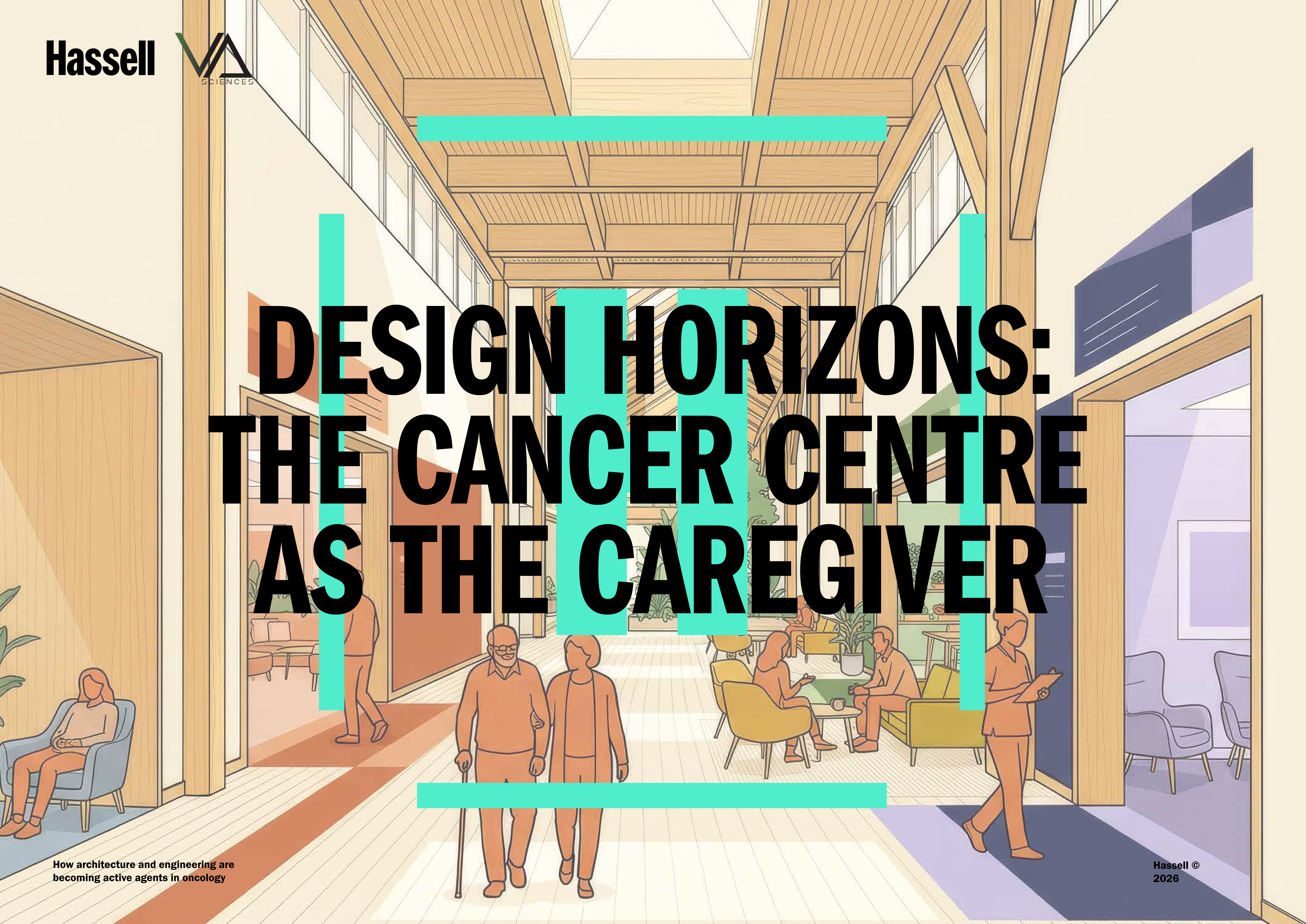


Hassell

VA SCIENCES

DESIGN HORIZONS: THE CANCER CENTRE AS THE CAREGIVER

How architecture and engineering are becoming active agents in oncology

CONTENTS

CARE IS CHANGING. WHY AREN’T BUILDINGS?

Cancer incidence is rising, patients are living longer with more complex conditions, and care is increasingly distributed between hospital and home. The buildings we design today must be ready for all of it.

This report examines what must change. We detail the forces reshaping cancer care environments, outline the new demands on architecture and engineering, and demonstrate how design can move from a background system to an active agent in clinical outcomes, environmental performance, and long-term adaptability.

Architecture and engineering don’t just support care. They shape it.

THE LANDSCAPE

Cancer care is shifting – from episodic treatment to continuous, complex care. Incidence is rising, patients are presenting earlier and with higher acuity, and care is increasingly distributed across hospital and home.

At the same time, advances in community-based treatment mean the people who do enter hospital are often sicker, more vulnerable, and more dependent on the hospital environment than ever before.

The implications are spatial, operational and environmental.

The conventional cancer centre – optimised for throughput, short stays and fixed clinical boundaries – no longer holds.

RETHINKING THE ROLE OF DESIGN

In the future, cancer centres must operate differently: as flexible, low-carbon and restorative systems that can absorb change. They must support longer and more variable patient journeys, higher acuity cohorts, and hybrid models of care, while responding to climate pressures, workforce demands and resource constraints.

This reframes the role of design. Architecture and engineering are no longer background systems; they are active agents in care. Together, they shape environments that stabilise, adapt and restore: thermally consistent, filled with natural light, acoustically calm and intuitively legible.

This re-framed approach necessitates the integration of health-planners into the design process as early as possible to ensure that flexible, hybrid models can continue to deliver the highest levels of patient care under a range scenarios.

BUILDING RESILIENCE

It also changes how buildings need to perform. The better the hospital environment, the faster patients can recover, transition home or continue care elsewhere, creating positive outcomes across the entire health system. But achieving this relies on infrastructure that is more resilient and dependable than ever before, operating within energy grids and climate conditions that are becoming less predictable.

This demands a shift from fixed and oversized systems to targeted and adaptable ones. From energy-intensive to a passive-first approach – design that harnesses natural heating, cooling and light.

THE DISSOLVING BOUNDARY: DIGITAL CARE

Digital care extends this further. As teleoncology, remote monitoring and AI become embedded, the boundary of the cancer centre dissolves. The building becomes a node in a wider care network, both physical and virtual, continuous and connected.

