

Rethinking Modern Hospital Architecture Through COVID-19

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ABSTRACT

Lately, the premier ateliers of contemporary architecture – such as Herzog de Meuron, or the Office of Metropolitan Architecture – are showing increasing interest in hospital design, once the realm of highly specialized architectural firms. This trend towards reevaluating hospital design and architecture is most opportune, as the COVID-19 pandemic urges us all to rethink the ways in which our healthcare institutions can be better designed. This commentary is a discussion on the emerging issues of contemporary hospital architecture, especially as reinforced by the pandemic. For instance, while hospital architecture today focuses on individualized care, providing each patient with hotel-like rooms, the pandemic has reminded us of the issue of capacity and inequality in these limited and costly spaces. To what extent should hospitals be centralized or decentralized? Specialized or despecialized? This commentary discusses how COVID-19 has provided insight into some of contemporary hospital architecture's greatest problems; specifically, it argues that the hospital of the future must exist on a more decentralized platform, both physically and digitally, and be more flexible in function.



KEYWORDS

Hospital, COVID-19, Architecture, Design.

1 | INTRODUCTION

In May 2021, the Venice Biennale – the world's preeminent art and architecture exhibition – premiered a short film titled "The Hospital of the Future". Created by architect Rem Koolhaas' Office of Metropolitan Architecture (OMA), the film summarized the results of OMA's team-led research on hospital architectural paradigms, inspired by their recent commission to design hospitals

in France and Qatar. (1,2) A month prior, Christine Bin-swanger, a partner at Swiss architectural firm Herzog de Meuron (HdM), gave a lecture at the Massachusetts Institute of Technology, titled "The Hospital / The Allure of Complexity" that focused on elements of creative design in hospital architecture. (3) HdM is commissioned to build the new medical center for the University of California, San Francisco, as well as other hospitals in Switzerland and Denmark. (3)

Such recent interest in hospital design by premier architectural firms is a new and interesting phenomenon. Hospital architecture was often the work of highly specialized firms, (4) such as Perkins Wills or NBBJ, but the recent interest by design-centric firms demonstrates a shift in thinking. (1) Partner at OMA, Reiner de Graaf explains (1) how their recent commissions to build hospitals despite their lack of experience signals “that hospital design needs to be rethought”. All this is in timely accordance with the SARS CoV-2 (COVID-19) pandemic, ongoing since 2019, (5), which has demonstrated the failure of healthcare facilities across the world to meet demand in times of crisis (6-9) and has inspired a need to evaluate better designs and concepts for hospital architecture.

This commentary focuses primarily on the evolution of hospital architecture in Canada and the United States. In such countries, contemporary hospital architectural paradigms are centered on individualism, decentralization, and specialization. Decentralization (10) refers to the transition from the postwar “modern” hospital – marked by its grand, “hospital-as-office-tower” (4) design – to the more “postmodern” hospital of today, which is typically more low-rise (3,4) and less clearly defined as a singular institution. In this latter typology, hospitals resemble more so hotels and shopping malls than offices, wards are replaced by individual rooms, and an emphasis is placed on incorporating as much “anti-hospital” elements in its design as possible. (4,11,12) In addition, hospitals today are smaller in scale, retaining less bed capacity than their predecessors, but nonetheless more specialized in treating specific illnesses through costly expert care. (13,14) Thus, the postwar model of the “tower hospital”, in all its conglomerate might and comprehensive capacity, is now an antiquity as hospitals become smaller in scale and dissolve in character and form. However, despite such typology shifts, the pandemic sheds light on the issue of capacity and inequality within these spaces. Throughout 2020, hospitals simply did not have enough bedspace and intensive care capacity to meet demands. (6-9) With space limited by the pandemic, certain demographics that already had disadvantaged access to

care were unable to access treatment, causing disparities most prominent in rural areas and black communities. (15-16) The hospital itself emerged as a locus of infection, avoided by many. (17) Once again, paradigms of centralization or decentralization, and specialization or despecialization, re-emerged as the defining questions for hospital architecture and its typologies.

This commentary examines how COVID-19 has challenged or reaffirmed architectural paradigms for hospital design. Specifically, it focuses on two central issues, (1) centralization, and (2) specialization. It concludes that COVID-19 has reinforced the decentralized notion of hospital design and challenged the trend towards specialization. Accordingly, the future hospital should be decentralized throughout the city, focus less on outpatient settings, and include within its design enough “flex space” to accommodate for multiple and scalable functions.

