in five cancer centres in the US. From 2000 to 2007, more than 300 cancer patients participated in a series of surveys, interviews and focus-group discussions at the Siteman Cancer Center (St Louis, Missouri), the Clarian IU Simon Cancer Center (Indianapolis, Indiana), the Todd Cancer Institute (Long Beach, California), CancerCare of Maine (Bangor, Maine) and the Karmanos Cancer Institute (Detroit, Michigan). These cancer centres include both community-based cancer centres and National Cancer Institute (NCI)-designated comprehensive cancer centres. The participants represented a broad spectrum of cancer types (e.g. brain, breast, lung, stomach, colon and blood); 76% were female and 70% were over the age of 50.

Interviews and patient surveys were conducted to collect data on patient needs during infusion treatment, using a questionnaire developed specifically for infusion patients. It included a group of open-ended questions asking what types of treatment environment patients experienced, what their feelings were with regard to how these environments met their needs, what kind of amenities they desired in their treatment environments, and what was important to them in a future treatment environment. Participants could select multiple options from a list or write their own answers. Questionnaires were distributed to patients; their family members were also encouraged to participate. Face-to-face interviews were held with patients and their family members at the cancer centres. Participants discussed their experiences regarding what environmental elements had helped, or could help, them to get through the treatment sessions and what their ideal treatment environment would be. Responses to the questionnaire surveys were documented in computer programs and interviews were video-recorded. A panel of healthcare designers conducted content analysis of these data.

Based on these surveys and interviews, focus-group sessions were held to discuss preliminary results from the content analysis and to establish design concepts. The sessions were attended by facility managers, architects, interior designers, planners, engineers and project executives at the cancer centres.

Findings and discussion

Associated with demographic factors, results from this pre-design research revealed

Family lounge at the Simon Cancer Infusion Center
Photo: Hedrich Blessing Photography

prominent needs of infusion patients, which can be classified into three categories: 1) choice and control; 2) privacy and social support; and 3) positive distractions. Fulfilling these needs is thought to foster a feeling of hope for future treatment. It helps patients to endure chemotherapy and maintain the willingness to continue the treatment.

Choice and control. Choice and control are of high importance to patients[5-7]. "A sense of control is important because cancer takes away your control," was stated by a patient in a focus-group discussion at the Todd Cancer Institute. Questionnaire responses to "what control would an infusion patient most want?" were related to light, sound and temperature. Temperature control ranked as the top priority by these participants. This is most likely related to patient reactions to chilled fluid medications. Allowing patients to individually control their treatment environments may increase patient satisfaction. From the perspective of environmental design, possible solutions included multiple HVAC control zones, radiant heaters over each patient station and/or infusion recliners with heated-seat options. These solutions should be considered in the planning and early design.

Privacy and social support. Private treatment rooms were preferred by 50% of the survey participants, while 28% always chose a shared space and 22% were flexible - it depended on how they felt on a treatment day. Interestingly, these responses varied depending on the type and location of participants[8]. For instance, in Chicago, 67% of the respondents at a women's cancer centre preferred private rooms. Sixty-five percent of the participants in a large NCI-designated cancer centre in the Midwest also desired a private room for their treatments, while the percentage in a community-based cancer centre in the Southwest was 27.

During the focus-group discussions, the desired type of treatment environments varied as well. Some patients stated that they may not like having others with them during the treatment sessions. One patient stated: "Don't put us in a big fish bowl!" – referencing a large space with patient treatment recliners facing one another. This reflected patients' negative responses to shared treatment spaces. However, other patients spoke about the incredible support they received from peers going through similar treatment. A patient in the Todd Cancer Institute said: "I really felt good about helping a patient sitting next to me. She didn't speak English, but holding hands with another patient means the same thing in any language."