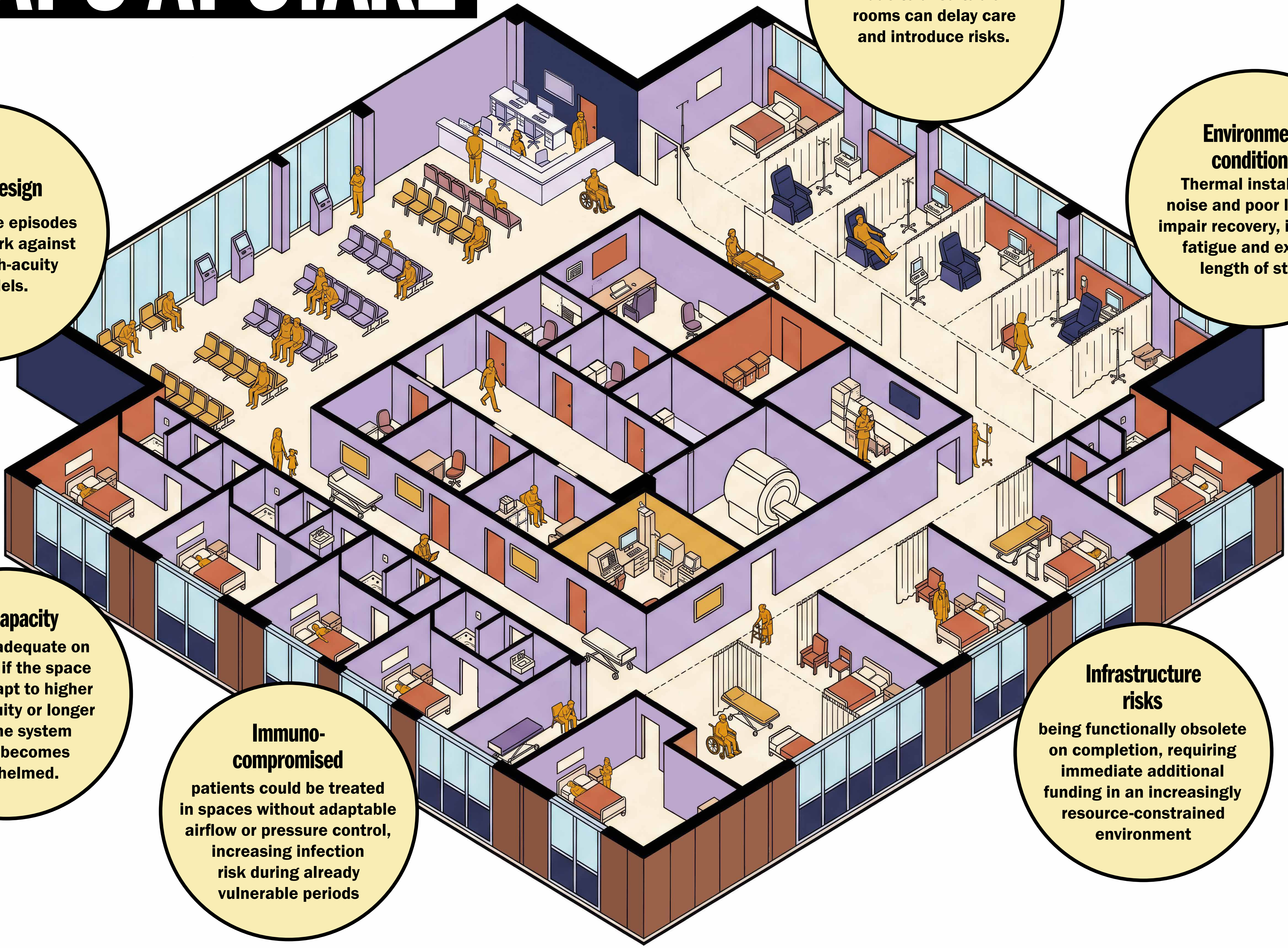
The cancer centre is no longer a building. It's a climate-responsive care platform, designed to restore people, support systems, and regenerate the environments it sits within.

THE HORIZON SCAN

A scan of recent research, policy and reporting that highlights the pressures shaping healthcare infrastructure in the years ahead

PRESSURES	NEAR-TERM SIGNALS	MID/LONG-TERM SIGNALS	WHAT IT COULD MEAN
What are the pressures on healtchare infrastructure?	Evidence from today and projections within the next 5-10 years, highlighting the shifts already underway.	Projections looking a decade out, mapping the structural shifts that will redefine the sector.	How these pressures could reshape the typical cancer care facility.
A changing patient profile	→ **Australia:** Cancer incidence rates for younger people in their 30s and 40s are increasing. → **Global:** Data from 1990–2020 shows that around one in three people with cancer also have at least one other ongoing health condition, and this has been gradually increasing over time at a rate of 0.54% per year	→ **Global:** In 2025, an estimated 88% of cancers diagnosed in Australia occured in people aged 50 or older. In 2021, people over 60 made up 13.7% of the global population, with Europe/North America and Australia/New Zealand having the highest shares. This is projected to rise to 19.2% by 2040. In 2020, 64% of the world's 19.3 million new cancer cases occurred in people aged 60 and above, accounting for 71.3% of cancer-related deaths. → **Global:** Over 35 million new cancer cases are predicted in 2050, a 77% increase from the estimated 20 million cases in 2022.	**There is no typical cancer patient any more.** → People are being diagnosed younger, the population is ageing, and most patients now arrive with multiple chronic conditions. A centre planned around an average patient may struggle to serve anyone well.
Longer, less predictable care journeys	→ **Global:** The overall trend for all cancers globally has moved from a 50% global five-year survival rate circa 1990 to a 66-68% global five-year survival rate circa 2020 → **Australia:** While most cancer patients in Australia are outpatients, those that do get admitted have an average stay of 7.6 days compared to the national average of 5.6 days.	→ **Global:** Whole genome sequencing and predictive analytics are entering routine cancer care, setting up a future where every treatment plan is shaped to the individual.	**No two cancer journeys will look the same.** → As treatment becomes shaped to each patient's genetics and risk profile, the standard cancer pathway disappears. Stays may be longer for some, shorter for others, and acuity will rise and fall inside the same admission. Physical spaces must work for one type of care today and another tomorrow.
Care is becoming distributed and digital	→ **United Kingdom**: The NHS plans to increase 'virtual wards', allowing many patients to be treated from their own home, freeing up beds for those most in need. → **Australia**: Between March 2020 and March 2022, over 100 million telehealth services were delivered to around 17 million Australians across the country.	→ **China:** The country's digital health sector is rapidly expanding, with growth expected to increase from US$19b to US$120b by 2035.	**Caring for cancer occurs in different places.** → With patients increasingly receiving care in-home, more space in healthcare facilities may become available to be used for different purposes.
Resilience under pressure; environmental and human	→ **Global**: The macro pressures of climate change - including food system disruption, rapid urbanisation, and extreme heat - are fuelling a quiet rise in sedentary lifestyles and poor nutrition. The cost of this shift is steep; sub-optimal diet alone is now responsible for 7% of cancer cases globally. → **Global**: Climate change is driving longer, more intense fire seasons that threaten life, property, and public health. The resulting surge in smoke exposure - compounded by dust and industrial emissions - is causing severe air quality degradation. The global health implications are vast, with air pollution now responsible for 20,000 cancer cases annually worldwide.	→ **Global**: Climate projections show temperatures rising under every emissions scenario, with hot days becoming more frequent and more intense by the late 21st century.	**Climate change contributes to clinical risks.** → A care facility must be a space that can withstand whatever extreme weather events are likely to occur in the coming decades. The space must protect patients and people delivering care from both visible and invisible challenges such as air pollution.

