

## INFRASTRUCTURE    The Wolfson Prize: designing the hospital of the future

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### ABSTRACT

#### Background

The 2021 Wolfson Economics Prize asked how new hospitals should be designed to radically improve patient experiences, clinical outcomes, staff wellbeing and integration with wider health and social care. With a major programme to rebuild and renew hospitals in England underway, the Prize offered an opportunity to understand current thinking about hospitals and their future place.

#### Methods

The 41 submissions that were identified as 'most promising' were reviewed and subjected to framework analysis. Emerging themes were identified and discussed iteratively.

#### Results

Five dominant themes were identified: a calming environment; systems of care; distribution of services; use of technology; and going green. Several tensions and trade-offs were evident across the submissions and a number of gaps were identified in the knowledge base that need to be remedied to ensure that new hospitals are safe and efficient.

#### Conclusion

The previous approach to building new hospitals, with its over-riding drive to reduce costs, has not served the UK well. New ways of thinking about hospital building and design are urgently needed, especially the funding of research and the creation of a national repository devoted to design solutions and post-build evaluations of new hospitals.

**KEYWORDS:** architecture and design, awards and prizes, hospitals, knowledge bases

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Rumours of the death of the hospital have been greatly exaggerated or at least that would appear to be one of the core conclusions from the submissions to the £250,000 2021 Wolfson Economics Prize.<sup>1</sup> The Prize is funded by the Wolfson Foundation,

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which is an independent grant-making charity aiming to improve the civic health of society through education and research. The judges were independent and drawn from a variety of backgrounds in healthcare, architecture and design, charities and business. The Prize brief asked the question 'How would you design and plan new hospitals to radically improve patient experiences, clinical outcomes, staff wellbeing, and integration with wider health and social care?'

In many ways, the Prize could not be more timely. The Conservative manifesto of 2019 included a pledge to review and renew hospital infrastructure. Although the promise to build 40 new hospitals has been questioned, around 50 hospitals are either currently planning or engaged in some kind of major building project, with more still in the planning stages.<sup>2</sup> The UK Government is also undertaking a review of the standards that underpin hospital design, as part of its Health Infrastructure Plan (HIP).<sup>3</sup>

Thus, the Prize provides an opportunity to understand how clinicians, architects, engineers, planners and designers are thinking about hospitals and their future place and the ideas that they consider important. This report first examines the main ideas in the submissions and then discusses the issues that emerge from this analysis. It then suggests areas for reflection, action and the development of future research and policy.

#### Methods

One reviewer (SD) read and analysed all the submissions that were identified as 'most promising' by Policy Exchange, the think tank that ran the competition. Submissions were summarised and interesting ideas were identified using a framework approach. Emerging themes were mapped by one researcher (SD); these were reviewed by the three other reviewers (PB, NE and LV) and then discussed iteratively, with refinement of the analysis. Discrepancies were discussed and settled by consensus.

#### Main themes

The nature of the 41 entries ranged widely. Some focused narrowly on details of internal processes and practical aspects of engineering, whereas others took a conceptual approach, attempting to reimagine the hospital and its surrounding campus and their interface with local communities. Regardless of the scope, five broad themes emerged.

#### Creating a caring and calming environment

Many of the proposals placed a strong emphasis on salutogenic design quality, natural light and a 'biophilic design' incorporating

nature, green spaces and links between the internal and external landscapes.<sup>4</sup> Art and other design elements were commonly deployed to create therapeutic and pleasant surroundings. Some stressed the importance of going beyond the visual and thinking about other senses, such as smell and hearing, with noise being a concern in many hospital environments.<sup>5</sup> The impact of design and layout in fostering a positive culture and supporting multidisciplinary working was a major theme. As part of this, most submissions that mentioned the topic appeared to assume that patients would be in single rooms, but this was not the case with the winning entry. The rationale was not only about patient privacy, but also about infection control and having adaptable space, such as to allow for age-appropriate care for children and adolescents within the same specialised unit.

### Systems and processes of care

Ensuring that designs supported more organised and systematic care processes was a theme in several submissions. This included physical arrangements to support better patient flow and attenuate risk in areas such as the accident and emergency department, and the separation of planned and emergency work.<sup>6</sup> The idea of simplification and allowing for agile adaptation was common. Thought was also given to clinical and other therapeutic adjacencies and clinical flow between different parts of the system.

### Distribution of services

The distribution of services across geographies was approached in two different ways. Some submissions pointed to the value of linking the core functions of the hospital to other related activities within a single campus. These included postdischarge convalescence, rehabilitation, residential care, a hotel for patient and relatives, biomedical small–medium enterprises (SMEs), research organisations, education and training. Providing other support services on site to reduce transport costs and create local jobs was also mentioned. The development of links to patient-centred community services and social care, the colocation of these on the hospital campus and other attempts that can dramatically transform and improve the system of care delivery and improve integration were also a common theme.

