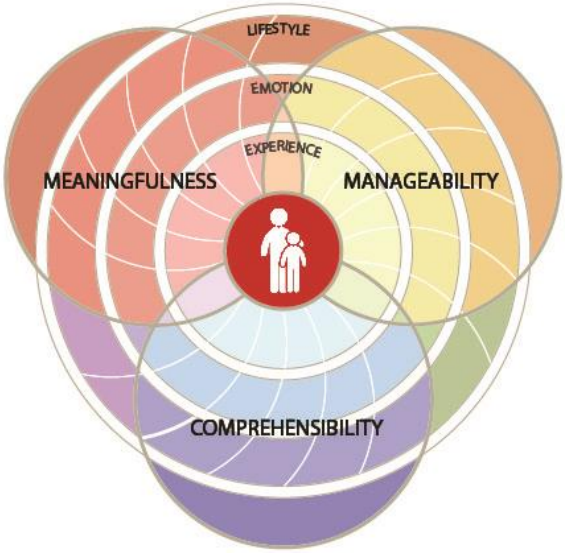
Hospital and health system planning to create high quality services, improved outcomes, integration and wellbeing



Submission for the Wolfson Economics Prize 2021

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Redesigning the hospital and rethinking the whole system

Introduction

From 1949 and into the 1960s, there was a blossoming of ground-breaking research into the design of hospitals. Then, hospitals were the focus of study and were looked at in isolation from other services. Now, hospitals are understood as part of a wider system of care with vital connections to the communities they serve. However, the task of ensuring that hospital buildings meet basic human needs and support caring remains as important as ever.

It is very timely that the Wolfson Economics Prize is focussing on this issue in 2021, not least because the impact of the pandemic provides an opportunity to take stock and make changes.

We propose an approach that builds on the existing body of knowledge but also seeks to challenge, reframe and expand the vision for hospitals in ways that improve heath and enrich the social fabric and vitality of the communities they serve.

We start with a **broader and more inclusive definition of value** than is generally used in hospital planning. The hospital, and the system it is part of, must deliver health and wellbeing for everyone who uses it – patients, carers, visitors, staff, researchers, local business, and so on. It is not just a factory for treating illness and it must also create sustainable health and wellbeing for its wider community.

The hospital must **address the holistic needs of patients** to actively promote their recovery, deliver better outcomes, promote agency and, where possible, provide care at home with the right support. Carers, visitors and other users also need environments that help them in what can be difficult times. **The needs of staff must be comprehensively met**, so that they too feel cared for and valued. This has often been missing or undervalued, as the pandemic has sadly highlighted. Many staff have died, suffered distress or acquired long Covid during the pandemic and there is no better time to seriously address their needs.

A change in outcomes – clinical or experiential – requires **a major shift in the culture of healthcare**. This is particularly important because of the way that healthcare produces anxiety in both patients and staff threatens everyone psychological safety and contributes to the growing problem of staff burnout. Creating salutogenic **environments that promote health and wellbeing and a supportive culture** are core to our proposal and will promote healing for the patient and nurture the staff.

A concern for health and social value also means that **hospitals need to be planned as part of the wider system in which they operate** and there needs to be a focus on how they contribute to the development of a wellbeing economy. This includes the provision of education, creating jobs, fostering a culture of innovation and supporting local firms, voluntary groups and other social capital that improves people's lives and reduces inequalities.

This ambition means rethinking how the organisation and the wider system of which it is a part functions and how its internal and external systems and relationships function. **To change the outcomes we need to change the design, culture and behaviours that produce them**. This means

identifying and **rewriting many of the current underlying design principles, cultural norms and other practices that dictate how hospitals operate** and how patients and staff experience them. Digital technology, new building design, changes in the operating rules for services can all help to support this change in radical new ways.

To drive a change in all these aspects of the system, **we need highly effective processes for co-creating designs and for truly understanding what patients, staff and communities value** and pay attention to. We must continue this process beyond the completion of the hospital building itself.

All of this combines to deliver the 'quadruple aim' of enhancing patient experience, improving population health, reducing costs and restoring joy at work. It should also create a **legacy that is sustainable** and promote the achievement of the United Nations' Sustainable Development Goals, which goes beyond just those concerning healthcare to include those related to education, inequality, climate action, the environment, sustainable cities and inequality.

An inspiring building is a noble goal. Beyond this, we want to create a wider health campus that contributes to vibrant civic life and is a living system where there is **continuous learning and development** that maintains the involvement of the constituencies who created it. This needs to be part of a learning cycle that feeds into each subsequent schemes in a virtuous loop. The objective should be to ensure that all NHS schemes evolve systemically to respond to changes in the health landscape, learn from best practice and contribute to a cycle of continuous improvement so each scheme is an improvement on the last. It is extraordinary that a national system does not have this learning approach or knowledge repository.

Our approach follows the flow illustrated in figure 1 below. Co-production and involvement sit at the heart of our methodology, so we start with a process for design that captures what is valued by the users of the buildings and the wider community. The designs must be functional, usable and reliable, but also, we want the experience to be meaningful, coherent and pleasurable; too often these factors are absent or are removed to save money.

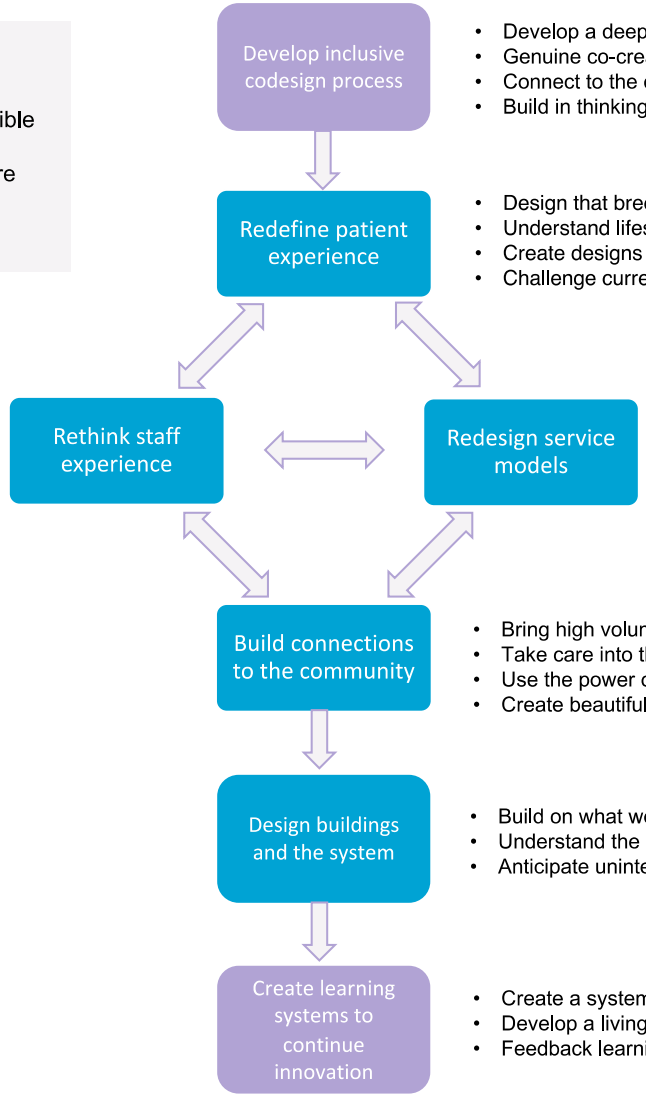
We then combine this with ways of thinking differently about care delivery and the experience of users to identify new design principles that show how the buildings, culture, technology and service models need to change. We apply the same approach to thinking about the development of a hospital with services across the town that promote health, are an integral part of their community, not just in providing care in locations that are more convenient, but also supporting and promoting prevention, local economic growth, education and other social capital to improve public health.

Our aim is not merely a new building, but rather a wholesale change in the culture of the organisation and local health system – one that simultaneously creates health and wellbeing, supports effective new ways of delivering care, fosters psychological safety, provides real benefits to the community, and embodies a system able to learn and adapt at every stage.

Figure 1: The structure of our approach

Our approach

- Hospitals are part of a system that creates health
- They support patients in their homes wherever possible
- They provide a core of high tech acute services
- They are closely integrated with social & primary care
- They a key part of their local community



- Develop a deep understanding of user requirements
- Genuine co-creation with multiple stakeholders
- Connect to the community and the whole patient needs/journey
- Build in thinking about sustainability, links to the community and future-proofing

- Design that breeds coherence and sensemaking, and gets the basics right
- Understand lifestyle, emotional and experiential factors and their impact on design
- Create designs that nurture, are meaningful and comprehensible
- Challenge current elements of the models

- Bring high volume hospital work into the community and the high street
- Take care into the home using technology that builds trust, encourages agency and self care
- Use the power of the hospital to support economic regeneration, education & social capital
- Create beautiful urban space to be available to all and supports civic pride and ownership

- Build on what works using best evidence
- Understand the opportunities to use technology
- Anticipate unintended consequences

- Create a system that learns from and improves healthcare iteratively
- Develop a living building that develops and improves
- Feedback learning to help other developments

Redesigning the design process

To create a robust, healthy plan for a hospital building requires an active and engaging process that brings knowledge, ideas and enthusiasm and which captures a deep understanding of what will be important to the users of the building. In our view, a healthy process creates something that people believe will serve a higher purpose – one beyond themselves that supports their community. Rather than a rigid, mechanical 'buy-in' approval process, we need to draw on knowledge of human nature, social commitment and the psychology of group decision-making.