WHAT'S AT STAKE



Patient relocation

due to unsuitable rooms can delay care and introduce risks.

Buidling design

for short, stable episodes will actively work against complex, high-acuity care models.

Environment conditions

Thermal instability, noise and poor lighting impair recovery, increase fatigue and extend length of stay.

Bed capacity

may look adequate on paper, but if the space cannot adapt to higher patient acuity or longer stays, the system quickly becomes overwhelmed.

Immuno-compromised

patients could be treated in spaces without adaptable airflow or pressure control, increasing infection risk during already vulnerable periods

Infrastructure risks

being functionally obsolete on completion, requiring immediate additional funding in an increasingly resource-constrained environment

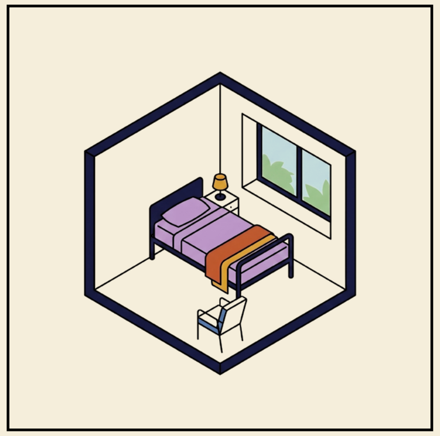
HOW CAN DESIGN RESPOND?

Five shifts the cancer centre has to make.

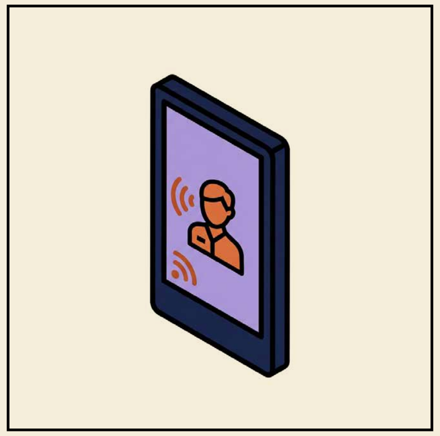
The healthcare industry faces unprecedented pressure. Our five design principles, below, show how to transform our care facilities, overcome systemic challenges, and deliver the best possible outcomes for patients

All five design principles draw directly on Hassell's latest research and extensive experience creating healthcare environments. They are scalable, interconnected concepts rather than isolated solutions - and they are built to flex.

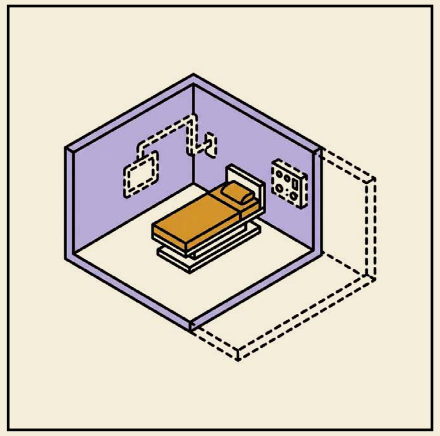
Whether you're planning a standalone cancer centre, integrating a new unit within a major precinct, or renewing an ageing building, these ideas provide a framework for creating the responsive spaces the future demands.