Figure 1: Floor plan of the Simon Cancer Infusion Center

In order to meet the different patient preferences, the team noted that an infusion environment should have three types of treatment settings: private treatment rooms, semi-open areas (defined as treatment areas with other infusion patients and retractable screens or curtains), and open areas with other patients receiving infusion treatments. This offers patients the potential ability to choose a desired treatment setting depending on how they feel on the day of treatment. Given the demographic and geographic changes in preference, it is important that design teams work with the staff at each centre to understand the unique characteristics of the patient population and to determine the appropriate mix of private and open treatment stations.

On the other hand, nurses noted the importance of seeing patients' faces in case of medication reaction. Most patients also expressed a desire to 'be seen' by nurses during treatment rather than being physically isolated from them[9]. Compared to watching infusion patients in open areas, providing direct visual control to patients in private rooms may be more challenging to nurses. The proximity of private treatment rooms to nurse stations should be ensured.

Positive distractions. Regarding positive distractions, survey participants were asked what types of amenities they would like to have in an infusion treatment area. Reading, television, computer access, window views, access to food and drink, and taking a nap were popular amenities. Therefore, design strategies for providing areas for reading, private television, wireless computer access, views to landscaped environments, access to nutrition areas and spaces for blanket storage should be considered.

Surprisingly, the most desired amenity was a guest chair for companions and visitors – cited by 90% of survey respondents. Therefore, to enhance the social amenity, a design strategy of planning space for at least one guest chair beside each treatment recliner was identified by the team. The team also suggested family lounge spaces to facilitate social interaction.

Development of design strategies

Outcomes from the pre-design research informed decision-making during the planning and design of six cancer centres, including the Simon Cancer Infusion Center in Indianapolis, Indiana. Design strategies developed from the pre-design research were applied in the infusion environments to promote patient care and increase satisfaction[10].

The previous setting for infusion services at the Simon Cancer Center was on one floor of a small office building designed in 1990. As the need for infusion services grew, the cancer centre had to put more patients in the environment than it was

Figure 2: Photo of semi-open infusion station with screens

originally designed to accommodate. As a result, there was little room for family members to be with the patient during treatment. Planning spaces for family members was an important design consideration when planning started in 2005. The 28,500 sq ft department was anticipated to include 60 patient stations at full build-out, tripling the previous setting's capacity. The population served was a mixture of urban and rural patients, ranging in age from 18 to 80 years and over, with the majority between 65 and 85. The centre treats most cancer types with the exception of bone marrow transplant.

Methodology

The design team consisted of architects, interior designers, engineers and facility administrators at the cancer centre. During early discussions between team members, it was agreed that the previous environment did not accommodate patient needs. To better understand patient needs, the design team established a patient focus group whose role was to inform the team about the unique needs of this patient population. The focus group consisted of a representative cross-sample of 15 patients who had received infusion care at the Simon Cancer Center or at other cancer centres in the county.

The design team met with the focus group on a regular basis during the design process, as well as with infusion staff. During the meetings, a detailed survey with open-end questions was implemented to better understand patient needs as they related to the treatment environments. Comments and suggestions from this survey and insights brought forward by patient were openly discussed in two one-hour meeting sessions. The insights brought forward by patients were discussed in depth. To further incorporate inputs, a visioning session was held with the focus group to understand the cancer care environment they would create if they could. Photographs of all types of infusion environments were reviewed with the focus group and staff, and consensus was reached with regard to what the desired environment would be.

Design strategies

To promote patient choice and control, the design team established the following strategies:

- providing different types of treatment areas including private, semi-open and open stations;
- providing retractable screens in each semi-open treatment station;
- distributing service areas including nurse stations, nourishment stations and patient toilet rooms to reduce the distances that patients need to travel;
- differentiating treatment pods to improve legibility for wayfinding;
- providing spaces for information desks and graphic signage; and
- providing alternate environments for patients and family members to experience during treatment that were in close proximity to the infusion area, including a roof garden and a cafeteria. Heated-seat treatment recliners were also recommended to the centre to promote patient control.