To create a comprehensive hospital master plan – one that will be embraced by all stakeholders – a co-creation process is essential. In our experience, when such a process is underpowered or absent, the project will fail to achieve its full potential – perhaps because not enough questions were asked, false self-imposed limits on thinking were accepted or basic assumptions were not examined. When teams jump to conclusions, or when they achieve 'buy-in' rather than 'believe in', the risks increase.

Our experience shows that a co-creation process needs to ask in-depth, challenging questions, verify what the true constraints of the project are, identify and confirm assumptions, push beyond 'an answer' to find 'the right answer' and identify the best way forward by thinking boldly together. The result of our proposed co-creative approach is a hospital's Comprehensive Development Strategic Master Plan that is:

- visionary – raising aspirations for what a health facility and community can be and the extent to which technology can transform it
- galvanising – a vehicle for building consensus around shared values, needs and priorities
- provoking – a catalyst for the rethinking of the role and function of the hospital
- responsible – making the best use of resources, including the site's full potential, operating costs and people
- flexible and resilient – accommodating multiple future scenarios
- identity building – providing opportunities to express a distinctive, meaningful landmark
- integrated – weaving into the surrounding neighbourhood land-use plan.
- Transformed by the deployment of technologies analogous to the impact on other parts of the economy but that have often left health behind

Our experience of the ingredients of success of the co-design process

1. Jointly define the project's purpose.
2. Review what to expect during the process.
3. Nurture a spirit of discovery and inquiry.
4. Encourage 'naïve' questions.
5. Invite diverse participation throughout the entire process.
6. Resist jumping to conclusions.
7. Look at issues from different viewpoints.
8. Work through options together.
9. Avoid 'predictable surprises' by identifying them early.
10. Challenge constraints.

Participant-centred co-creation process. A participant-centred co-creation process needs to be shaped so that decisions are made incrementally and are based on defined criteria for success that are established and made transparent at the outset of the project. These must be assessed throughout the life of the project through formative and summative evaluation and fed back into the design process. These assessment points are needed to review the project's scope, cost, quality, function and how to limit its impact on existing operations.

Inquiry-based design. To create a strategic master plan, we need to hear from a wide range of stakeholders. We need to know what they believe and what the ultimate purpose of the plan is, including:

- What kind of impact do the stakeholders want the space to achieve?
- How should people feel about the plan, the building and its proposed services?
- What qualities create these feelings?
- To what extent should the hospital's image be similar to and/or evolve from existing facilities?
- Are there any 'predictable surprises' (potential roadblocks or mistakes) we can avoid?
- What are our assumptions regarding constraints and opportunities for the project?
- What do we want the site and new spaces to say about the hospital's values and mission? What messages do we *not* want to convey? What messages do the site and facilities presently convey? What messages do similar global healthcare environments convey?
- What other questions should we be asking ourselves?
- What if we were to think 10-times bolder?

Confirming assumptions and best practices. This is not just about listening but also creative debate about addressing known risk trade-offs. It is about challenging and confirming assumptions and bringing ideas and appropriate global best practices to the master planning process, so as to create the conditions for continual improvement of quality, as well as the site's overall operations, through a virtuous learning process. Using this inquiry-based design philosophy, we can shape the hospital site so it reflects the future aspirations of the organisation while achieving 'beauty on a budget'.

What the CEO said: "*we were serious about avoiding constraints from the get-go…we put children at the centre and got them to draw pictures….not a single one of the 1,000 pictures we received was of a "hospital". They categorically did NOT want a hospital! They said 5 things to us through this exercise (2009) which became our guiding design principles:*

One of the contributors in action

It must not feel like a hospital
It must care for my mum as much as it cares for me
It must feel like we are in the park you are building
Inside and out I must be able to see green spaces!
It must be fun…have places to play and enable me to connect with my friends/world… digitally
It MUST be environmentally sustainable"

We kept things flexible and therefore future-proof….and engaged widely with partners to understand what the art of the possible might be….the wider campus potential came from this

engagement…with HEIs, industry partners, the local community…and developed the Research and Education Institute, the Innovation 'Bat Cave', the Alder Bereavement Centre, the Mental Health/Child Development facilities, Social Prescribing/Health promotion opportunities in the Park. It's given us the space to grow our thinking and expand our offer hugely."[1]

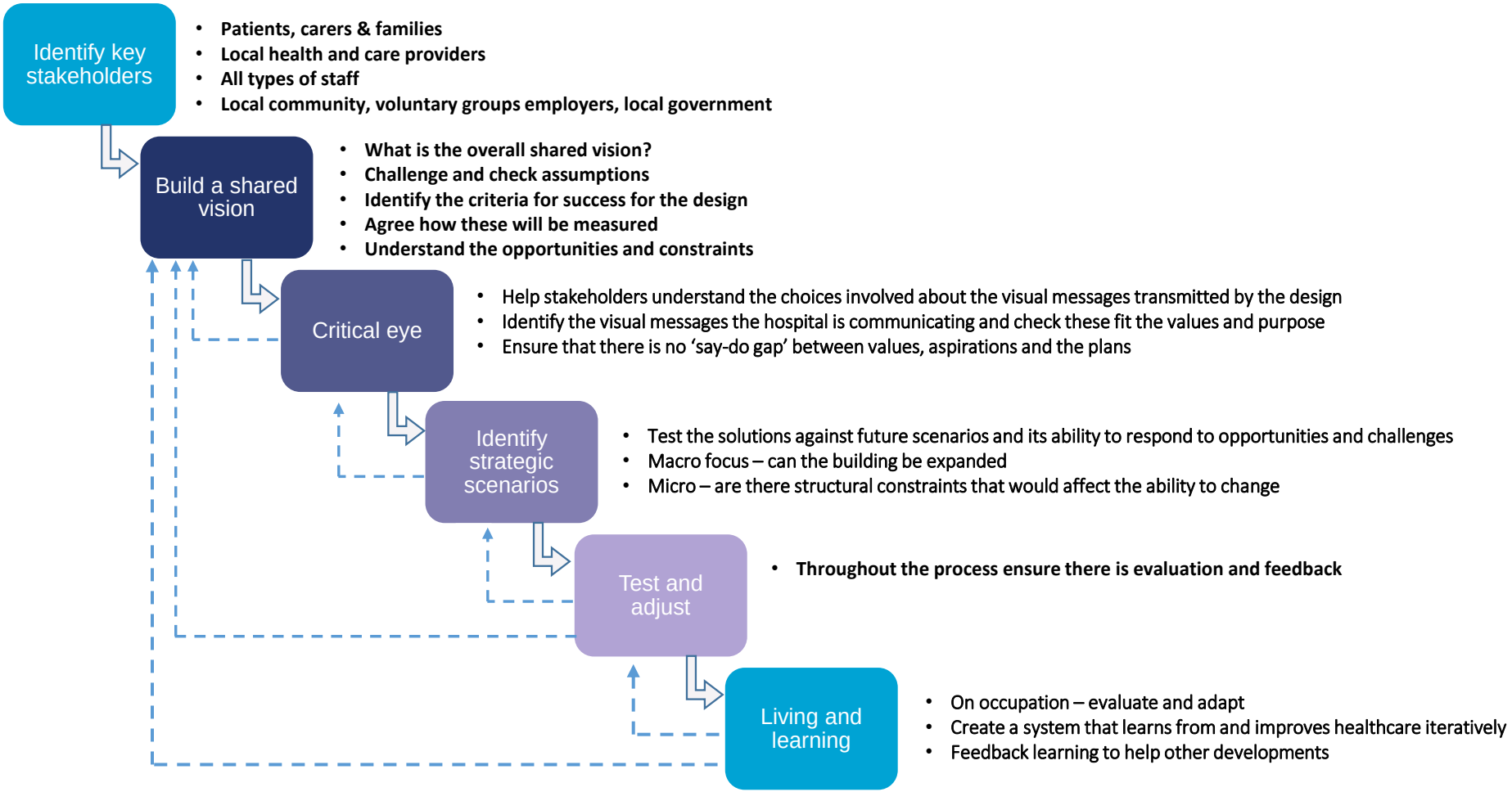
Outline of the co-creation process. The process is illustrated in figure 2 below. This has been found to reliably build solid support for design decisions. When diverse stakeholders are united by the specific purpose and values reflected in their defined criteria for success, it is easier to achieve a spirit of shared ownership of the results that 'get it right'. These sessions are part of a proven methodology that builds understanding of complex strategic issues and options. Using hands-on 3D physical models, simulation, virtual reality headsets combined with stimulating dialogue, it is possible to expand thinking, help people understand the physical manifestations of the design and explore ways to achieve the best way forward.