Others approached distribution in a more decentralised way. The separation of planned and unplanned work was one example of this, whereas another suggested separating ‘hot’ high technology areas from hotel, office and service functions to maximise flexibility and reduce construction costs. Others assayed more radical attempts at decentralisation, looking at the opportunity to locate services in more convenient locations, such as walk-in centres in more accessible high street locations, especially commercial space now unoccupied because of Coronavirus 2019 (COVID-19). These submissions emphasised the benefits beyond the clinical, suggesting that shifting locations would reinvigorate town centres, contributing to local economic regeneration.<sup>7</sup> This theme also stresses the importance of planning the hospital as part of the wider healthcare system and this was picked up by several submissions.

### Use of technology

Various submissions sought to better embed technological advances within the hospital. The use of digital tools for patient

tracking, wayfinding, and patient navigation and self-service were mentioned several times, as was providing more appropriate, dedicated facilities for virtual outpatient consultations.<sup>8</sup> Other submissions looked at the practicalities of substantially improving heating, ventilation and air conditioning (HVAC) and/or other infection control processes. The most eye-catching proposal was the use of drone technology to cut down on portering time.

### Going green

Many of the submissions paid attention to environmental sustainability leadership and guardianship in terms of energy and water use, transport, the eventual reuse or recycling of the building and in relation to flexibility to extend the function and lives of buildings.<sup>9</sup> These proposals were often went hand-in-hand with the desire to create more biophilic spaces, as mentioned above.

### Tensions and trade-offs

The Prize submissions revealed a lack of consensus in some thinking about the hospital of the future. Four major areas of tension were identified in the proposals.

The first of these was the tension between the desire to collocate services on single sites (campus models) and those proposals that suggested distributing services across larger geographical spaces. In some cases, the split of planned from emergency care envisaged these services being away from the main hospital site, whereas, in others, they were on the same campus. There are arguments on both sides of this choice. A related issue could be seen in suggestions for hub-and-spoke models, the distribution of services across towns and the inclusion of care in other locations, such as patients’ homes. Much of this reflects the tension between the drive for ever more specialisation and the desire to provide care closer to home for other groups of patients. The current literature supports centralisation for some complex procedures and highly specialised care, such as paediatric cardiac care, but does not provide a useful guide for more standard hospital services, such as care of older patients.<sup>10</sup> Those interested in the decentralisation of care to other locations and patients’ homes provided limited evidence about the steps needed to ensure that it would be cost effective; thus, this appears to be assumed. In addition, although many of the proposals advocating decentralised services, such as diagnostics on the high street, had much merit, there was little consideration of the downsides of multisite working for staff and other key factors important to patients, carers, and healthcare professionals, to inform the implementation of decentralisation. Although there is a trend for specialist hospitals to be located as part of more a generalist campus rather than in stand-alone hospitals (eg Papworth at Cambridge, Evelina Children’s Hospital at St Thomas’ and cancer institutes at Leeds and Liverpool), this issue was not really considered by the proposals for specialist units.

A second tension was between the core job of the hospital as the ‘repair shop’ for the injured and the unwell and the desire for hospitals to broaden their scope and focus more on health improvement and disease prevention. Unfortunately, attempts to create resources in the hospital to support this were not very convincing in terms of their scale or reach, given the size of the population they would serve. Approaches that saw the hospital working with local government and other parts of the local economy as a partner and the concept of the hospital as an ‘anchor’ institution were more interesting, but surprisingly few submissions picked up this concept.<sup>11</sup>

A third tension was evident between the rhetoric about the need for the design to be patient focused and the acknowledgement of the importance of staff welfare. Although the patient experience should not be understated, staff spend more time in buildings than patients do. Poor building design can unhelpfully increase staff movement and time spent through poorly planned departments, inconsistent room layouts and long walking distances between areas, while the COVID-19 pandemic has demonstrated the absolute necessity of providing appropriate facilities for staff.<sup>12</sup> Although many of the design features proposed would be beneficial to both staff and patients and some proposals highlighted design innovations specifically for staff, it was not always clear that the building design proposals would necessarily improve the workplace environment.

Finally, several proposals sought to 'bake in' better systems and processes of care, as well as patient flows, into the design of the building, on the grounds that these would force efficiencies into the system or deal with areas where the current designs are thought to be suboptimal. In this regard, accident and emergency departments appeared to have been seen as particularly problematic by several entrants. Many submissions included tacit assumptions about further reductions in length of stay and much more care being provided elsewhere (eg hospital at home).<sup>13</sup> Others proceeded on the grounds that the future cannot be predicted and that hospitals will need to respond to emerging changes in technology, shifting patterns of disease and the need to cope with future emergencies. Proposals along these lines included the use of modular design, the incorporation of flexible and/or redundant spaces, as well as engineering and construction approaches that allow buildings to be more easily adapted at a later date.

### Gaps in our understanding of hospital design

We identified three gaps in thinking where additional research would be valuable in the planning of better, safer and more accessible hospital services.