2 | CENTRALIZATION VERSUS DECENTRALIZATION

The word hospital stems from the Latin root *hospitium*, which denotes a place to entertain strangers. (2) As such, hospitals were originally small, religious facilities used to look after the poor or homeless, while most medical services were carried out for the wealthy in their homes. (2,18) Centralization of the hospital as an institution occurred only after the advent of medical technology in the 20th century, notably the X-Ray machine, which had to be housed in a singular locus and was used by rich and poor alike. (2,19) Technology thus gave birth to the centralized hospital, marked by its “tower-like” design.

Contemporary architectural paradigms focus on decentralizing the hospital once again. This decentralization occurred at all the architectural, managerial, and city-planning levels. Early on, the hospital began to integrate with shopping malls, parks, and cafes (12) so as to disguise its true character. (20) Then, it physically dispersed throughout the city, being less concentrated in one environment and smaller in capacity. The buildings became wide rather than tall, with more elements of cre-

ative exterior and interior design. (3) In fact, it seemed that the less a hospital took the characteristics of a hospital, the better.

Reasons to decentralize the hospital are many, but there are mainly the trends toward Evidence-Based Design (EBD) and neoliberalism. EBD refers to the ways in which surrounding design may improve patient conditions and outcomes. In his milestone study that gave birth to EBD, Roger Ulrich noted how recovery of patients from cholecystectomy improved when a tree was visible out the window. (21) Further developments in EBD theory (22) in the late 20th and early 21st century provided a medical basis for changing the hospital environment from an office-like form to include more windows, green space, art, lighting, (12) and as many anti-hospital elements as possible. (20) In addition to EBD, neoliberalism, a politico-economic model of the 20th century in which free, autonomous markets are fundamental, (23) also played a role; specifically as patients, too, were construed "as consumers and responsibility-citizens". (12) As patients become autonomous economic players, the hospital adopts "features of the shopping mall, the hotel and the home", (12) so as to provide as much consumer freedom to patients as possible. Today, one can easily see the ramifications of these shifts: from the Alberta Children's Hospital in Calgary – with its mango-colored walls and a mall-like atrium – to the McGill University Health Centre in Montreal, whose design is based on shopping malls, parks, and suburbs, and features within its campus a Zen Garden. (4)

At the physical, city-planning level, the popular opinion from contemporary architectural theorists is that the hospital of the future will be integrated into cities. In their most extreme form, "hospitals will be everywhere". (1) The hospital will be "the city in itself, an urban condition", as stated by Reiner de Graaf at OMA (1). Binswanger of HdM (3) also expresses similar theses guiding contemporary hospital architecture, asking: "Are hospitals cities or organs of cities? How do we deghettoize hospitals?". What was once a grand office tower is now a scattered array of boutique clinics, as the singular hospital decentralizes into smaller entities embedded throughout the city, or even, no physical form

at all.

This "hospitals will be everywhere" concept is in fact strengthened by recent advancements in digital communication, specifically in remote treatment. In telemedicine, patients no longer need to visit the doctor in person, but can easily communicate with their physicians online, antiquating the singular existence of the hospital. In McKinsey's report titled "Hospital Care in 2030", (24) there is even discussion of iPhones conducting blood tests at home, and the elimination of outpatient waiting rooms entirely. Recent advancements in telemedical technology has made possible not merely remote consultation, but remote diagnosis and post-treatment follow-ups. (25) As such, patients of the future may not often visit the hospital, but rather do so remotely or via smaller institutions across cities. (24)

COVID-19 supported the argument for decentralization through its encouragement of telemedicine. Throughout the pandemic, patients who otherwise could not access the hospital resorted to receiving consultation online. In the United States, telemedicine is already a market worth \$250 billion, (26) with more than 50% of American healthcare consumers registered in 2020. (27) Though most were forced into using telemedicine during COVID, an Accenture survey (28) found that 60% of respondents wanted to keep using telemedicine even after the pandemic. People generally found treatment at home more comforting than treatment at the hospital, (28) which corroborates the results of a study in pediatric emergencies which found that telemedicine was more beneficial for patient recovery. (29) Moreover, this trend was not unique to the United States; even in Bangladesh, where the issue of medical deserts and rural medicine is most pressing, telecare was a promising platform to combat COVID-19 and enjoyed by many. (27) It is important to note here that this commentary focuses primarily on urban environments, thus overlooking the important issue of rural medicine and medical deserts, (30,31) which architecture must also address. But in any case, COVID-19 promoted telemedicine as a potential paradigm for the hospital of the future in its completely decentralized state.