3D models make sense of the proposals and invite wide participation

Participant-centred planning. A master planning design methodology is needed that includes purpose-focused questioning, critical thinking and active, experiential learning workshops throughout the life of the project. Participant-centred planning sessions result in better decisions because they are research based, rigorous, reliable, practical and demonstrate to patients, carers, other users and their community a deep respect of their lived experience. This approach aims to achieve the full potential of the project by thinking together and co-creating with imagination, respect, purpose and a concern for legacy. This is summarised in figure 2 below.

[1] From correspondence, used with permission,

Figure 2: Participative design process



Developing new design principles

A well-known idea in healthcare improvement is that 'every system is perfectly designed to get the result it gets'. Therefore, to change the outcomes, we have to change the design. Hospitals and healthcare systems are often not well set up to deliver the innovative outcomes that will be needed in future, for example:

- They give people less agency and control than they experience in other parts of their lives.
- They are focussed on single diseases when many patients will have multiple conditions.
- They have failed to keep up with the opportunities of digital technology.
- The packaging and delivery of treatment are often inefficient, ineffective and unfriendly.
- Healthcare is still astonishingly fragmented and erects an array of barriers to innovation.
- Healthcare and healthcare building have a long way to go to deal with issues of sustainability.

To address this, we need to identify the design principles that are producing sub-optimal, and highly variable and inconsistent safety and quality, outcomes and re-specify them to fit the goals the system is trying to achieve. This process is a key part of the co-creation approach described above.

Here we contrast common elements of current practice – the de facto design ideas – with design principles that would create change. Many of the examples of change principles we set out come from service models that are already in place in the NHS and elsewhere, but which have not been widely adopted or understood. Note that the examples are incomplete by design. They are a starting point for the conversations and co-production activities described above, not the fully worked-through solutions.

Designing for patients, carers and visitors

The co-creation process will generally identify a range of key design factors, including the importance of privacy, art, light, greenery, noise, the ability to control temperature and ventilation, clear signage, legible layout, cleanliness, how welcoming the environment seems among many others. It should also include a focus on how buildings work for people with visual impairment, limited mobility and other characteristics that need to be designed for. There is already a lot of good research and experience to build on, but there is more to do to take these to another level.

Many of the ways in which patients interact with the health system are rooted in history and tradition. There is a major opportunity to recast this, as the rapid shift from face-to-face to phone, video and e-consultations during the Covid-19 pandemic has demonstrated, there is a major opportunity to recast this. Developments in tele-tracking, digitally assisted way-finding, personalised digital assistance and remote monitoring offer further opportunities.

We now set out examples of how the design principles for how patients, carers and visitors experience the system can be changed. Note that a key theme of a number of the changes in this area is about providing agency and reducing anxiety.

Examples: Old and new principles relating to patients, carers and visitors

Current practice	**Change principle**
The patient's time is treated as free – travel and waiting have no costs associated with them	Travel and waiting times are minimised One-stop services are created
Patients are passive recipients of care that is often impersonal	Patients are active participants in their care and need access to resources to support this. Digitisation allows personalisation.
Anonymous and institutional reception space and airport style common areas	Open and inviting, breaking down barriers, smaller more personal spaces
Patients have limited access to information	The patient's record is at their bedside or on their devices
Outcomes are defined in terms of narrow biomedical indicators rather than the goals of the patient	Outcomes incorporate patient experience and personalised needs
Patients interact with the system on a face-to-face basis	Patients can choose a variety of ways, including phone and video, to meet their needs
Patients share rooms	Patients have single rooms
Patients are moved to suit clinical management arrangements or when they deteriorate	Once admitted to hospital, care is brought to the patient (critical care may be an exception to this but outreach and early intervention can reduce this)
There is little design consideration for visitors and carers	Visitors and carers have space to meet with patients and professionals

Designing for staff

Concerns about staff burnout and lack of professional fulfilment pre-date the Covid-19 pandemic, but the pandemic has highlighted the burden we place on our clinical workforce. Burnout leads to poor patient experiences, patient harm, medical errors and lost productivity. During the early stages of pandemic, the importance of looking after staff and providing the facilities they need became painfully obvious. New hospital design must be based around addressing these challenges, reduce the occurrence of burnout and moral injury, and incorporate solutions to address them. Staff themselves need to be involved as part of the design process in identifying the practices they want to see.

We now set out examples of how current practice in the implicit design of the system for staff might change.

Examples: Old and new principles relating to staff

Current practice	**Change principle**
Casual and social interaction between staff is of low value	Opportunities are created for opportunistic interaction to support socialisation, promote peer-to-peer learning, increase innovation and manage patients better
Offices for busy staff can be a long distance from clinical areas	Teams work together and close to the clinical areas
Staff movement and internal travel are a cost of doing business	Activities are clustered around patient needs and key adjacencies
Expert support is limited to who is available on call or on site	Telemedicine provides the opportunity to spread expertise across distances
Staff facilities can be limited – for example, staff have to change at home and when on night shift they need to feed themselves	There are dedicated staff changing facilities, lockers and support areas; the infrastructure is created to help staff to flourish – hot food at night, mess rooms and so on are provided
Staff may work in areas with limited or no natural light	Stress is reduced by enabling access to light, biophilic design and green space
Staff may deal with multiple room layouts, different storage arrangements and idiosyncratic approaches	Standard room and ward/department layouts reduce frustrations and improve safety
Staff spend a lot of time looking for equipment	Key equipment is tracked wirelessly and stored in standard ways and locations
Staff cope with multiple alarms	Intelligent systems integrate alarms to minimise noise and alarm fatigue
Staff undertake work that can be automated	Work is automated where possible, releasing time for high touch patient contact

Design principles for services

A similarly challenging approach is needed for the redesign of how services operate. Many of the new principles in this area, which we set out below, build on well-understood ideas developed in the NHS using lean, improvement science or pragmatic local experiment and innovation.

Examples: Principles relating to the operating model

Current practice	**Change principle**
Running at 98% of capacity is efficient	Systems work at a steady pace, with spare capacity to support infection control and the ability/capacity to deal with variation
Design is for average workflows	Design is able to flex capacity and service configuration
Queuing, waiting and batch processing are efficient mechanisms for programming work	The aim is for flow and 'pull' models designed around the clinical microsystem that supports patient-centred, humane and personalised care
Care is based on face-to-face encounters in the hospital	Telemedicine means clinicians are no longer bound to the hospital in which they work
Care is organised around medical specialties	Care is organised around clusters of specialist multidisciplinary care that reflects the growth of patient complexity
Emergency and planned care workflows can be mixed.	Processes are separately streamed to improve flow of patients and to optimise equipment use
There is a reliance on rules and individual effort to ensure safety	Predictive and proactive high-reliability systems are created- see Appendix 1
Approaches to care delivery are highly variable within the organisation	There are highly reliable standardised approaches that can adapt, scale and flex as necessary
Patients who are medically fit remain in hospital for extended periods due to the complexity of their (often non-medical) needs	Patients are transferred to appropriate alternative modalities of care as soon as they are ready
There is a secondary–primary care split, with hospitals delivering episodic care	Hospitals work closely with local places to support population health management
Referral is the route to expertise	There are multiple other routes to expertise, for example: advice and guidance services, specialist support to primary care and multidisciplinary clinics
General hospitals have a supplicant relationship to tertiary centres	Hospitals are part of networks with balanced reciprocal relationships supported by integrated control centres

Building a health-generating hospital environment

The thinking described above, the co-creation of objectives, new design principles and ambition for change combine with a well-developed body of research on these issues to create a rich picture of a health-creating (salutogenic) and health-promoting environment. See figure 3 for our comprehensive taxonomy that provides a practical interpretation of this.

The design matrix shows the psychosocial components of the design that emerge from this thinking. It links the elements of the design that improve well-being and address the needs of people in terms of their lifestyle, emotions and experience. To succeed, each of the design ideas in each domain needs to achieve three key aims, which are as follows.

Comprehensibility

The different components of the buildings, operating model and culture must be coherent and consistent. This encourages a sense of trust and positive predictability. Environments that are easy to understand and navigate reduce anxiety and create safer environments by reducing cognitive load, wasted time and motion and opportunities for errors. For example, key equipment used by staff should be standardised and held in the same place in each area. Computer user interfaces follow the same pattern in each department and site, and the approach to safety and improvement uses the same language, philosophy and culture.