To balance patient needs for privacy and social support, design strategies applied in the infusion centre included:

- providing private/semi-open/open treatment stations;
- providing retractable screens in each semi-open treatment station;
- distributing patient toilets;
- providing spaces for guest chairs; and
- creating a lounge area with a faux fireplace adjacent to the nurse station.

To develop positive distractions in the treatment environments, the team developed both architectural and interior design strategies. The architectural strategies focused on developing quality window views, including: selecting appropriate building orientation to invite daylight and active views into the interior; developing a multiple-edge floor plan to increase opportunities to open windows to the outside; appropriately placing windows for quality views; and creating a garden adjacent to the building for visual access to nature.

The interior design strategies included: providing appropriate artwork, developing areas for book/magazine reading, providing patient recliners with tablet arms, providing a wireless internet connection, providing spaces for personal television, and providing food/drink and personal storage spaces.

Most cancer centres use fabric cubicle curtains to divide open treatment areas between patients for privacy. In the design of the Simon Cancer Center, the team designed a retractable screen between each of the semi-open treatment stations. In a fully open position, the patient could interact with one or more patients. In a closed position, the patient was visually separated from other patients but staff could still observe the patients. The three-part screens were frosted glass in a wood frame, installed with a ceiling track only to address concerns of infection control.

In addition to the semi-open treatment areas with screens, the design team planned four open stations with a faux fireplace adjacent to the nurse station. Here patients

could sit in an 'informal' setting with all the required access to medical gas and electrical power for the chemotherapy infusion pumps. The centre was built and opened for patient care in September 2009. Shell space was included to allow future build-out of 20 treatment stations and associated support spaces.

Post-occupancy research

Post-occupancy research, including surveys and observations, was completed in the Simon Cancer Infusion Center to investigate the significance of the applied design strategies. Significant strategies were revealed by quantitative and qualitative data analysis.

In May 2010, on-site observation regarding the design and utilisation of treatment environments was completed in the infusion centre. In June 2010, 165 patients were surveyed in the centre, regarding their environmental experiences and perceptions of privacy, stress, comfort, satisfaction and hope (defined as feeling hopeful about future treatments). All patients were invited to participate and participants were screened by nurses to verify their competence for answering survey questions. Hard-copy questionnaires were distributed to patients at the beginning of their treatment sessions and collected at the end. Response rates were from 20% to 45% depending on the survey day. The average age of participants was at the range of 51~60; 70% were female; 85% were Caucasian.

Methodology

Before the aforementioned surveys were distributed, two researchers observed the use of public spaces and treatment stations

Patient needs	Design strategies to help fulfill the needs	Significance identified by POE	Methodology
Choice & control	*Providing multiple types of treatment environment to allow choice*	Having a desired treatment space in term of type* was positively related to patient satisfaction, comfort and hope	Survey data, ANOVA
	Providing adjustable screens in each treatment station to facilitate control	27 out of 165 patients used their retractable screens	Observation
	Reducing the distances between places that patients need to travel	Wayfinding** and distances** were related to patient stress, comfort, satisfaction and hope	Survey data, ANOVA
	Differentiating treatment pods to improve legibility		
	Providing spaces for information desks and graphic signage		
	Multiple HVAC control zones	n/a	
	Providing comfortable recliners	Recliner comfort* was positively related to patient satisfaction	Survey data, Regression
Privacy	*Providing multiple types of treatment environment to allow choice*	Having a desired treatment space (type*) promoted satisfaction, comfort and hope	Survey data, ANOVA
	Providing adjustable screens in each treatment station	27 out of 165 patients used their retractable screens.	Observation
	Distributing patient toilet locations	Accessibility to patient toilets**was related to patient privacy, stress, satisfaction, comfort and hope for future treatments	Survey data, ANOVA
Social support	*Providing spaces for guest chairs*	Of 248 patients, 99 had one guest and 20 had two or more in their treatment stations	Observation
	Creating lounge spaces	93 of 160 patients would not like to stay in a lounge space during treatment	Survey
Positive distractions	*Selecting appropriate building orientations*	Window view** was associated with patient privacy, stress, comfort, satisfaction and hope	Survey data, ANOVA
	Developing a floor plan with multiple edges for windows to the outside		
	Appropriately placing windows		
	Developing a roof garden		
	Providing appropriate artwork	1 of 148 patients watched artwork in observation	Observation
	Providing areas for book and magazine reading	35 of 148 patients read during observation	
	Providing recliner with tablet arm	89 of 106 patients used their tablet arms	
	Providing wireless internet access	9 of 148 patients used their computers	
	Providing spaces for personal television	56 of 146 patients watched their television	
	Providing spaces for food/drink storage	74 of 137 patients drank and 10 of 141 ate during observation	
	Providing spaces for social interaction	57 of 88 patients interacted with guests and two of 98 patients interacted with each other during observation. See also Social Support	