The recent pandemic also heightened public worry

about consolidated hospital structures and their potentials for mass hospital-acquired infection. COVID-19 engendered a fear of centralized spaces, like hospitals, at which people congregate and infection occurs. Richterman et al. noted (17) how “early case series in China estimated that 44% of 179 severe acute respiratory syndrome [Covid-19] infections were hospital acquired”, proving the public health threat of the centralized hospital during a pandemic. This threat then translated into a public fear of the hospital, avoided even by people who were critically ill and required treatment. (32) Healthcare workers themselves were also fearful of the environment. (33) Ultimately, the centralized hospital has been labelled a threat, garnering support for the decentralized form of the hospital. Perhaps the most effective way to minimize hospital-acquired infection is to not have a physical hospital at all. Decentralizing the hospital seems to provide a solution even for the problem of inequality during COVID-19. Black and indigenous communities, in particular, have suffered disproportionate impact from COVID-19, especially due to their lack of access to medical services in “trauma deserts”. (15,16) Indeed, in the United States, “Black and Hispanic individuals faced the greatest exposure to overburdened ICUs” as one federal research found. (34) To decentralize the hospital, either through telemedicine or physically throughout the city, would potentially be a democratizing force for healthcare and help to alleviate this inequality. Of course, the problem of disparity is not as simple as proximity to medical services, but rather includes a myriad of public policy quandaries. Architecture must work with public policy and city planning to create solutions for health inequality as reinforced by the design of healthcare institutions.

Architecture must reflect this growing trend towards remote medicine and decentralized hospital spaces by scaling back spaces for outpatient care. As centralized hospitals themselves become a threat, being spaces of infection and undemocratic access, telemedicine seems to be a promising alternative. Thus, the hospital as a space for outpatient consultation is now exchanged with digital platforms. Architects must claim the hospital as a space of inpatient care and necessary high demand

functions (i.e. critical care, operations and procedures, and emergency responses), whilst minimizing spaces for routine outpatient visits. The hospital will be less so a place to consult, but a place to operate; as the McKinsey report explains, (24) the picture of the outpatient sector with chairs and waiting lists is outdated. In essence, COVID-19 has provided more momentum to the effort of hospital decentralization, and one can expect to see this trend translated architecturally.

3 | SPECIALIZATION VERSUS DE-SPECIALIZATION

Another trend in hospital architecture is that instead of general hospitals, highly specialized “clinics” have become mainstream. (13) This trend is expected: As the decentralized postmodern hospital grows smaller and wards are individualized, the focus for hospital strategy moves from comprehensive capacity to expertise care for a few patients with specific conditions. Indeed, the portfolios of the aforementioned architectural firms list mostly small clinics with a boutique-design for specific conditions; such as REHAB Basel, a specialized neurorehabilitation center by HdM, with only 100 beds. (3)

The factors facilitating this trend are mainly changing patient expectations and economic advantage. As explained in a report by McKinsey titled “The Hospital is Dead, Long Live the Hospital”, (14) patients today “have higher expectations than before” as therapy for major illnesses becomes more targeted and personalized. “High-quality care requires concentration into specialised, high-volume centers of excellence”, (14) however such expertise is not possible in a general hospital’s economy of scale. (13) Foreshadowed by the effect of neoliberalism in healthcare as explained earlier, (12) there also exists the profit motive: specialty hospitals – especially in the cardiac, orthopedic, and surgical fields – draw in more financially wealthy and profitable patients, while fueling competition and threatening the survival of safety-net general hospitals. (35,36)

The case for specialized hospitals, however, was not supported by the pandemic; if anything, the importance

of the general hospital was reinforced. The pandemic reminded us of the limited function and capacity of specialty hospitals: they are unable to adapt to crisis situations and are an unaffordable model of care in contrast to the safety-net model of general hospitals. (356,36) In terms of capacity, today's specialized hospitals such as REHAB Basel maintain a minimum capacity usually of around a hundred, which pales in comparison to the general hospitals of the late 20th century (19) whose bed counts reached the scale of thousands. The problem is that specialty hospitals simply do not offer enough capacity and flexibility in function during crisis situations like COVID, during which lack of bedspace is a significant problem. (6-9) Of course, the problem was also a lack of medical personnel (7), in addition to bedspace, and such issues must also be addressed through proper policy.