Manageability

Designs must support patients and staff to cope with challenges and exercise control over the environment. They should remove barriers and distractions by creating environments that are safe, comfortable, and accessible for all users, regardless of any pre-existing impairments. The right design can enhance people's ability to cope and support those that may need additional help. This can be created through aesthetics, natural light, green environments, visual stimuli and evidence-based ergonomics. A similar approach can help to create cultures that promote patient-centeredness, agency, psychological safety, and a focus on learning and improvement.

Meaningfulness

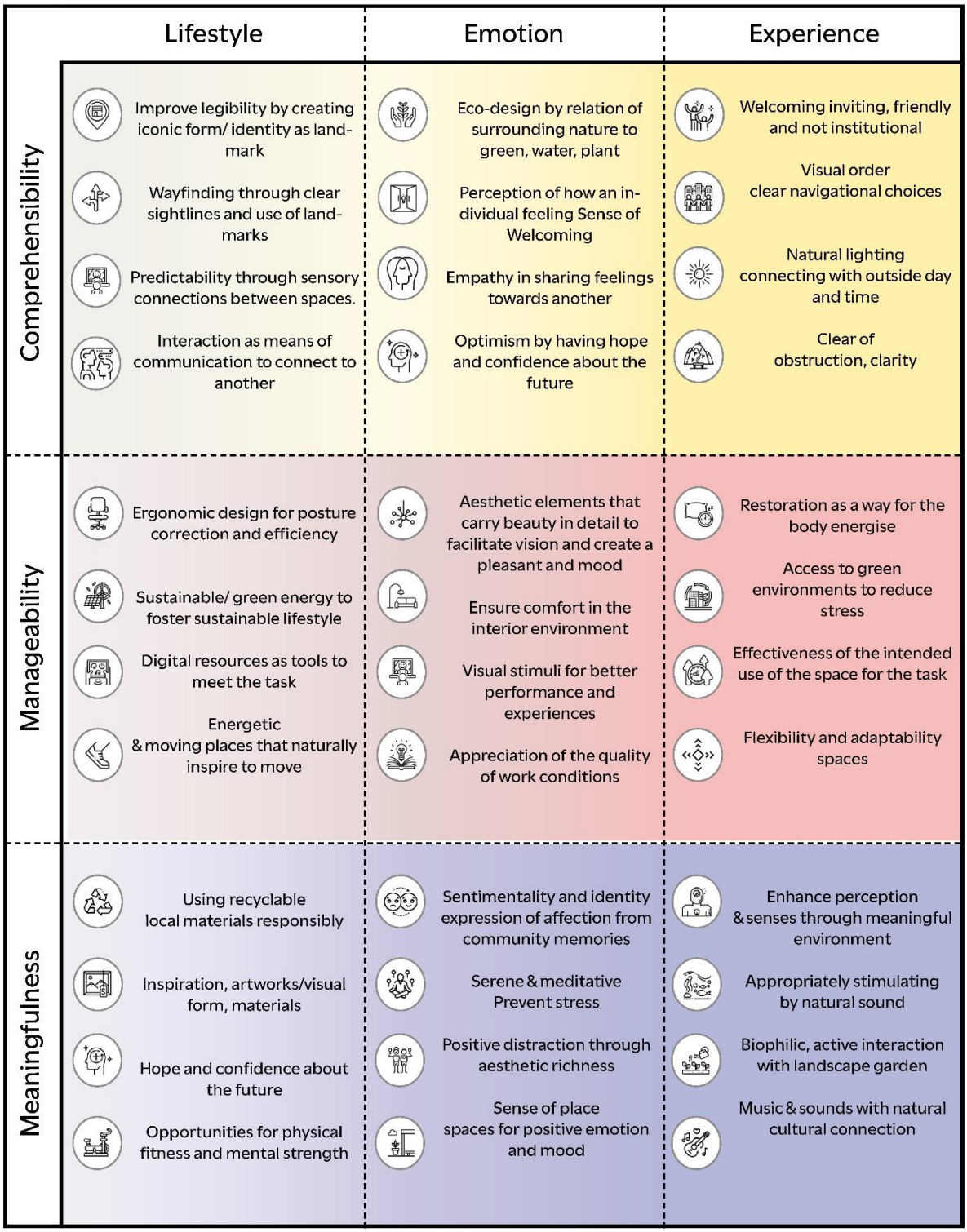
All users of the services and building need to feel a sense of belonging and respect. This can be supported through environments that are inspiring, engaging, restoring, challenging and aesthetically rich. Fostering this sense of belonging is even more important for the culture of the organisation. Research on helping staff deal with stress and trauma, moral injury and similar challenges shows that creating meaning and purpose is vital for restoration and recovery.

As we said above, the pandemic has intensified many of these challenges, but they were always present, yet poorly addressed. Our approach tackles them head-on and links the design of buildings and service delivery models to changes in culture and behaviour, and conceptualises these as a linked package of changes.

Looking at these three key components together shows what is expected not only of the designers of the building, but also of the service models, the culture and the overall re-imagined experience. The design brief needs to bring all of these together.

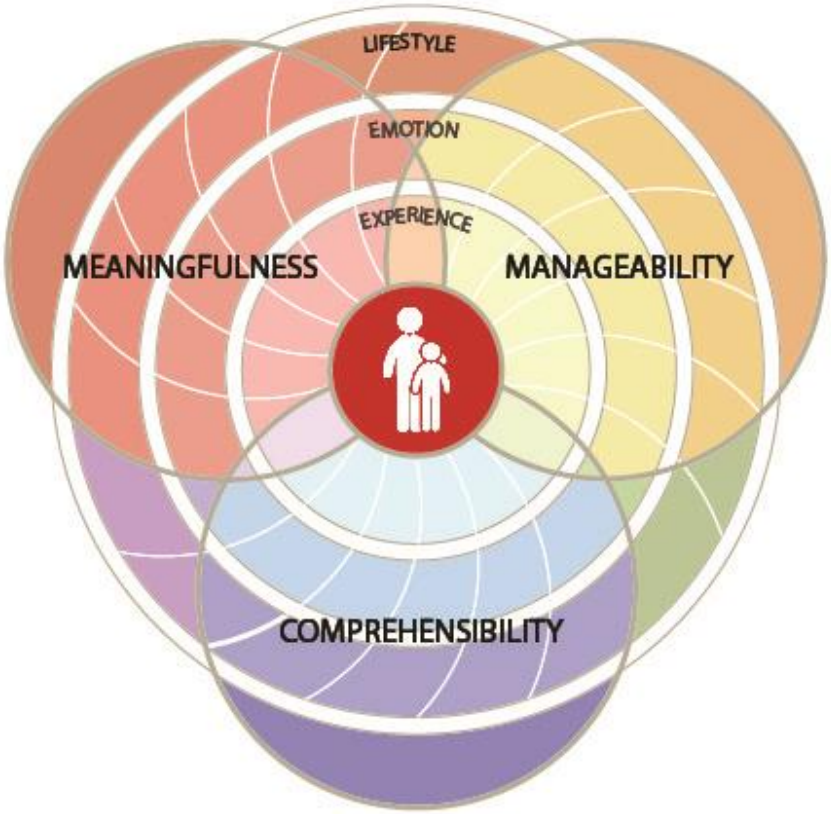
It is worth looking back at the comments made by children on page 5 above to see how these ideas resonate.

Figure 3: Key psychosocial dimensions of design



The above concept builds on existing work by [team members – the references have been removed to protect the review process – Appendix 2 refers]. The ideas are more organically linked than this diagram suggests: we see them more as overlapping and interacting issues that evolve and change – the table is simpler to read than the reality; in practice the more evolutionary process is closer to the graphic below.

Figure 4. Organically linked and evolving design concepts



Turning these ideas into designs

This section shows how the co-creation process described above, the reframing of design ideas and questions and a broader definition of the objectives for hospitals and their redevelopment translate into a concept for the design of the hospital and how it sits in its community. For selected areas we show examples with images and ideas that demonstrate how the design principles we identify above have been captured in existing designs. These might work differently in new contexts, but this does not mean that such concepts have to be completely bespoke. Much can still be done with standardised rooms and departments and repeatable design ideas, and from the point of view of costs and patient safety, there is a strong argument for this.

After this we develop these ideas combined with some additional principles about the hospital in the community and sustainability to show how this can create **a distributed hospital fully connected to its community and the creation of a living, learning and innovative hospital system**.

A community-facing hospital

Accessible and generous to its users and the wider community

Hospitals are important symbols for their community but must also offer a reassuring and friendly welcome to people at difficult points in their lives.