Table 1: Patient needs, design strategies and significance

*Note: Design strategies in italic font were applied in the Simon Cancer Infusion Center. Mulitvariate Ordinal Regression Model Fitting: p<0.001; * p<0.05; ** p<0.01*
n/a: not applicable in this POE research.
Numbers of total patients in the observations may be different due to data availability. Hope is defined as feeling hopeful for future treatments.

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for two weekdays in the infusion centre. Patients and staff were not informed of the observation in advance. The observation protocol included two parts: environmental items and user behaviour. To represent a typical work day in the centre, one-hour timeslots were selected for the observation: the early morning, late morning, after lunch and mid-afternoon. The researchers were trained on observation coding and used consistently in the observation to ensure similar decisions about similar events on the different occasions. The inter-observer agreement was almost perfect (Kappa>0.8).

A questionnaire was specifically developed for the surveys, with an emphasis on the applied design strategies. Questionnaire items on infusion environmental design were created for this research. Participants were asked in which type of infusion environment (private/semi-open/open area) that they received treatment in the survey day. The patient's preferred type of treatment environment was also ascertained. Detailed environmental items were surveyed, regarding the recliner, window view, lounge spaces, access to patient toilets, wayfinding and distances between places where patients needed to travel. Besides demographic factors, social items considered as possible confounding variables were also collected, such as interactions with other patients. Survey items on stress, that had acceptable validity, were adapted from Filege's study[11]. A six-point Liker Scale from 'strongly disagree' to 'strongly agree' was used to measure responses.

Analysis of the survey data was conducted using the Statistical Package for the Social Sciences (SPSS, version 16.0). Normality plots and histograms were used to test the distributive normality of all study variables. Bivariate correlations among variables were analysed through Spearman Correlation and Chi-square. T-test and one-way ANOVA were conducted to identify significant differences between groups.

Findings and discussion

Having infusion treatment in one's desired treatment environments, in terms of type (private/semi-open/open areas), was positively associated with perceived environmental comfort, satisfaction and hope ($p<=0.02$). Other significant environmental features associated with patient care and satisfaction included access to patient toilets, window view, wayfinding and distances between places that require patients to travel ($p<0.01$). Patients' perception and utilisation of the lounge spaces were different from what was expected. Findings from the surveys were supported by those from the observation. Observations further identified the importance of including patient tablets, food/drink storages and guest chairs in the treatment environments.

Typology of treatment stations. Reported environmental satisfaction, comfort and hope were significantly higher among the patients whose treatment environments were in their desired types than those among other patients ($p<=0.02$). Allowing patients to choose desired spaces for treatment may improve patient satisfaction and thus help them to feel hopeful for future treatments. To allow choices, offering different types of spaces for infusion treatment is necessary and should be a basic provision in the design of an infusion centre.