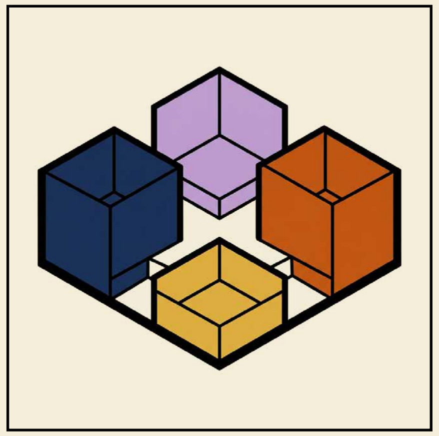
Shift 1: Design for longer stays



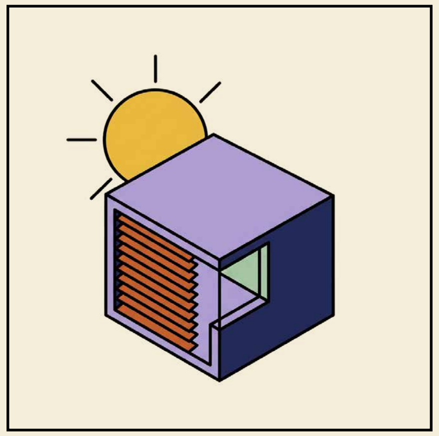
Shift 2: Support digital shift



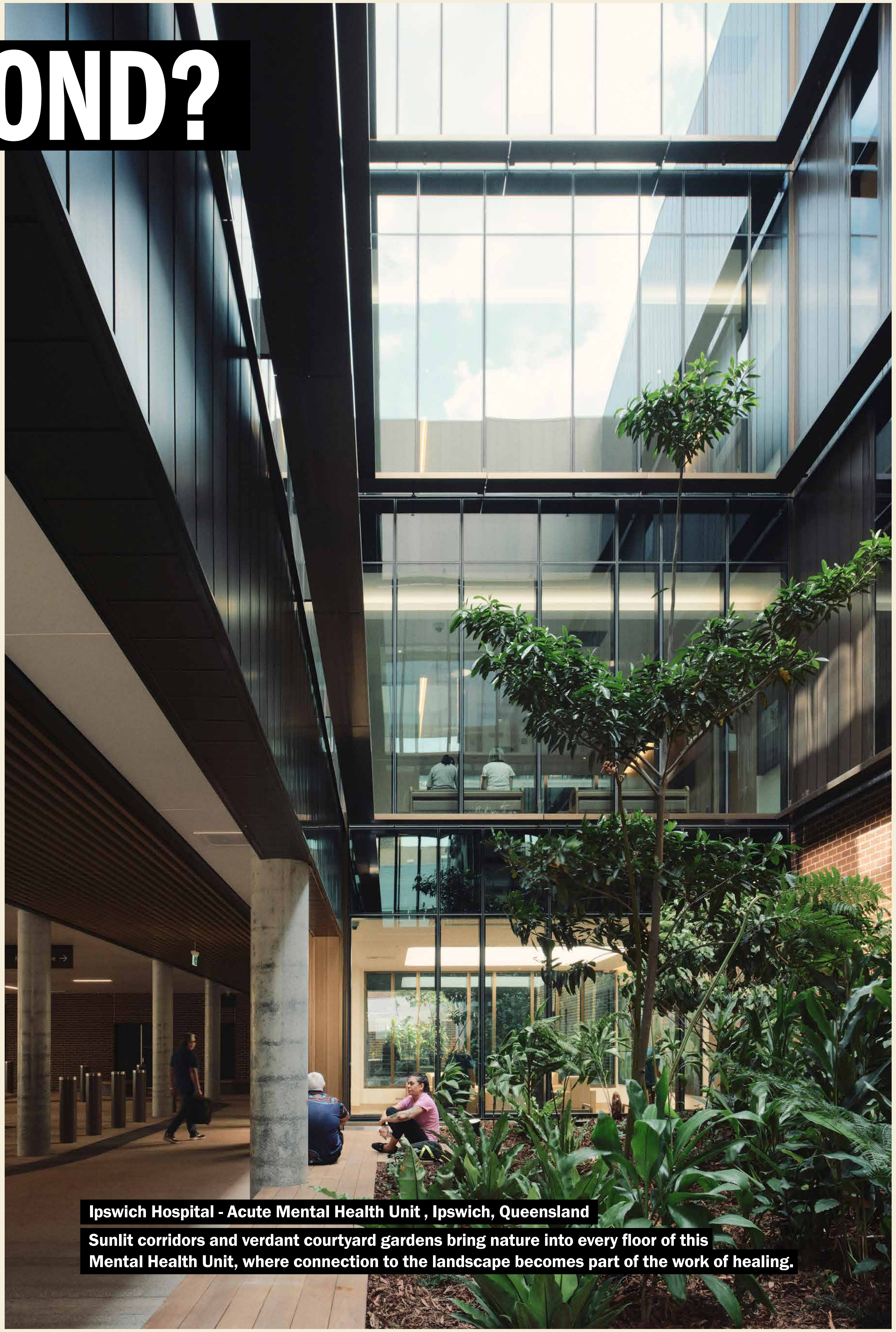
Shift 3: Design for higher aquity



Shift 4: Break down clinical silos



Shift 5: Building climate-responsible infrastructure



Ipswich Hospital - Acute Mental Health Unit , Ipswich, Queensland

Sunlit corridors and verdant courtyard gardens bring nature into every floor of this Mental Health Unit, where connection to the landscape becomes part of the work of healing.

SHIFT 1: DESIGN FOR LONGER STAYS

Transform high-turnover acute wards to fewer, larger, home-like inpatient rooms.

As cancer care shifts toward longer admissions and sustained supportive management - while simultaneously expanding into home and community settings enabled by AI and remote care - the inpatient environment needs to be recalibrated.

The conventional acute ward, optimised for throughput and short stays, no longer aligns with this dual reality. Instead, inpatient settings must operate as therapeutic, low-stimulus environments for those who truly need to be there, while the overall spatial model rebalances between hospital-based and distributed care.

A SYSTEM-LEVEL REDISTRIBUTION OF SPACE

This design approach requires a coordinated shift across architecture, interiors and engineering, alongside a fundamental redistribution of space.

At a system level, advances in AI-supported diagnostics, remote monitoring and hospital-in-the-home models reduce the need for some traditional inpatient and outpatient functions to be physically accommodated on campus. This creates an opportunity to downsize high-volume, low-acuity zones. Large waiting rooms can shrink into compact, digitally managed spaces that fast-track appointments and eliminate wait times. This allows us to reallocate underutilised space - including repetitive consult rooms and some short-stay beds - toward higher-acuity, longer-stay environments.

The result is not simply more space, but different space: fewer, more purposeful beds, each with a larger footprint and higher performance requirements.

A REIMAGINING OF THE PATIENT ROOM

At a planning level, patient rooms increase in both size and complexity, reflecting their role as primary places of mutli disciplinary care, recovery and living. Additional area is required to accommodate family presence, overnight stays and a greater volume of in-room equipment.

This shifts the typical room module, with clearer zoning between patient care, family occupation and staff access. Circulation space within the room becomes more generous, supporting mobility aids, medical interventional procedures and informal occupation without conflict. Storage, both clinical and personal, expands and integrates seamlessly, maintaining a calm visual field over longer stays.

We are designing for occupation over days and weeks, not hours. This fundamentally changes spatial and placemaking priorities.

Leanne Guy, Principal, Global Health Sector Lead, Hassell

The inpatient ward must work as hard as the care team.

RETHINKING WARD PLANNING

Designing larger rooms means a different approach to ward planning. Fewer beds per floorplate are balanced by more distributed, decentralised care points and digital observation models, reducing staff travel while maintaining oversight. Support spaces - family lounges, retreat areas and shared winter gardens - are embedded within inpatient zones rather than treated as ancillary. At the same time, some traditionally internal functions shift outward: education, follow-up consultations and certain therapies increasingly occur virtually or in community-based settings, reducing pressure on hospital floor area.

THE HOSPITAL AS PART OF A WIDER NETWORK

This redistribution extends beyond the hospital footprint. As more care is delivered at home or in local hubs, the hospital becomes part of a broader network of care environments. Spatial investment shifts toward enabling this network through digital infrastructure, logistics, and spaces that support virtual care delivery (such as telehealth suites, remote monitoring hubs, clinician touchdown spaces). The hospital becomes both a destination for complex care and a command centre for distributed care.

DESIGNING FOR SENSORY COMFORT AND FLEXIBILITY

Design plays a critical role in mediating this shift. As patients spend longer periods in fewer, higher-acuity inpatient environments, material palettes move away from overtly clinical expressions toward durable, tactile finishes that support long-term sensory comfort.

Acoustic absorption becomes more prominent to reduce cumulative noise exposure.

Lighting strategies establish clear day-night hierarchies supporting circadian rhythms and melanopic ratios, whilst giving control back to the patients. Individual temperature control supports fluctuating needs of high care patients and provides a further sense of control.

Furniture supports a spectrum of use - clinical care, rest, family occupation and personalisation - blurring the boundary between hospital and living environment while maintaining robustness and infection control.

Engineering systems must align with both the intensification of inpatient environments and the expansion of care beyond the hospital.