Applying the principles

1. **Community asset**: A community-accessible lush park that creates much-needed new green space for the surrounding community. This has become a much-beloved seasonal gathering places for families and patients, staff, and the community alike. ***Jerusalem, Israel***

2. **Generosity:** The front face of the hospital main entrances is a 'tree-lined avenue' running a city block in length. The 'avenue' consists of a covered canopy of whitewashed structural columns as art integrated within the city structure. In a city with its fair share of rain, the exterior covered canopy is an offering to the wider community on a wet winter's evening, or a bright sunny day where the light and shadow on the columns creates a 'natural' feeling of a hospital in harmony with the historic church structure on the same avenue. ***Dublin, Ireland***

3. **Art that reflects the community**: a hospital in ***British Columbia, Canada*** where the community has a large First Nation Aboriginal population. The design of the main entrance was intentionally shaped to communicate known symbols for 'we are together' (the boat) and health (the sun), all made by a local artist in local wood.

4. **Fitting in with the environment** – here the hospital blends into the adjoining park –where produce is grown for the ward kitchens - maximising green space. ***Liverpool, UK***

5. **A reassuring arrival** – a gently sloping curved entrance canopy clad in wood provides a warm embrace to patient, families and staff. ***Ontario, Canada***

The front of house

This communicates – 'we welcome you'

Comprehensibility – Natural light helps the circadian rhythm; is welcoming, inviting and non-institutional; and iconic forms help legibility, wayfinding and create coherence

Manageability – The entrance conveys a sense of hope and confidence about the future. It is inspirational in its shape and form. It also reinforces a sense of place, with positive distractions of natural plants and materials, and biophilic shapes enhancing positive perceptions through a manageable environment where patients with special needs are also taken into consideration.

Meaningfulness – Curved shapes inspire people tomove and explore. Aesthetic and structural shapes communicate a vision of an organisation's values. Access to green, inside and out, reduces stress and evokes feelings of belonging, self-worth and a sense of purpose.

Case studies

1. A hospital lobby in the form of a treelined courtyard with wooden structural columns

2. Natural light and gardens create a welcoming hospital lobby space for patients and staff

3. A curved hospital lobby creates a clarity over wayfinding

4. A single loaded lobby next to a glass wall makes wayfinding more straightforward, with visitors always orientated from the point which they arrived

5. Natural plants and natural materials create a sense of comfort and authenticity

6. Lobby overlooks the arrival area outside improves legibility and ease of wayfinding

7. A co-creation process explores both 'functional'issues as well as 'value' issues

We were particularly taken with the approach that Maggie's have to reception and how people are welcomed that featured in the Policy Exchange seminar. We were already aware of this but don't have rights to using it here - but in developing further thinking we would seek to adapt their approach to these services.

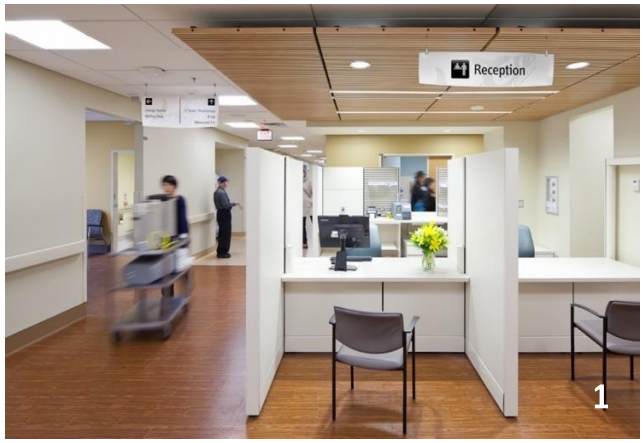
The emergency front door

The emergency department is an area where there is a particularly pressing need to rethink the design principles for the physical environment, the operating model and culture. Examples of the changes that are required include:

- Design features that create calm and reduce the chance of aggression – e.g. Design Council guidance
- Space that is continuously adaptable and reconfigurable during the day and across the week
- Meeting the needs of different types of patients through well-designed processes and teams working in pods – not multiple fragmented units that reduce flexibility and teamwork
- Dedicated access to imaging and point-of-care tests
- Design that allows separation of flows and can segregate infectious patients
- Minimise patient moves – a senior decision-maker at the front door and proper space for assessment
- Large flexible resuscitation rooms and other adaptable rooms for high acuity care
- Pleasant space for staff to work and rest
- Space for difficult conversations & bereaved families

Talking to users reveals insights that are often missed, for example:

- Waiting areas need to be thought of as active clinical areas where patients need to be observed
- Toilets – insufficient in number, poorly placed and a risk if staff cannot monitor them
- Noise and competition for space by staff are big issues



1

Manageability – A place that communicates hope and confidence, that is inspirational, with familiar symbols and visual references; a sense of place and positive mood

Meaningfulness – A place that offers comfort andwarmth and is restorative, not stressful and busy. Ergonomic furniture for both staff and patients

Comprehensibility – Predictability through sensory connections between spaces, starting at the exterior drop off, through to the lobby and treatment areas

2

Case studies

1. and 2. Reception area uses natural sealed materials, communicating warmth, calm and comfort

3. A co-creation process was used to explore patient and staff flows as well as what the environment should communicate to arriving patients

4. Resilience in disaster – see appendix 3


3


4

Inpatient care experience

Patient rooms and ward areas with short travel times for staff, a healing environment that is flexible and easily adaptable spaces

Manageability – Serene and coming spaces that reduce stress for inpatients and staff

Meaningfulness – Digital resources to help staff and inpatients access information; ergonomic design for staff and inpatients; comfortable interior environments

Comprehensibility – Spaces that communicate hope; have clear unobstructed views; natural light for circadian rhythm; visually ordered, clear to navigate; welcoming and non-institutional; interaction and communication easy amongst staff members

Case studies

1, 2, & 3. Inpatient rooms that are warm, comfortable, with natural light; can accommodate guest or family members staying overnight; are functional for staff

4 & 5. Workstations that are ergonomically designed and have clear sightlines

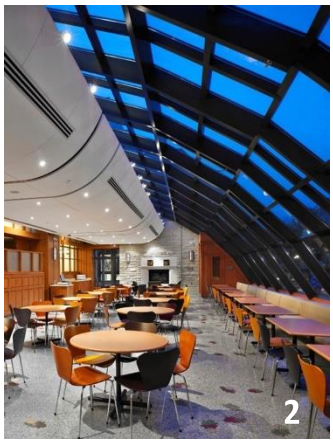
6. NICU spaces that are intimate, non-institutional and have access to natural light

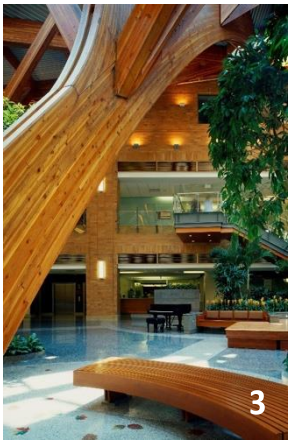
7. Inpatient ward entrances that are welcoming, visually distinctive, use natural materials and welcoming forms; and close and convenient staff meeting areas

8. A co-creation process with staff and patient representatives allows a broad range of planning and design issues to be explored and incorporated into inpatient designs

Staff experience

This is a key example of using design and buildings to change the culture – in this case to rewrite the deal with staff – key elements are - changing, relaxation, hot food, etc. staff offices would be nearby. A gym would be available, with natural light into staff spaces; access to the outdoors and temperature control.





Manageability – Places with positive distractions for down time; serene and meditative areas for yoga and preventative stress; a sense of place for positive emotions and mood; biophilic and active connections to nature and natural forms

Meaningfulness –Positively energetic places that naturally inspire one to move; appreciation of the quality of the off-stage areas for staff; access to green spaces and views of natural or visually pleasing areas; restorative places for downtime

Comprehensibility – Natural lighting for good circadian rhythms; empathy in shared feeling for other staff; welcoming perception; eco-design for good mental health and wellbeing; spaces that promote ease of interaction for staff off stage.

Case studies

1 & 2. Off-stage staff areas that are intimate, warm, with views to the outside and with natural materials and shapes within

3. Convenient and comfortable places to sit and rest

4. Active fitness spaces with good views to the exterior, lots of natural light

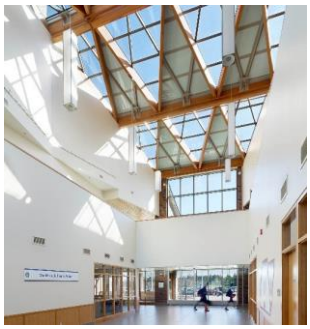
5. Off-stage areas that offer a variety of places for different gathering of staff: at a 'kitchen table', around a fireplace, or in a small, quiet meeting room

6. A co-creation process allows staff and the design team to explore what is really important in the qualitative and functional needs of these spaces for those that use them.

Learning and innovation spaces

Integration with clinical areas; space for play and experimentation; smart theatres and clinical rooms to disseminate images, record activity and hook up to teaching spaces

We take our inspiration from initiatives such as the Israel Centre for Medical Simulation, the Alder Hey Innovation Hub ('the Bat Cave'), the Imperial Innovation Hub and other similar examples that create space for research, education and innovation.