The three types of treatment stations in the Simon Cancer Infusion Center are private stations in single-patient rooms, semi-open stations with retractable screens and open stations. Details of the retractable screen have been introduced previously. According to the data from our observations, some patients closed their screens during napping, procedures and if they had several guests. Meanwhile, staff also informed the team that moving the screens had been suggested to patients after their first visit, as a result of the staff's need to observe new patients for possible adverse reaction to medication. Allowing patients a choice to screen their treatment environments may psychologically foster a sense of control and help patients feel satisfied, comforted and hopeful[5].

Access to patient toilets. Access to patient toilets during infusion treatment was highly associated with patient privacy, stress, satisfaction, comfort and hope ($p<0.01$). These findings emphasised the importance of patient toilet accessibility in infusion settings. When planning infusion environments, it is critical to consider distributed locations of patient toilets. Infusion patients may use toilets more frequently than typical patients in healthcare facilities due to long treatment sessions and administration of fluid medications. Based on appropriate building codes and accumulated professional experiences, the ratio of toilet rooms to patient treatment stations applied in the Simon Cancer Center's infusion centre was 1:6. During on-site observation, no patients were documented waiting for toilets.

Window view. Patients who had an enjoyable window view to the outside during infusion treatment reported higher levels of privacy, comfort, satisfaction and hope and lower levels of stress than those who did not have the view. Findings from previous research have shown that quality window views help reduce stress, decrease pain medication usage and promote faster patient recovery[12-14]. Our study further supports these findings. To increase the opportunities for accessing views to the outside, the design strategy of developing a floor plan with multiple edges should be considered.

To improve the quality of window view, strategies of appropriately placing windows with views to landscaped space should be considered. Previous design research also recommends designers carefully consider the surroundings while making decisions about site planning and building orientation, to invite quality window views including active street views and appropriate daylight to the interior[15, 16]. Due to site constraints and connections to existing buildings, the Simon Cancer infusion centre did not allow opportunity for windows in private treatment rooms, but moving forward this should be considered.

Wayfinding and distances. Good wayfinding was associated with high levels of patient comfort, satisfaction and hope, and lower levels of stress. Previous studies have shown that stressful wayfinding problems could be addressed by appropriate spatial reference frames[17-19]. These findings further support the design strategy of distributing service areas, including toilet rooms, medication, nourishment and blanket storage, in infusion settings. This strategy helps to reduce the distances between places that require patients to travel and thus facilitate wayfinding. Appropriate distances between these places were also associated with high levels of patient comfort, satisfaction and hope, and lower levels of stress. In addition, the Simon

Cancer infusion centre is legibly divided into three pods linked by a short corridor with direct access to the waiting room. Graphic signage and staff designation are also applied to reinforce wayfinding.

Lounge spaces and guest chairs. Surprisingly, 93 of the 160 survey participants indicated in their questionnaire responses that they would not like to sit in the lounge area designed for them. One possible explanation is that patients may not like sitting in an 'informal' setting during infusion treatment. Additionally, during observation, the design team learned that the staff did not allow the patients to choose a recliner in the lounge space. However, the lounge space was used by patient companions during treatment procedures for napping and reading.

In future planning, it is important to understand whether the staff would support a group space for patients receiving treatment. Given the observed guest use of the lounge area, additional places of respite for patient companions should be considered in planning.

Moreover, interaction with other patients was not shown to be related to perceived care and increased satisfaction. During the on-site observations, a few patients interacted with each other. However, most patients did interact with their companions in their treatment stations. An important design consideration is the selection of appropriate guest chairs for long periods of sitting. The team also noted that 119 out of 248 patients had 1-5 companions in their treatment stations and nursing staff had made accommodation for addition flexible seating and storage. To plan an appropriate size for treatment stations, it is important to identify how many guests typically accompany patients.