First, in general, the proposed deployment of digital technology was often interesting, but tended to be an extension of existing applications. Although some of the proposals would undoubtedly provide efficiencies, it was not clear how these would create real transformation or how their integration into present service lines of care would necessarily have a positive impact on the quality of patient care. A related question is whether the impact of digital was being oversold, at least in terms of its medium-term impact. Despite an abundance of research, there is not yet enough evidence of technological advances, such as AI and warning systems, to support assumptions about very major impacts on patient outcomes.<sup>14</sup>

Second, although evidence was cited to support a broad consensus about the use of natural light, connection to nature, the use of art and similar aspects of design, it is striking that some key questions, such as whether all inpatient accommodation should be single rooms, were not agreed upon or, in other cases, were not sufficiently researched.<sup>15</sup> There appears to be a similar and surprising lack of a clear view about how to provide good, ergonomically sound workspaces for clinicians who need to see patients both face-to-face and digitally and also to do office-based work.

Third, one regrettable aspect of hospital investment has been a lack of rigorous postoccupancy evaluation. Very often there has been little reflection or learning from the process of planning

and procurement, the finished building or the extent to which the investment met its original goals and allowed for flexibility and innovation. This is a lost opportunity. Submissions generally made little reference to the need to propose robust assessment evaluating the flexibility and resilience of hospital facilities or to ensure that their ideas are part of a more general learning system based on regular evaluation and continuous quality improvements in response to contemporary and future public health emergencies.<sup>16</sup>

### Conclusions: where next?

There were many good ideas, interesting concepts and beautiful and innovative designs in the submissions. There were also some inventive attempts at storytelling and one based on powerful personal experience of maternity services. However, given the licence that entrants were given to be radically innovative and imaginative, it is interesting that, in general, the basic plan of hospitals resulting from these designs would have been recognisable to Florence Nightingale.

Most submissions recognised that patients will continue to need the basics of hospital care: an appropriate clinical space (predominantly a bed) and expert care provided by a multidisciplinary team with the support of very expensive equipment. This means that there is an ineluctable logic that demands that certain functions be grouped within a single building.

It appears that, in some areas of hospital planning, the current limits of the possible have been encountered.<sup>17</sup> Hospitals tend to evolve and, thus, are only able to exploit currently available development pathway possibilities to move to different types of model. Factors such as the capability of the technology, the flexibility of the estate, skills of staff and the willingness of payers and the public to support change have a big influence on what can be realistically achieved. Radical new directions often require a range of novel elements to be in place to support the change and, without these, there is no available route to the desired endpoint, even if it can be clearly imagined. This means that it is possible to move to more adventurous models of technologically enabled home care or to move certain diagnostic functions to the high street, because these are within the reach of current practice and technology. However, we lack the supporting technological, employment and other scaffolding to enact the more futuristic changes that were suggested and there was little attempt to consider whether these were economic, practical or in fact possible.

The discussion of flexibility and the more ambitious design considerations in the submissions raise two important questions about planning and how investment appraisal decisions are made about funding new hospitals. First, planning to be flexible is very important and more effort to allow for this could yield better results in many cases compared with trying to refine forecasts in such a fast-moving and uncertain area as hospital medicine.

Second, there needs to be a move away from minimising the costs of design and construction. In many previous builds, art, biophilia, staff facilities and other innovations have been stripped out to save money. However, such design features are only a small proportion of the operating costs of the buildings. Savings made by not factoring these features, flexibility and future readiness into designs result in high costs of modification and adaptation later, as well as a price in terms of staff turnover and wellbeing. Some

submissions gave examples where higher initial costs and careful design at the start of the project can produce lower costs across the lifetime of the hospital. There are similar issues in thinking about the eventual end of the life of the building and the costs of demolition, recycling and disposal. This calls for more effective, transparent and accessible ways of considering the whole range of costs across the life cycle of a building, not simply the cheapest design and building solutions.

These submissions also highlight the limitations of thinking about hospitals as a siloed standalone facility that has a simple capital cost attached to it as a building. Instead, a hospital is only one component of a local or regional health economy, albeit an important and resource-hungry one. It either allows or constrains the whole system to become more or less productive and efficient. Alongside this is the question of the social value of the hospital and its practical and symbolic importance to local communities. Reframing the hospital in these ways allows for better considerations of what really constitutes return on investment and what might improve the quality of decision making and reduce bias toward the minimisation of capital costs.<sup>18</sup>

There is a significant risk that the mistakes of the past will happen again unless there is clearer thinking about future hospitals. The fact that many existing buildings have major structural and safety issues, are difficult to adapt, are environmentally unsound and are disliked by patients and staff alike suggests that a different approach is needed.<sup>19</sup> Solutions to this include a mandatory postbuild evaluation of each hospital, using a robust evaluation framework, as well as better funding for research around hospital design. A call through the NIHR Health and Social Services Delivery Research programme might go a substantial way to resolving some of the more pressing research questions identified. A national repository of ideas (such as many of those submitted to the Wolfson Prize), existing design solutions, evaluation methodologies and case studies would also be useful, with the Sykehusbygg 'library' and the Bouwcollege in the Netherlands providing examples of how design and planning information can be collated so that each building does not effectively 'reinvent the wheel'.<sup>20</sup> Such solutions would go a substantial way to saving money in a time of economic hardship and would provide the UK with a hospital infrastructure much more fit for the future. ■

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