These models are based in university institutions but they can be adapted for general hospitals. The componentsare highly adaptable space that is easily accessible for clinicians and patients, multidisciplinary staffing, patient involvement, remote learning links to teaching centres and joint working and alliances with med-tech and information businesses.

Simulation is growing in importance for technical procedures such as learning to operate but also for helping clinicians learn consulting skills and how to deal with difficult conversations. The use of simulation could have greatly improved how hospitals adapted to Covid-19, helped to understand the practical difficulties of using PPE in cramped ward conditions and many other aspects that had to be discovered in the real world, often with undesirable outcomes.

Dedicated spaces close to clinical areas or on the hospital campus needs to be part of the development. In some settings the innovation centre might be integrated with treatment facilities to allow for translational research, especially in areas such as rehabilitation. Inspiring examples of this can be seen in specialist centres such as the Shirley Ryan AbilityLab or the KITE Institute in Toronto.

All of these elements combine to create a positive staff experience as well as building links beyond the walls of the hospital.

Connecting to the system and wider community

The development of Integrated Care Systems and place-based models of care highlights the importance of hospitals as contributors to population health.

Hospitals can make a key contribution to the management of many chronic conditions in primary care by ensuring their expertise is made more easily available and through their role as 'anchor' institutions.

One of the most significant gains that is available is the opportunity to use a major project to boost the local economy and use it as a catalyst to make better connections to small and medium-sized enterprises, education providers and community groups. We now set out current practice in this regard and the new principles that should be applied in planning and designing a hospital of the future.

Examples: Old and new principles connecting hospitals to their local systems

Current practice	**Change principle**
Hospitals are standalone institutions and private spaces	Hospitals are integrated with the community and other resources – either within the hospital site or by taking the hospital to the high street Hospitals are important symbols and important components of civic society
Limited health promotion is undertaken	The hospital is an active health promoter, both internally for patients, visitors and staff and also in its participation in its wider community, including schools and leisure facilities
Wellness and leisure happen elsewhere	Hospital ambulatory, rehab and wellness work use leisure facilities and other public space
Centralised procurement saves money	Local procurement saves food miles and puts money into the local economy
Travel, food miles and carbon are externalities	Carbon and other environmental costs are treated as real Hospitals contribute to the social, economic and environmental sustainability of the wider system

The increasingly specialised nature of much modern medicine and the shortage of some key specialists require hospitals to be part of networks for specialist referral and advice, education and training and peer review and improvement. The implications of this for design are that information systems are needed that can seamlessly communicate and share data with other providers and there needs to be high-speed Wi-Fi that is readily available across the hospital site to support telemedicine and private spaces for clinicians to use it effectively.

Stewardship and legacy:
A multidimensional approach to healthcare sustainability

The changing climate is influencing disease vectors, fuelling mass emigration and social unrest, and disrupting the ability of the healthcare system to respond to health needs of the communities we serve. These changes and their impacts will accelerate. Reaching the goal of improved outcomes and sustainability will require a number of interrelated actions from national policy to local decision makers. **We must measure outcomes as much by the environmental and public health impacts of our work, as by the quality of the care we deliver.**

Those responsible for the hospital have a duty of stewardship and an obligation to think about the impact on the future. The old approaches incentivise short-term thinking and leave problems for those that follow. Our distributed health campus model has the ideas of legacy and sustainability at its heart, from design through to funding and the post-occupancy operation of the model.

There are some basic elements that we assume:

- Efficient energy outputs/zero carbon
- Low toxicity materials
- Long life materials
- Minimisation of waste, cut and fill excavation and imbalance
- Positive impact on air quality
- Sustainable transport solutions
- Water collection and reuse
- Connection with nature and encouragement of biodiversity across the hospital campus.

There are other basics to **build into the operation of the building:**

- Continuous monitoring of water use and energy and carbon output
- Charters and governance to control long-term application of standards for estates teams etc,
- Improvement targets in green transport plans
- Continuing apprenticeship programmes post-construction
- Ongoing initiatives around the green spaces on the campus/gardens.

Lessons from the building programme of the 2000s show the importance of the buildings being technically competent and not prone to faults that can interrupt and compromise care delivery and staff safety. In particular, planning teams need to be aware of and design out the 'usual suspects', such as inadequate fire stopping, thin-wall water pipes and inaccurate drainage runs which have plagued the recent wave of public sector building development.

We are also thinking long term about the building in the following ways.

Capital versus revenue costs

In the past there has been a strong push to minimise capital costs at the expense of operating costs. Running costs dwarf the costs of capital and, in a system aiming for sustainability and taking a longer-term view, this is increasingly inappropriate and unsustainable. This means that consideration of life-cycle costs should incorporate staffing, operating and wider costs such as adaptation. At the moment, this is often conceptualised very narrowly. Facilitating the right operating model through thoughtful design can pay back many times, while cost-cutting and value engineering to reduce the costs of capital can cost more in the long term. Building services need to be planned with an element of 'loose fit' so that clinical services can adapt and grow without being constrained by services rammed tightly into corners or power provided into the building without growth tolerances.

Design should support sustainability

Buildings that people really care about get reused and modified and are looked after. Building that people hate or are indifferent to get demolished. Involving patients and frontline clinicians in sustainability planning efforts improves understanding of their experience, helps with engagement and adoption of new processes, and gives medical professionals a vested interest and ownership in sustainable actions. Creating buildings that are sustainable and that can be reused or recycled is therefore important.

Reducing the costs of modification and inevitable redesign as technology and demand changes is also important. Adaptable stand frame buildings with services, pillars and connections configured for easy change and growth both laterally and vertically will require some investment up-front but a long term and comprehensive view of life cycle costs shows this to be the most logical, sustainable and responsible approach with regard to the legacy left by the developers.

Sustainable funding and minimising new building

Targeted capital funding will be limited to buildings that have no alternative use. These are the buildings housing high-acuity activity such as the emergency department, theatres, ICU, specialist imaging and treatment (e.g. radiotherapy) and specialist beds. However, for all other elements of the campus, i.e. post-acute and rehabilitation, community diagnostics, office buildings (including the command centre), outpatients/consultation and primary care, buildings will be designed for alternative use or even be a fit-out of existing buildings. The reuse of redundant retail space can assist in regenerating the high street as well as reducing travel and building-related carbon.

Through this approach capital investment requirements will be kept to a minimum and alternative revenue funding models can be developed to lease or rent buildings. Not only does this support the overall affordability of the model, it also delivers a sustainable approach whereby significant elements of the campus have an alternative use for housing, retail or office space. This commits to keeping new or one-off building to a minimum and links the campus to wider community-led sustainability infrastructure such as energy solutions and green transport models.

Sustainable communities

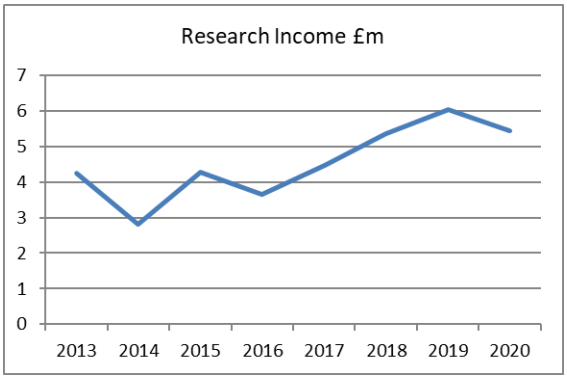
The ripple out impact on the local community helps to promote sustainability in the following ways:

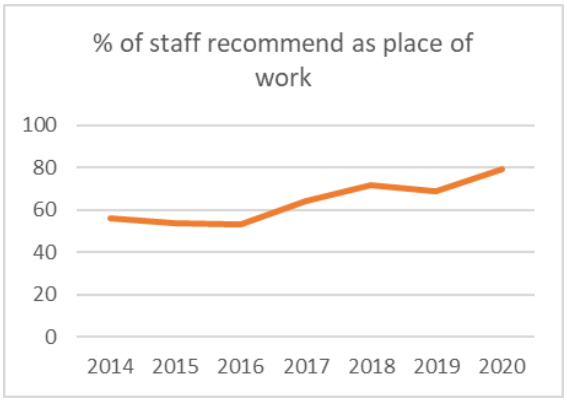
- Job creation/apprenticeships
- Permeable campus that knits into the community
- Support for local supply chain
- Stimulus to local culture-links to arts programmes, etc.

Case study

Members of the team have worked with Alder Hey Children's Hospital, which embodies many of these ideas and demonstrates their positive contribution using robust process and outcome measures. The hospital:

- allows a growth in research income
- supports innovation and education initiatives that the new hospital development has stimulated. This spans participants in the programme developing skills – for example, the head of the Kids' Design Panel at Alder Hey is now a qualified architect – through to expansion of specialist training programmes to support the new hospital model of care
- grows and cultivates safety and outcome initiatives
- has a vibrant arts and culture programmes associated with the hospital
- grows and supports the volunteer effort that supported the hospital move – Alder Hey won the Queen's Award for Voluntary Service in 2021, and has grown its base from 20 to 500
- promotes and shares the lessons learned into the wider programme.