Other interior design strategies. Recliner comfort was positively related to patient comfort, satisfaction, hope and stress reduction. When selecting furniture, design teams should pay special attention to the comfort level of recliners. If possible, a focus group of chemotherapy patients should be included in the selection process. During the observation, 89 out of 106 patients used their recliner's tablet, a swivel table built into the recliner. Patient tablets play an important role in treatment sessions, providing a place where patients can put their personal belongings, beverages and books. Given the side-effects of chemotherapy, it is critical for patients to drink water during infusion treatment. During the observation time, 74 out of 137 patients drank. Spaces for food/drink storage should be included in the treatment environments for patient convenience.

Conclusion

With a strong impact in future research and evidence-based design, this project identified that significant environmental features in outpatient settings are similar but different from that in inpatient environments. Design strategies developed through inductive analysis of the needs may help to improve patient care and increase satisfaction. However, designers should not assume the same results of their design. The validity and reliability of suggested design strategies need to be examined with respect to the unique characteristics of target patient population.

As more than 70% of participants in the pre-design and post-occupancy research were female and 85% of the POE survey participants were Caucasian, male patients and other races were not well represented in this research. Future studies on cancer treatment environments should incorporate more gender-balanced and ethnically diverse samples. The survey items created for this study to investigate design strategies can be further developed to guide future research.

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Blubberland

Elizabeth Farrelly
MIT Press, 2008
Price: US$19.95/£14.95

If there is one chapter worth reading this book for, it is the last chapter, entitled 'I have a dream …'. The author – a well-informed, amusing and literate writer and critic who originally trained as an architect – outlines a future ideal of a functioning, sustainable and satisfying community. Her vision lightens the gloom-laden messages that have gone before, with its implicit faith that we are capable of moving on from the compulsions and habits that make modern western lifestyles so destructive.

While the previous chapters are witty and well-written, they can be heavy going. Farrelly expresses her opinions on a wide range of topics including failures in the democratic process, the ugliness of modern architecture, the lack of leadership for environmental change, thoughtless city planning and suburban sprawl, the meaning of beauty, what we eat and feminism. Her arguments tend to be more declarative than analytical and many of her conclusions (about happiness and beauty, for example) have been drawn by other writers in more comprehensive and thoughtful ways – writers she names, such as De Botton and Mark Kingwell.

This lack of in-depth analysis makes parts of the book read like a rant and, if not, then certainly like a blog. The reader has little option but to nod and mutter, "I agree" (or not), rather than to share in a review of facts and findings and what they might mean.

In discussing democracy, for example, Farrelly points out that the power given to the majority has distorted the process of government decision-making and allowed minority viewpoints and concerns to be ignored. When commenting on modern architecture – about which she is clearly well-informed and able to provide numerous vivid examples – she repeatedly exclaims at its ugliness, as though we are all in agreement, automatically. And she will no doubt antagonise members of her profession by characterising them as 'enslaved' (to profits and corporate gain).

Farrelly makes some insightful comments about the lack of government controls over city planning and urban sprawl in Australia (her country of origin) compared to North America and Europe, which help explain why the phenomenon is so evident along Australia's coasts. However, she frustratingly dismisses years of published research on how human behaviour is affected by physical space and buildings by lumping the whole field into a simplistic deterministic argument – buildings 'cause' certain types of behaviours and social outcomes – that can easily be dismissed.

For Farrelly, Blubberland is the opposite of community

Her views on modern life – and especially our predilection to increase personal wealth at all costs and with it to consume ever more goods, such as food, homes, cars, gadgets – are predictably negative. This rapacious lifestyle causes 'blubber' – a condition that means we get fat, and eventually ill, while contributing nothing to the sustainability of our planet or, indeed, to the quality of human life. For Farrelly, Blubberland is the opposite of community. By the time we get to Chapter 5 'Fat and family home', we begin to know what's coming and to long for solutions rather than continuing to be reminded of everything that is wrong with our society.

It is a relief, then, to arrive at the final chapter in which a very reasonable and persuasive scenario of how a successful sustainable and humanistic community could grow and flourish once we have driven our current society so far into the ground that drastic measures need to be taken to save humanity. Farrelly's inspiring view of what could be, were we to overcome our current headlong dive towards massive self-destruction, are realistic. I wish she had written more about it and how those of us who agree with her can go about getting from here to there.