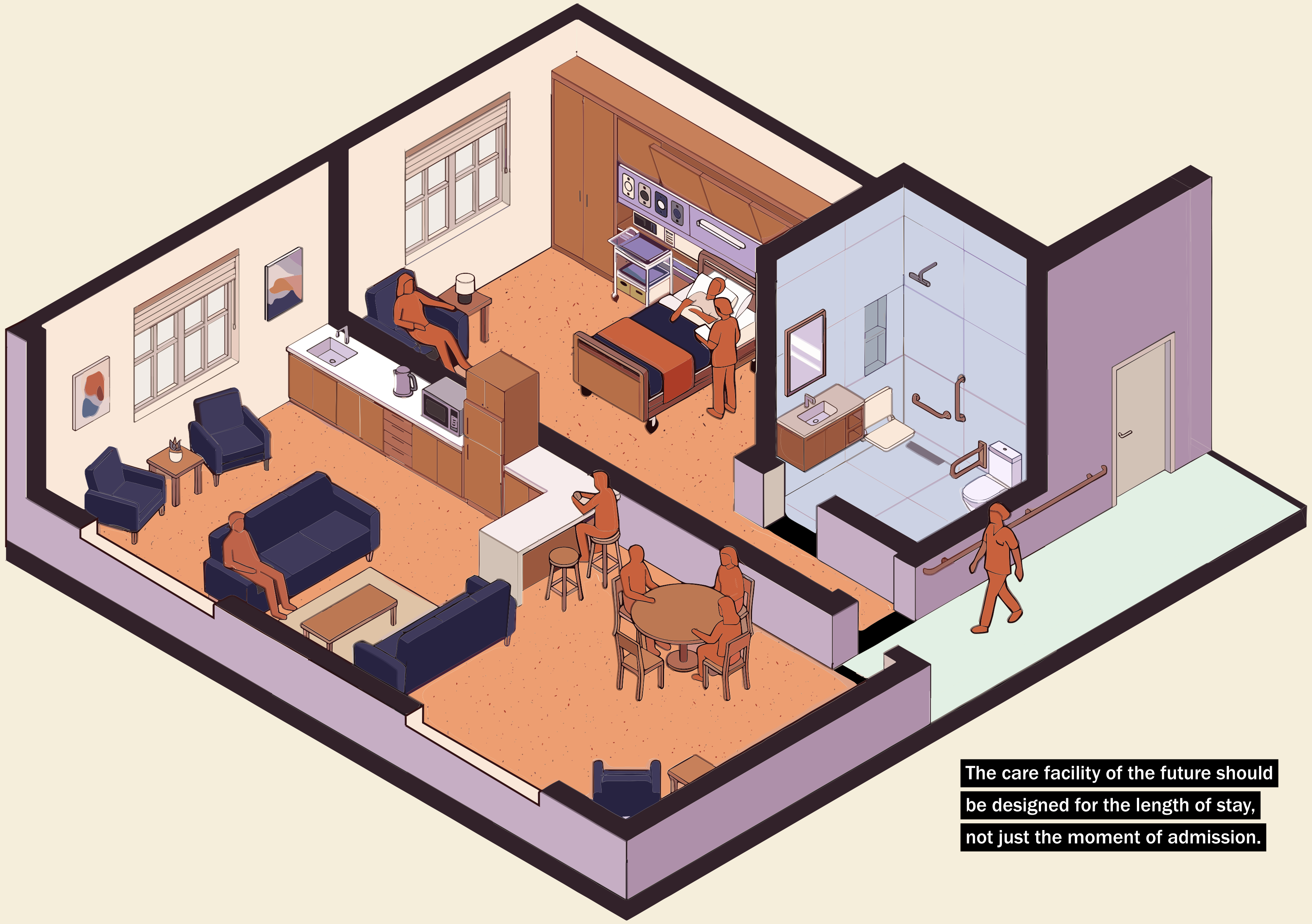
Within patient rooms, a higher degree of environmental stability is required, with tighter tolerances around temperature, air movement and noise. This supports:

→ Room-level environmental control, allowing patients and staff to fine-tune conditions within safe parameters

→ Carefully designed air distribution that avoids draughts in occupied zones

→ Adaptive controls capable of responding to variable internal loads, including fluctuating occupancy and equipment use

→ Systems that maintain stable conditions with minimal manual intervention



The care facility of the future should be designed for the length of stay, not just the moment of admission.

At the same time, building services must support a more distributed model of care. This includes robust digital infrastructure for AI-enabled diagnostics and remote monitoring, resilient data systems, and integration between hospital-based and home-based care technologies.

The variability of in-room loads, driven by longer stays, family presence and equipment, requires more responsive and flexible servicing strategies.

PASSIVE-FIRST

A passive-first design approach becomes increasingly valuable, stabilising internal conditions through building orientation, façade performance and daylight access, while reducing reliance on active systems.

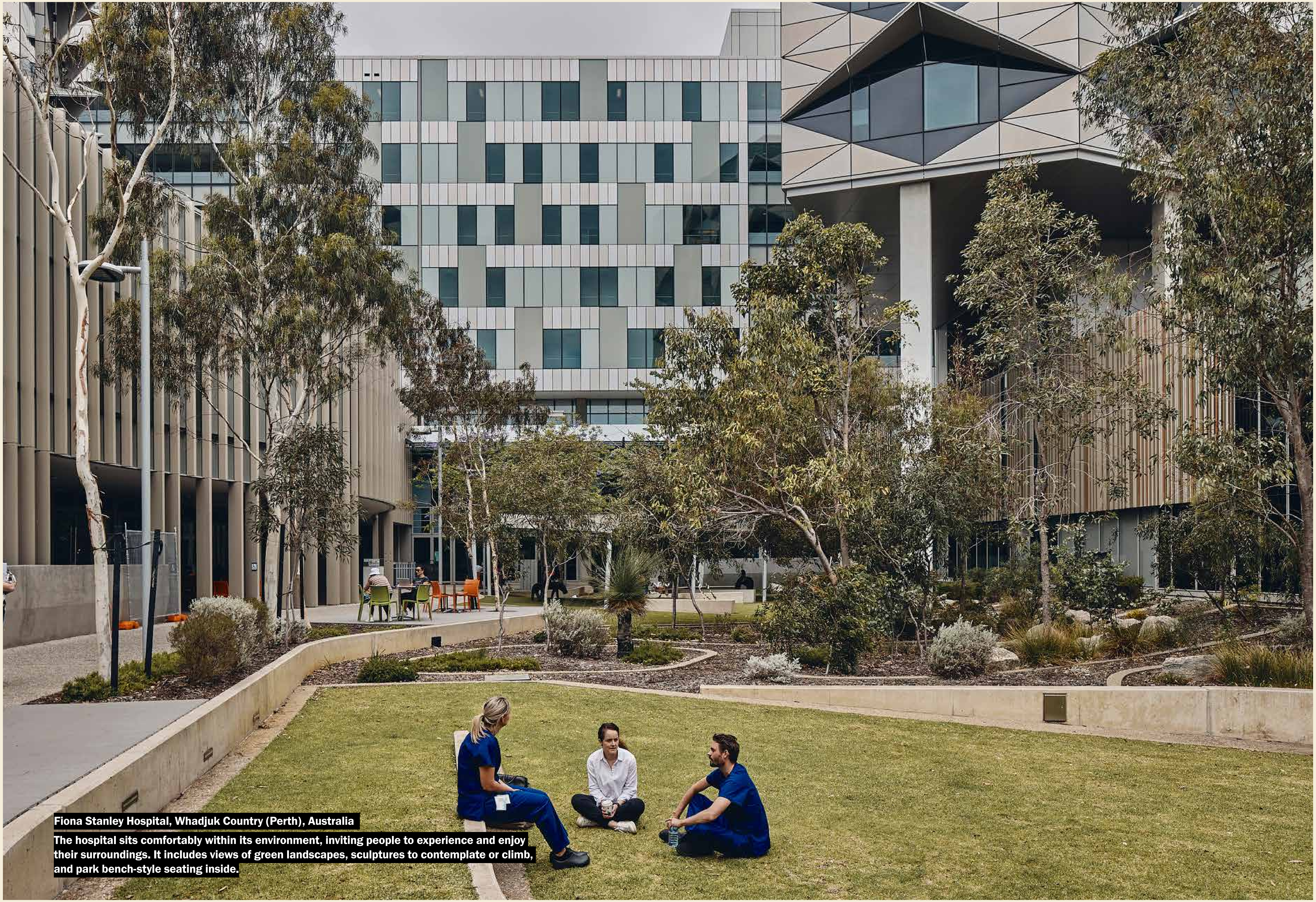
Access to nature is both an environmental and therapeutic consideration. Controlled outdoor or semi-outdoor environments such as winter gardens, terraces and protected courtyards are embedded within inpatient zones, offering restorative exposure without compromising infection control.