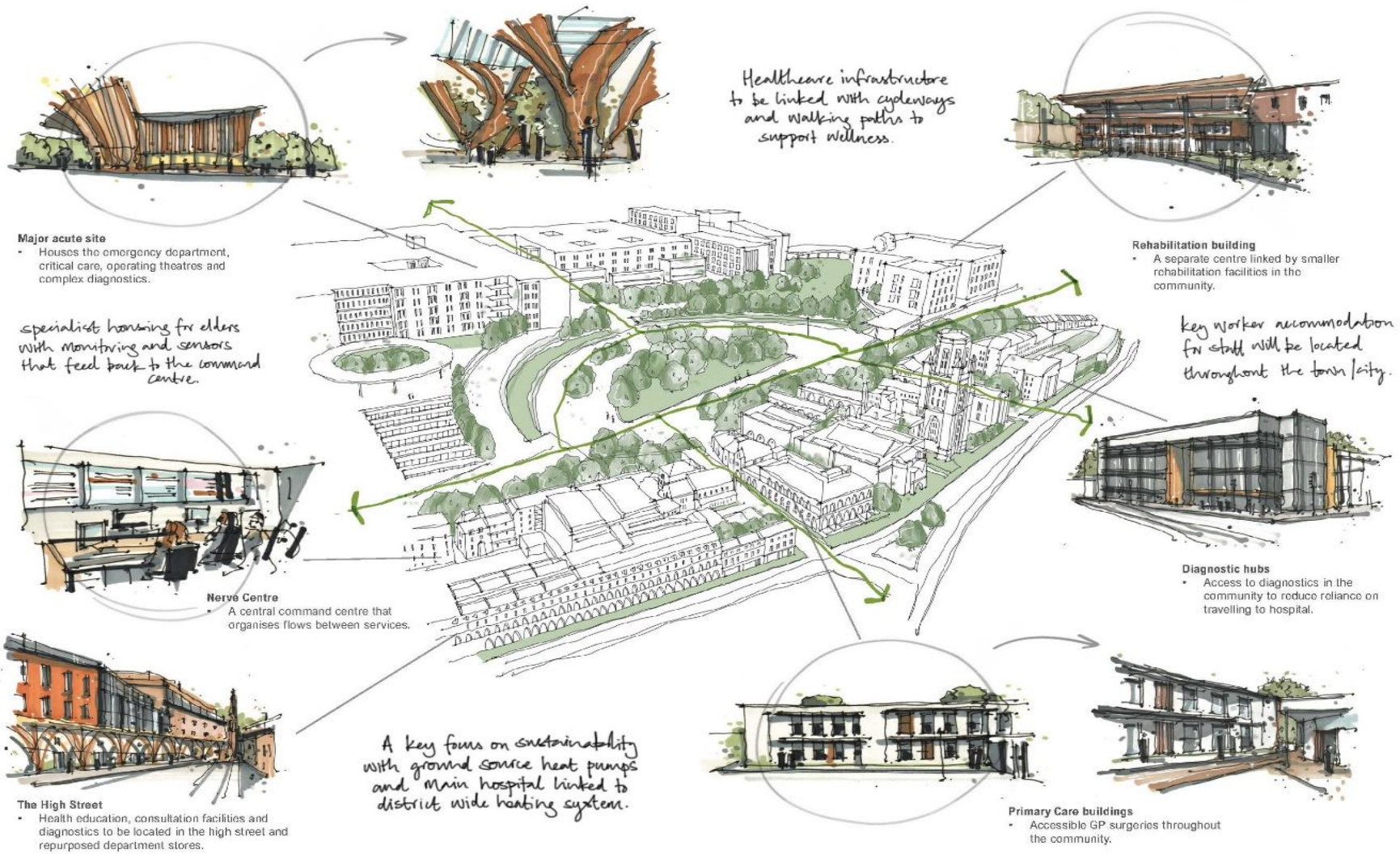




The hospital around the town

We see the hospital as one key part of a wider network that promotes good health, supports the avoidance of poor health, and manages health conditions while always being there in an emergency.

It is this thinking and the revised design principles that give rise to the concept of the 'distributed hospital campus' – an integrated network of assets, whether buildings, technology or people – that are harnessed to deliver healthcare and promote wellness. The campus is spread throughout the community. The hospital of the future is modelled on many universities that have a mix of buildings and amenities throughout their cities and towns.


Healthcare infrastructure to be linked with cycleways and walking paths to support wellness.
Major acute site
• Houses the emergency department, critical care, operating theatres and complex diagnostics.
Rehabilitation building
• A separate centre linked by smaller rehabilitation facilities in the community.
specialist housing for elders with monitoring and sensors that feed back to the command centre.
key worker accommodation for staff will be located throughout the town/city.
Nerve Centre
• A central command centre that organises flows between services.
Diagnostic hubs
• Access to diagnostics in the community to reduce reliance on travelling to hospital.
A key focus on sustainability with ground source heat pumps and main hospital linked to district wide heating system.
The High Street
• Health education, consultation facilities and diagnostics to be located in the high street and repurposed department stores.
Primary Care buildings
• Accessible GP surgeries throughout the community.

We now look at the components of this and how some of the design principles can be applied – unless indicated otherwise, the following sections show examples from projects that team members have themselves been involved in.

The hospital hub

A hospital hub is a high acuity hub for delivering general emergency care. The emergency department, ICU, theatres, complex diagnostics and specialist care are provided here. In addition to larger ICU facilities, pods of single rooms within ward accommodation will be engineered for easy conversion to additional ICU beds – including removable sanitary pods to allow for additional space. The pandemic gave further weight to the evidence that UK hospitals have too low a ratio of ICU to general beds, and this approach takes heed of this shortcoming.

The hospital hub would split out the flows of emergency, specialist and planned activity to protect capacity and allow planned care to run much more smoothly, with fewer cancellations caused by emergency pressures. Beds in the hub would be organised as 100% single rooms, which allows for increased adoption of personalised care focused around the needs of the individual. It also permits greater flexibility for easy conversion to high dependency care and improved infection prevention and control. The uneasy way that the specialisms of medicine interact with the more general needs of the patients can be addressed through increasing the availability of 'specialist generalists' in medical specialties and the use of multidisciplinary teams.

Larger hubs may be campuses themselves, with separate buildings for emergency care, planned care, inpatient mental health and specialised care (e.g. chemotherapy and radiotherapy).

The level of very highly specialised care would be dependent on the size of population served. By ensuring these hubs are part of a network of support from specialists in larger centres, telemedicine and other forms of remote support and monitoring can be provided to give expert advice and reduce the need to transfer patients.

Virtual hospital/hospital at home

Some patients do not need acute care but are still cared for in hospital because of the absence of alternative services. However, there are increasing opportunities for these patients to be cared for from their own home or using contracted beds in the care home sector. The widespread use of remote monitoring and GPS connect mobile teams that bring together both health and social care allows many people to be looked after remotely continuously and reliably.

Combined with enhanced rehabilitation, home-based palliative care and specialist nurse and allied health professional advice, there is an opportunity to provide a significant amount of hospital care at home. This may not be very much cheaper in terms of the direct costs, but patients prefer it and it will significantly reduce the space required in the acute hub. Experience in the UK and Germany during the pandemic also shows that these models have significantly reduced cross-infection.

Rehabilitation

The UK has massively underinvested in rehabilitation services. In addition to rehabilitation provided in wellness centres, in people's homes and remotely using technology, there may is scope to develop partnerships to provide institutional rehabilitation at a much lower cost than traditional hospital care. We are monitoring some developments in this area in Birmingham and are interested to see whether this could reduce the need for high-cost inpatient care and improve outcomes for patients as part of this model.

The command/ nerve centre

A disseminated hospital model with a substantial footprint across the town, close links to other providers and a large number of people receiving care in virtual wards needs a command centre. This operational hub monitors and manages capacity across the system in real time. Command centres are already proving their worth in a number of hospitals.

All the resources of the health and care system can be monitored and mobilised via the command centre using GPS, hand-held devices and tele-tracking systems in the hospital.

Merging, or working very closely with, the equivalent local government control arrangements has been found to be highly effective. This also helps with connecting to voluntary sector organisations.[2]

Wellness centres

Wellness centres are purpose-designed buildings distributed throughout a conurbation providing a range of health services focused on promoting wellness and connectedness. These services cover primary care, consultations, some diagnostics and a range of therapies focused on promoting wellness in communities surrounded by nature and healing settings. They can also be a resource for care for frail older people in the post-acute phase of their care and this focus on rehabilitation will improve outcomes and relieve pressure on the hospital hub. The opportunity to distribute these wellness centres throughout communities coupled with robust mobile health applications brings care closer to home and supports the work of primary care teams in promoting integrated and continuous care and developing a focus on the individual rather than their conditions.