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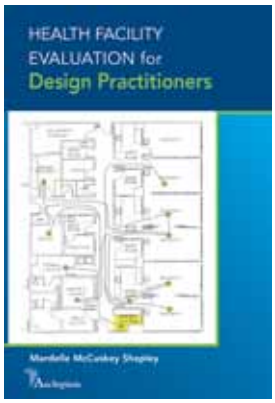
Health Facility Evaluation for Design Practitioners

Mardelle McCuskey Shepley
Asclepion Publishing, November 2010
Price: US$99.95



Winston Churchill is credited with saying: "True genius resides in the capacity for evaluation of uncertain, hazardous and conflicting information." Evaluation, defined as "the act of placing value on the nature, character or quality of something"[1], is a word often associated with judgement, value and performance.

When we want to investigate whether or not a building is meeting its intended design goals, affecting occupant behaviour or operating efficiently, we conduct an evaluation. This type of investigation is called a post-occupancy evaluation, facility performance evaluation, building performance evaluation and a myriad of other names. Although often used interchangeably, these various terms may have different meanings. Whatever you call it, a facility evaluation is difficult to do well. You usually understand this after just one attempt. Whether previous facility evaluations have left you feeling defeated, or you are about to embark on your very first one, rest assured that Mardelle McCuskey Shepley's new book offers both a breadth of information and depth of insight into how to successfully conduct a facility evaluation. Focused principally on what the author calls 'practitioner-focused facility evaluation', this resource is intended to support building evaluations that are readily applied in healthcare design practice.

The author is the director of the Center for Health Systems and Design and holder of the William M Peña Endowed Professorship in the College of Architecture at Texas A&M University. Highly regarded in her discipline, this publication makes a valuable contribution to the field of healthcare design.

The book's title, which is perfectly descriptive of the contents of the book, does not, however, acknowledge the richness of its pages, which make this book a useful tool for anyone interested in the process of conducting design-based research, regardless of building type.

This book is a must-read for those involved with evidence-based design

Part I of the book provides a historical context for facility evaluations and briefly summarises several published examples. The author's description of the benefits of, and barriers to, conducting facility evaluations is right on target. Although I would like to see more hard numbers regarding the business case for facility evaluation, they may not exist. Commentaries by various contributors regarding facility evaluations, in both Parts I and II, are insightful and interesting to read, but seem a bit disjointed and wedged into a book that otherwise flows beautifully.

Part II is the real meat of the book and takes the reader step by step from conducting a literature review through implementing a facility evaluation and disseminating results. Pertinent information on working with institutional review boards and writing grant proposals is also included.