Finally, longevity and adaptability become critical. As care continues to shift between hospital and home, buildings must be able to flex. This means designing for potential contraction or expansion of inpatient areas, repurposing of outpatient zones, and integration of new technologies over time.

Building services infrastructure should allow upgrade and maintenance without closing wards or shifting patients - and be supported by accessible service zones and modular plant strategies.

> “Nature is not decoration. It’s functional infrastructure that supports healing and improves thermal comfort.”

Sian Willmott, Sustainable Design Leader, Hassell



Fiona Stanley Hospital, Whadjuk Country (Perth), Australia

The hospital sits comfortably within its environment, inviting people to experience and enjoy their surroundings. It includes views of green landscapes, sculptures to contemplate or climb, and park bench-style seating inside.

SHIFT 2: SUPPORT DIGITAL HEALTH

Embed high-quality tele-health workspaces – driven by resilient, cyber-secure infrastructure – right next to clinical care.

As tele-oncology, hospital-in-the-home, remote monitoring, AI-enabled diagnostics and patient-flow analytics mature, cancer facilities are shifting from static, room-based models to dynamic, networked systems of care.

The implication is not simply more technology, but a reconfiguration of space, systems and experience - where digital infrastructure is treated as core building fabric, and the hospital operates as both a place of care and a platform for distributed care.

DESIGNING HIGH-QUALITY DIGITAL CARE ENVIRONMENTS

Tele-oncology suites, remote monitoring hubs and multidisciplinary clinician touchdown spaces need to be embedded within the schedule of areas, but not treated as back-of-house call centres. Instead, they are designed as high-quality work environments with access to daylight, acoustic privacy and visual relief. These spaces require careful adjacency, close to clinical teams for collaboration, yet buffered from high-traffic zones to maintain concentration and confidentiality.

Spaces must seamlessly accommodate both in-person and virtual interactions, with integrated technology and backgrounds that support clear communication without feeling clinical or impersonal. Materiality and spatial character differentiate between focused work zones, collaborative areas and restorative spaces, supporting staff wellbeing in increasingly screen-based roles.

PRIORITISING STAFF WELLBEING

For staff, the risk is that digital care environments default to high-density, low-quality work settings. Instead, tele-oncology and monitoring spaces should be designed with the same intent as clinical environments; providing ergonomic workstations, access to natural light, acoustic control and opportunities for retreat. This represents a spatial uplift compared to traditional administrative areas, with increased area per workstation and more generous shared amenities.

Engineering systems underpin this shift and must be elevated to a primary design driver.

Digital infrastructure becomes as critical as mechanical and electrical systems, with implications including:

- → Dedicated, resilient ICT rooms with sufficient spatial allowance, redundancy and cooling capacity, often increasing plant space allocations compared to traditional models
- → Robust, high-capacity network distribution, with consistent Wi-Fi and data coverage across all patient, staff and external interface areas
- → UPS and power-quality protection for critical digital infrastructure, ensuring continuity of care across both physical and virtual platforms
- → Increased sensor density throughout the building, integrated with building management systems (BMS) and asset management platforms to enable real-time monitoring and predictive maintenance
- → Infrastructure that supports hybrid care delivery, decoupling services from fixed room locations and enabling flexibility over time
- → Separate and more highly segregated risers are increasingly required as power, digital, security and life safety systems grow in complexity and criticality. Greater physical separation supports resilience, maintainability and ongoing upgrades without disrupting critical services

This results in both spatial gains and redistribution within plant and riser zones. More space is required for ICT infrastructure, data pathways and cooling, alongside greater coordination between disciplines to avoid congestion and ensure maintainability.

The integration between clinical systems and building systems becomes more sophisticated. Patient-flow analytics, environmental monitoring and asset tracking inform operational decision-making, requiring interoperable platforms and secure data environments. Engineering design must therefore prioritise not only capacity, but integration, resilience and cybersecurity.

Under Australia's Security of Critical Infrastructure (SOCI) framework, hospitals are increasingly recognised and managed as critical infrastructure assets. This places greater emphasis on the resilience, separation and protection of digital and engineering systems supporting critical clinical environments. It drives higher expectations around redundancy, cyber-security and continuity of operation.

A passive-first design approach remains important, reducing baseline loads and supporting system resilience. However, this is complemented by intelligent, responsive systems that can adapt to fluctuating occupancy and use patterns driven by hybrid care models.

> **"Loss of data is now as critical as loss of power."**
>
> **Simon Witts, Director, VA Sciences**

Hassell ©

SHIFT 3: DESIGN FOR HIGHER ACUITY

Create adaptable rooms with built-in capacity to handle shifting clinical needs instantly – without moving the patient.