Responses to COVID-19 also demonstrated that spaces of healthcare need not be permanent, but can be flexible in function, be built and unbuilt. Throughout the pandemic, temporary architecture developed all throughout hospitals and cities, including temporary testing centers, reception centers, vaccination centers, and such. Places conventionally far removed from healthcare – from hotels to parking lots – imaginatively repurposed themselves as “surge hospitals” throughout the world. (37) Perhaps most famously, China built and unbuilt a 1000-bed hospital in Wuhan. (38) This trend is incredibly promising to architects, who are quick to articulate the most pressing issue of hospital design: (10) With rapidly evolving technologies, hospitals face an “ever quicker expiry date of the typology”. (2) The lifespan of hospitals is shrinking dramatically, and in its most extreme form, hospitals are obsolete as soon as they are complete. The main challenge for hospitals, therefore, is adaptation and flexibility, (10) and to see such flexible spaces – built and unbuilt according to contemporary demand – may be an encouraging solution.

However, as much as COVID-19 may have discredited the model, specialized hospitals are still an important adaptation mechanism to our changing patient demographic. In tandem with the paradigm of flexible spaces as demonstrated by COVID, the solution from an

architectural standpoint is to create in hospitals enough “flex-space” – spaces that, in exceptional times, can be rescaled and maneuvered from its original purpose to another. With such spaces, hospitals can actively reconfigure to meet certain needs, whether it be enlarging bed capacity or building vaccination centers. Indeed, the acknowledgement of hospital spaces as flexible is not a new phenomenon, but a paradigm shift already underway. The McMaster Health Sciences Center in Ontario is one project noted for flexibility in design; revolutionary for his time, the architect “Zeidler created an infinitely flexible space, deliberately designed never to be finished”, including within its design a potential to expand horizontally and vertically. (10) Recently, another major hospital development in Paris by the renowned architect Renzo Piano has attracted jury members for “the capacity for scalability”, which has allowed for “the addition of hospitalization units and the capacity for resilience to exceptional health situations.” (40) Such flexibility in healthcare spaces is promising as we still grapple with COVID-19, and architects must keep this flexibility into consideration to design hospitals that are scalable for both exceptional and non-exceptional times moving forward.

4 | CONCLUSION

The built environment is a function of its time. For contemporary hospital architecture, this function has meant two specific changes in typology: (1) decentralizing the postwar hospital – dissolving the once castle-like hospital into multiple, small hospitals throughout the city, and promoting the “anti-hospital” in hospital design – and (2) specializing the general hospital – replacing the hospital with the specialty clinic, which has lower capacity but a greater focus on expertise. However, the universal experience of COVID-19 has changed the ways in which we consider spaces of healthcare. Specifically, it has supported the notion of decentralized healthcare by encouraging telemedicine and labelling the consolidated hospital as a place of risk. On the other hand, it has challenged the notion of specialty hospitals by emphasizing the im-

portance of hospital capacities. Architecture needs to allow such lessons learned to be incorporated into future design.

The hospital of the future will no longer need large outpatient spaces, as many proceedings can now occur digitally. It will be highly integrated into cities, and consequently less congested as patients visit such places less frequently. It will likely remain specialized but will include within its design enough “flex space” that can be maneuvered to allow flexibility as needed. Of course, limitations exist in such policy recommendations: there are opportunity costs involved with allocating space, capital, and money for flexible functions in hospitals and with purposefully moving more outpatient services online. Despite the costs, such changes would allow better preparation for exceptional times such as COVID-19, however ephemeral they may be. Therefore, as emphasized throughout the essay, architects must work with public policy and city planning sectors to accommodate for both exceptional and non-exceptional times. Only then will the hospital of the future be a readied institution, a truly postmodern place and space, suited for its time and time thereafter.

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