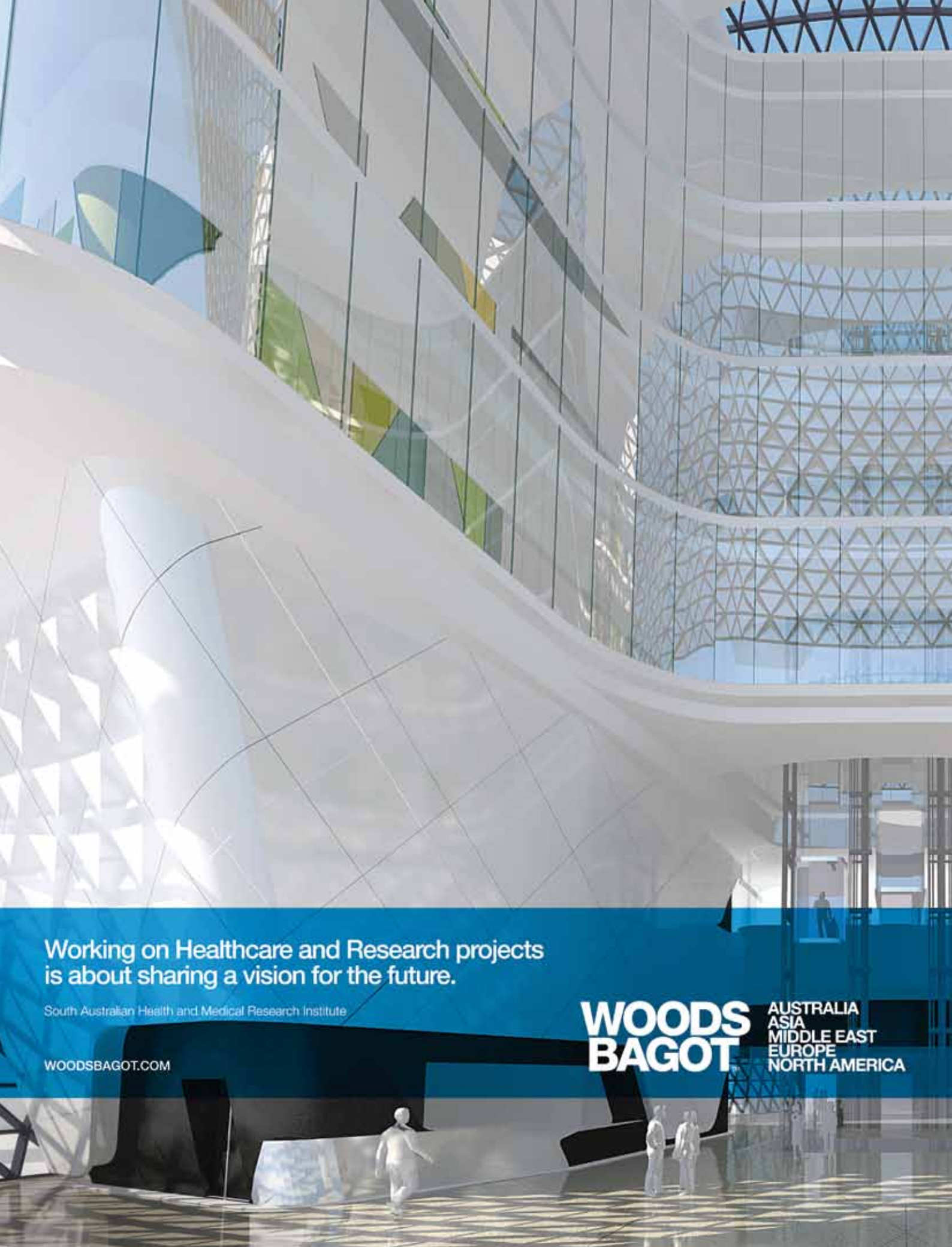
Part III briefly discusses factors affecting the future of practitioner-focused facility evaluations, such as an increased focus on sustainability, the need to enhance professional credibility and the acceptance of evidence-based design. The author addresses a key question among design practitioners and advocates that design firms and facility owners can, in fact, conduct effective facility evaluations if the methods are rigorous and the results are disseminated. The appendices offer a sample literature review summary, a brief practitioner-focused facility evaluation survey format and a glossary of research terms.

While impediments to the facility evaluation process are difficult to overcome – lack of funding, disinterest by the client, reluctance to be scrutinised, etc – this new book provides a wealth of information to enhance the practitioner's knowledge and ability to conduct such evaluations with skill. In this book, the author once again demonstrates her leadership in the field of facility evaluation.

While written primarily for design practitioners, it is an excellent resource for graduate students and seasoned researchers alike. This book is a must-read for those involved with evidence-based design. If genius truly resides in the capacity to evaluate uncertain and conflicting information, this book may just inch readers a notch closer to IQs above 140.

Sheila J Bosch, PhD, EDAC, LEED AP, is director of research at Gresham, Smith and Partners

1. Retrieved from www.merriam-webster.com on 8 June 2011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