Cancer facilities must be designed to absorb volatility, where a patient's acuity can shift rapidly and without warning, without defaulting to relocation as the primary response. This requires a fundamental recalibration from spaces that are optimised for a single level of care, to environments that can safely and seamlessly intensify in place.

DESIGNING FLEXIBLE, ADAPTABLE ROOMS

Room sizes increase modestly to accommodate additional equipment zones and headwalls evolve into multi-service spines, with concealed capacity for additional medical gases, power and data.

Circulation zones around the bed are deliberately generous and unobstructed, enabling rapid intervention without spatial compromise.

More space does not need to mean more cost. A 'kit of parts' approach that uses standardised elements – rooms, clusters, zones and floorplates – that allow for local flexibility while capturing innovation and improving sustainability, could enable modern methods of construction at scale.

Joinery, ceiling systems and wall linings are designed for access and adaptability; demountable, modular and service-integrated, allowing upgrades or reconfiguration with minimal disruption.

The environment must also hold two conditions simultaneously: calm, restorative settings for standard care, and the ability to support high-intensity clinical activity.

Lighting, acoustics and materiality therefore need layered control, supporting both clinical precision and psychological comfort, while maintaining clear sightlines for staff and intuitive orientation for patients and families.

> **"If a room can't step up in acuity without intervention to services, it's already obsolete."**
>
> **Simon Witts, Director, VA Sciences**

Patient rooms and treatment areas require embedded spare capacity: additional electrical load allowance, latent medical gas provision, and scalable ICT infrastructure to support increased monitoring or future technologies.

Rather than centralising high-acuity capability, services are distributed, enabling more spaces to 'step up' in function. System zoning and controls are designed to support multiple operating modes, allowing parts of the facility to respond differently during periods of increased demand or clinical risk.

VENTILATION AND INFECTION-PREVENTION RESILIENCE

Cancer patients are often immunosuppressed and particularly vulnerable to respiratory infection. In this context, ventilation design must support both comfort and infection-prevention resilience.

For future facilities, this demands clearer HVAC zoning, maintainable pressure-regime strategies, and the ability for selected spaces to operate differently in response to individual patient vulnerability.

Rather than applying a uniform high-acuity model, the intent is to create a system that can flex safely as risk profiles change.

Ventilation strategy therefore becomes more nuanced and spatially responsive. Air systems are separated according to clinical risk profiles, with clearly defined pressure relationships and carefully designed exhaust pathways. Selected rooms or clusters are enabled to operate in alternative airflow modes - neutral, positive or negative pressure - when clinically required.

MEETING RISING DEMAND FOR ISOLATION CAPACITY

A growing proportion of higher-acuity and comorbid patients may also require increased isolation capacity, including rooms capable of managing concurrent infectious risks. This is likely to increase demand for isolation rooms and associated ante spaces, with implications for floorplate efficiency, ventilation infrastructure, staff workflows and pressure monitoring systems.

This also has direct infrastructure implications: increased plant space, more complex riser distribution, and accessible maintenance zones that allow ongoing operation during servicing.

Robust pressure monitoring, alarm strategies and commissioning approaches are essential to ensure performance without disrupting care, while systems must remain as intuitive and operationally legible as possible for clinical and facilities teams managing them day to day.

SHIFT 4: BREAK DOWN CLINICAL SILOS

Combine shared, cognitively supportive spaces and high-capacity engineering systems that flex across diverse conditions.

The growing convergence between cancer care, geriatrics, chronic disease management, rehabilitation, supportive care and translational research is reshaping the brief. These environments must move beyond singular disease pathways to become integrated care ecosystems that accelerate the translation of research into practice while supporting diverse patient needs.

At an architectural level, co-location becomes a primary organising principle. Bringing research closer to clinical environments creates stronger feedback loops between discovery and practice, accelerating the adoption of new treatments and enabling patients to participate more easily in clinical trials.

This requires a rebalancing of departmental footprints - less space allocated to siloed clinics, and more to shared, flexible consultation, treatment and research-enabled care environments. Adjacencies shift to prioritise direct connections between outpatient care, therapy spaces, diagnostics and translational research, creating environments where care delivery, innovation and learning occur in parallel.

INTERIOR DESIGN REINFORCES THIS INTEGRATION AND DIVERSITY OF USE.

Spaces are designed to be shared rather than owned - consult rooms, treatment bays and therapy areas support multiple specialties across the day. Critically, interior environments must be cognitively supportive. Wayfinding strategies rely on clear sightlines, intuitive spatial sequences and layered environmental cues - colour, texture and lighting - to assist patients experiencing fatigue, stress or cognitive impairment.

Waiting and transition spaces are designed with a gradient of stimulation, offering quieter, lower-sensory zones alongside more active areas. Wellness, nutrition and rehabilitation spaces are embedded within clinical zones rather than separated, requiring a redistribution of area but reinforcing care as a continuum rather than a series of discrete events.

> **“Legibility is not wayfinding, rather cognitive support under stress.”**
>
> **Leanne Guy, Principal, Global Health Sector Lead, Hassell**

ENGINEERING SYSTEMS MUST MATCH THIS BROADENED SCOPE OF CARE.

Mechanical systems are designed to support a wider range of environmental conditions, from standard consultation spaces to higher-dependency treatment areas and therapy environments.

This often necessitates more granular zoning and increased plant capacity, with implications for ceiling voids and plant room sizes.

Electrical infrastructure must accommodate a greater diversity of mobile equipment, increased charging demand and expanded monitoring, requiring higher baseline capacity and more distributed power and data points throughout clinical and shared spaces.

Medical gas infrastructure extends beyond traditional bedroom and procedural zones, supporting symptom management and higher-dependency care in a wider range of settings. This drives more extensive reticulation and spatial allowance within walls, ceilings and risers.

SHIFT 5: BUILD CLIMATE-RESPONSIBLE INFRASTRUCTURE

Design high performance, adaptable spaces that can maintain operations during extreme weather and environmental shocks.

Future healthcare facilities must be able to sustain safe, stable internal conditions during heatwaves, bushfire smoke events and broader climate disruption. For a patient group that is often heat and smoke-sensitive, and frequently immunocompromised, indoor environmental quality is not just a comfort metric but a clinical requirement.

Optimising building envelope performance requires a rigorous, data-driven approach. Early-stage thermal and visual comfort modelling allows us to balance orientation, building massing, window-to-wall ratios, insulation and external shading.

Simultaneously, tighter construction tolerances ensure we minimise unwanted heat gain and air infiltration. This can marginally reduce useable floor area or increase façade thickness, but delivers a significant uplift in thermal stability and air quality control.

DESIGNING FOR RESILIENCE AND WELLBEING

Facades should be carefully designed to prevent smoke ingress to the building and maintain safe internal air quality during extreme events.