Wellness on the high street

As well as purpose-designed centres, the distributed campus should include space for health and wellness services in buildings on the high street close to the focal point for business and the retail sector. Consultations and diagnostics can take place in high street spaces that are specially fitted out for the purpose – and in some cases co-located with primary care, welfare, housing and other key local authority and voluntary sector services. These amenities help to bring footfall to revitalised high streets that are as much about health, wellness and leisure pursuits as they are about retail. This presents the opportunity for health systems and local governments to accelerate the transformation of the high street and show they are investing in the health of citizens and the vitality of their towns and cities.

The end of traditional outpatients

Moving outpatient care from face-to-face interactions into digital approaches is an important step, but our change principles imply a more radical change that means the traditional outpatient model will unravel into:

[2] Picture used with permission of GE – not part of the team

- Highly specialised and multidisciplinary consultations that require physical examinations and procedures, or where communication and confidentiality issues mean that the patient needs to be present
- Phone and video consultations – sometimes connecting with more than one profession, or with carers and others who can help
- Advice and guidance from specialists on the management of patients
- Specialist/primary care case conferences and teaching sessions to deal with complex cases.

This will require investment in administrative and other support to primary care to deal with this and assumes a highly connected electronic health record system which the patient can control and contribute to.

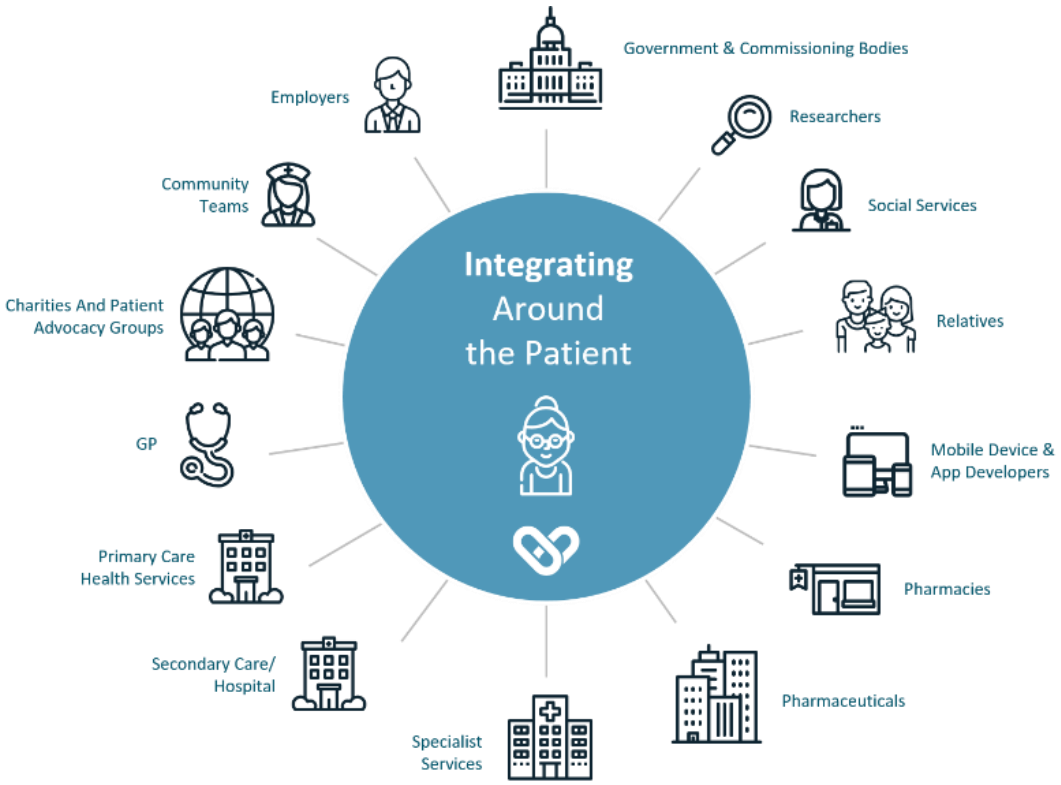
Specialists will need well-designed space to have face-to-face and virtual consultations:

'Loose fit' design and standardised rooms and suites allow for flexible use over time as technology changes.

Patient record

The electronic health and care record is the platform upon which the distributed campus model sits and provides the underpinning for many systems that allow easy data interchange, systematic care and personalisation for patients. The model relies on the safe and secure flow of data from the citizen through to the structures, organisations and workforce that provide care. This will require systems where data and information can flow freely between citizens and organisations and all suppliers will be expected to conform to this and make their APIs available. This will allow self-care, shared decision-making and support for home care ranging from routine home monitoring to virtual wards and hospital at home.

The Patients Know Best[3] system exemplifies many aspects of this kind of system and puts control in the hands of the patient – a short description can be found in Appendix 4.



Patients control their integrated record and access it anywhere in the system (and elsewhere)

The back office

The transactional elements of most back-office services such as finance, HR and administrative support will be 'digital-first'. This means that many of those involved in providing this support service can work in a range of locations, embedded with clinical colleagues, from home, or in lower-cost office space across the hospital campus. This can be multi-use, flex during the week and be co-located with community services, social care and other local government and voluntary sector services.

Health and housing

Housing will increasingly be designed with health and wellness in mind, from monitoring frail older people in specialist, ergonomically designed accommodation through to wellness centres in key-worker housing, with interconnected walking and cycling routes that take precedence over the car. All of this will support increasing dominance of 'in-home' healthcare as the predominant way in which citizens will interact with healthcare services and providers.

[3] Not part of the team but used with permission

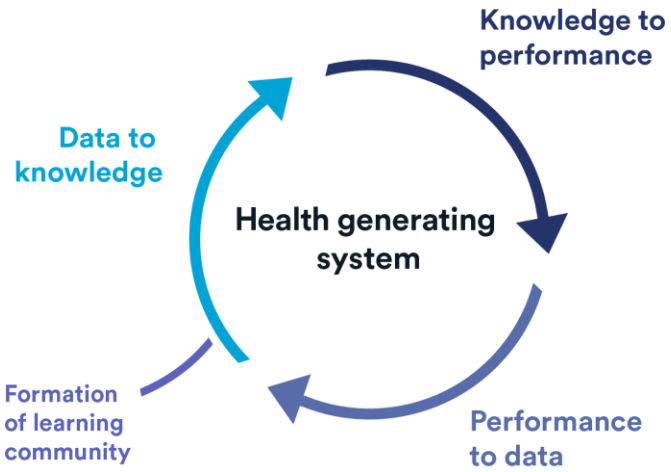
Learning, development and feeding back

One of the most significant criticisms of previous hospital building programmes is the lack of evaluation of the designs involved or the buildings they have produced.

We also know that hospital buildings are subject to a large amount of modification and change during their lifetime, sometimes even during construction.

We therefore think that the task of design does not stop when the building opens. The idea of a living building that adapts, changes and learns through a continuous process of evaluation, redesign and improvement forms an important part of our concept. The goal is to facilitate progress toward the development of a learning health system — in which science, informatics, incentives, and culture are aligned for continuous improvement and innovation, with best practices seamlessly embedded in the delivery process and new knowledge captured as an integral by-product of the delivery experience.

Using tele-tracking and other technology to monitor how people use the building and move around it, having a well-developed process for quality improvement and continuous redesign, and formally evaluating how services are developing and changing, all need to be built into the process. This should use the same approach to co-production as in the original design process and many of those who were involved at that stage so that they can continue to contribute.



Source: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5623976/

This learning needs to go beyond the individual hospital. It is astonishing that a national health system such as the NHS does not have any mechanism for systematically learning from completed hospital building schemes or creating knowledge on leading-edge practice and how to design for it. There are also lessons to be learnt from the process of design and construction that need to be shared but very often this only happens through informal mechanisms without any rigorous evaluation to accompany it. Part of the answer to the Wolfson challenge is to ensure that in all new projects:

- all hospital building schemes share ideas and learning including when design schemes under perform

- those schemes that are more advanced share learning with those that follow
- there is a strong link from research on patient and staff experience, service delivery, design and construction into projects
- there is rigorous evaluation before the building is occupied using failure mode and effects analysis methods, and once the building is occupied.

Conclusion

There is so much more to explore – for example, the detailed rethinking of areas such as the emergency department, the relationship between hospitals across the wider system or the opportunities for contribution to the local economy. This proposal only covers some of the main elements.

The Wolfson Prize question seems to us to be as much about changing services, culture, ways of thinking and other aspects of the health system as it is about buildings and the environment. We see all of these as inexorably linked. The task of the designer is to align them to create a sustainable legacy. This creates the environment where outcomes for patients, experience of staff, service to the public and contribution more widely can be more successfully delivered – and a system that can learn change and adapt to meet the next set of challenges and opportunities as they arise.

References

References redacted