Spatial planning can establish a hierarchy of resilient zones, ensuring critical clinical areas such as inpatient units, infusion suites and diagnostic services remain fully operational under stress conditions.

While these spaces require higher levels of environmental protection, all patient areas should retain access to natural light and outlook, using planning strategies such as courtyards and atria, and carefully arranged floorplates to balance resilience and refuge with patient wellbeing.

Access to external spaces remain important for staff and patients well enough to use them - shaded courtyards and terraces are designed as controlled microclimates rather than incidental amenities, requiring dedicated area but offering therapeutic value when conditions allow.

LANDSCAPE AND ENGINEERING AS PERFORMATIVE INFRASTRUCTURE

External landscape becomes performative infrastructure rather than decoration. Increased tree canopy and shaded outside areas reduce ambient temperatures, manage stormwater, and buffer the building from heat and smoke. This often requires a reallocation of site area - less hardscape, more planted zones - and early coordination with building form and services to ensure these systems work together.

Engineering systems are central to delivering refuge conditions. Mechanical systems must support smoke exclusion and cleaner-air strategies, including higher-grade filtration, dynamic control of air intake and the ability to operate in reduced outside air modes during poor air quality events. This drives larger plant capacity, increased plant room areas and more complex ductwork zoning. Systems are designed to operate selectively, maintaining optimal conditions in priority zones even under constrained scenarios. As global temperatures continue to rise, baseline design conditions are also shifting, requiring systems to be sized for higher peak loads and longer periods of sustained extreme heat. This has direct implications for plant capacity, heat rejection infrastructure and energy demand across the facility.

> **"Outside air is not always an asset; systems must be able to operate safely in contaminated air mode."**
>
> **Simon Witts, Director, VA Sciences**

Thermal resilience requires systems capable of sustained performance during prolonged heat, supported by redundant capacity and diversified load management.

DESIGNING FOR FUTURE CLIMATE SCENARIOS

Increasing ambient temperatures and more frequent extreme heat events mean conventional design assumptions may no longer be sufficient over the life of the building. Systems must therefore be designed not only for current conditions, but for projected future climate scenarios. Electrical infrastructure must accommodate this demand, with backup power strategies aligned to protect critical clinical areas. Medical gas and other essential services are similarly extended to ensure continuity of care within identified refuge zones

Equally, facilities must be designed for continuous evolution. Rather than a fixed future-ready state, services infrastructure supports staged renewal within occupied environments. This has clear spatial implications: larger and more accessible services areas, and clearly zoned shutdown arrangements that allow partial system isolation. While this increases the proportion of area dedicated to services, it enables upgrades without shifting patients or disrupting care.

THE PATH FORWARD

WHAT'S NEXT?

Plan for care models that can evolve, integrate and endure.

Future cancer centres must be planned as adaptable, resilient and digitally enabled ecosystems of care – not fixed hospital models designed around today's needs alone.

As healthcare shifts toward more complex patient journeys, integrated services and increasing care delivered beyond the hospital, facilities need to support flexibility over time: clinically, operationally and technologically.

This requires earlier alignment between briefing, health planning, infrastructure, engineering and design so that buildings can evolve alongside changing models of care, climate pressures and emerging technologies.

By embedding resilience, scalable infrastructure and integrated care thinking from the outset, cancer centres can remain effective, safe and supportive for patients, staff and communities over decades of change.

Design for adaptability, not fixed models of care

Cancer centres should be planned as flexible systems that can evolve over time - clinically, operationally and technologically. Designing with modular spaces, scalable infrastructure and spare servicing capacity allows facilities to respond to changing patient needs, new technologies and emerging models of care without major refurbishment. This reduces future disruption and cost, while supporting safer, more resilient care.

Rebalance space around higher-acuity and longer-stay patients

As more low-acuity care shifts into homes and community settings, the patients who remain in hospital are increasingly complex and vulnerable. Cancer centres should prioritise fewer, larger, more supportive inpatient environments with capacity for family presence, isolation, in-room treatment and restorative care. Success should be measured not just by throughput, but by how well environments support longer, more complex patient journeys.

Treat digital infrastructure as core building infrastructure

Telehealth, remote monitoring and AI-enabled care are reshaping how cancer services are delivered. Digital systems should be planned as essential infrastructure from the outset - alongside power, HVAC and medical gases - with resilient ICT, cyber-secure platforms and spaces for virtual care embedded into briefs and business cases. This enables more care to be delivered outside the hospital, reducing demand on physical treatment spaces, waiting areas and inpatient beds, while improving continuity of care between hospital and home.

Embed resilience into both buildings and operations

Cancer facilities must remain safe and operational during heatwaves, smoke events, infrastructure failures and changing climate conditions. Passive-first design, resilient servicing and adaptable operational strategies should be embedded early - not treated as late-stage technical add-ons. This improves patient safety and continuity of care during disruptions, while reducing reliance on energy-intensive systems and supporting better thermal comfort and indoor air quality year-round.

Move from siloed departments to integrated care ecosystems

As cancer patients present with increasingly complex and overlapping needs, facilities should support integrated models of care rather than isolated clinical functions. Shared consult spaces, multidisciplinary adjacencies and flexible treatment environments can reduce fragmentation and better support coordinated care. This improves patient experience, reduces unnecessary transfers and enables more efficient use of healthcare infrastructure overall.

Align briefing, health planning and engineering earlier

Future cancer centres should be planned around long-term adaptability, not just current models of care. Governments, health planners, engineers and designers need to define operational flexibility, digital care requirements and infrastructure resilience early in briefing and business case development. This reduces redesign risk, supports better long-term investment decisions and enables facilities to evolve alongside clinical and technological change.

ABOUT

Design Horizons is an ongoing foresight project looking at how our industry might evolve in the years to come to meet the challenges our planet faces.

At Hassell, we're actively exploring what a better future looks like and what our role is as placemakers To learn more and read about the latest trends and innovations, visit hassellstudio.com or contact:

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Acknowledgment of Country

We acknowledge and respect Traditional Owners across Australia as the original custodians of our land and waters, their unique ability to care for country and deep spiritual connection to it. We honour Elders past, present and emerging whose knowledge and wisdom has, and will, ensure the continuation of cultures and traditional practices.

METHODOLOGY

The research for this report combined targeted expert interviews with a review of current published information to understand the pressures shaping contemporary cancer care centres. As an initial stage, qualitative interviews were undertaken with Leanne Guy, Global Sector Lead for Health at Hassell, and Simon Witts, Director at VA Sciences to gather specialist perspectives on the key tensions currently affecting cancer care environments, including changing models of care, patient and staff experience, operational demands, and the impact of broader environmental and social factors on healthcare planning and design. This interview-based inquiry was supported by desk research into emerging evidence on cancer prevalence and climate change, with particular attention to the interrelationship between the two.

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