McKinsey & Company

Healthcare Practice

Virtual hospitals could offer respite to overwhelmed health systems

A shift to more-accessible, cost-effective virtual-care models could mitigate increases in healthcare service demand, expenditures, and patient dissatisfaction.

by Oscar Boldt-Christmas, Rebecca Kannourakis, Madeline Maud, and Drew Ungerman

May 2023

Healthcare systems around the world are under pressure. It's no secret that the combination of aging populations, increased burden of disease, and staffing shortages has left substantial unmet needs when it comes to acute hospital care. Resource constraints are also affecting wait times in many government-run health systems; in Australia and the United Kingdom, for example, it is commonplace for ambulances transporting patients to "ramp" at hospital entrances because bedspace is at capacity.

COVID-19 has compounded these challenges and, in many cases, further overwhelmed the capacity of hospitals and intensive care units worldwide.[1] These pressures have left healthcare staff overworked and exhausted. According to a 2022 McKinsey survey, between 20 and 38 percent of nurse respondents in Australia, France, Japan, Singapore, the United Kingdom, and the United States indicated they were likely to leave their current role in direct patient care within a year.[2]

These pressures are driving administrators to shift toward more accessible, cost-effective models of care. A 2021 report from the US Department of Health and Human Services found a 63-fold increase in the use of "telehealth" services, which helped maintain access to care during the pandemic.[3] Although the use of telehealth has declined since the peak of the COVID-19 pandemic, it remains more popular than it was prior to the pandemic.[4]

Moreover, as payers, providers, and patients look to more sustainable, patient-centric, safe, and accessible models, a range of virtual-care options have gained increased recognition as viable alternatives to inpatient hospital care. For example, in the United States, 186 hospitals used Acute Hospital Care at Home—a federal program that allows Medicare-certified hospitals to treat patients with inpatient-level care at home—in the program's first year.[5] The need for new models of virtual care is apparent globally. In Australia, the South Australian Child and Adolescent Virtual Urgent Care service saw more than 2,000 patients in its first few months of operation, and almost 90 percent of those patients avoided a visit to the emergency department.[6] Australia's Royal Prince Alfred Virtual Hospital supported consultations with more than 13,000 patients between February and July 2021. Patients surveyed consistently reported high levels of satisfaction: a positive experience (86 percent), confidence knowing they are monitored virtually (89 percent), and easy-to-use technology (90 percent).[7]

Although the use of telehealth has declined since the peak of the COVID-19 pandemic, it remains more popular than it was prior to the pandemic.

[1] Élie Azoulay et al., "COVID-19: A heavy toll on health-care workers," *Lancet Respiratory Medicine*, March 2021, Volume 9, Number 3.
[2] Gretchen Berlin, Connor Essick, Meredith Lapointe, and Faith Lyons, "Around the world, nurses say meaningful work keeps them going," McKinsey, May 12, 2022.
[3] In this article, we define telehealth as "video or phone consultations between patients and their care providers." Telehealth is part of the realm of virtual health and can be part of both chronic- and acute-care solutions; see "New HHS study shows 63-fold increase in Medicare telehealth utilization during the pandemic," Centers for Medicare & Medicaid Services, December 3, 2021.
[4] Oleg Bestsennyy, Greg Gilbert, Alex Harris, and Jennifer Rost, "Telehealth: A quarter-trillion-dollar post-COVID-19 reality?," McKinsey, July 9, 2021.
[5] Danielle Adams et al., "Acute Hospital Care at Home: The CMS waiver experience," *NEJM Catalyst*, December 7, 2021.
[6] "SA's virtual paediatric emergency department is a winner!," Women's and Children's Health Network, February 10, 2022.
[7] "Royal Prince Alfred Hospital (RPA) introduces new 'Virtual' Hospital," Australian Council on Healthcare Standards, accessed March 2, 2023.

In contrast to the use of telehealth in outpatient settings that do not require physical examination, some of these "virtual hospitals" provide an enhanced, digitally enabled at-home alternative to emergency or inpatient acute care. Delivering hospital-grade care to a substantial cohort of high-acuity patients in their homes could unlock hospital beds and improve the patient experience and equitable access to care.[8] Our analysis of the Australian public-hospital system, a possible bellwether for other advanced systems, found that an estimated 11 percent of inpatient hospital admissions could be done virtually.[9]

To illustrate that potential, this article examines the benefits of virtual-hospital care, based on a case study of a successful Australian virtual-hospital service, including expanded care capacity, lower costs, and higher patient satisfaction than traditional counterparts. We also track a typical patient journey in a virtual-hospital system—highlighting the advantages of virtual care—and conclude by explaining how providers can begin to consider setting up a virtual hospital by engaging in a four-step process of examining their operations.

Three advantages of virtual hospitals

Brick-and-mortar hospitals have long been the gold standard of healthcare, given their onsite proximity to medical specialists, surgical services, emergency care, and 24/7 telemetry. But patient capacity pressures, growing costs, and increasingly dissatisfied patients are prompting health systems to examine more accessible, cost-effective models of care. Well-established, in-home nursing services address part of the need, but they don't usually provide acute care. By comparison, virtual hospitals provide comprehensive and enhanced digitally enabled care—including remote patient monitoring and integrated data analytics—that support remote ward rounds by doctors and in-person nursing visits. This, in turn, could improve patient experience and sustainability of care delivery.

By shifting acute care to the home, virtual hospitals could deliver three key benefits over traditional brick-and-mortar models of care: expanded bed capacity, improved patient satisfaction and outcomes, and cost savings. Many patients also prefer to receive care at home, rather than in a hospital bed.

Expanded bed capacity available through virtual care

By reducing the need for inpatient hospital services, virtual hospitals could flexibly and rapidly scale bed capacity, helping hospitals meet fluctuating healthcare demands. For example, the UK-government-run National Health Service (NHS) recently committed to increasing virtual ward capacity by 40 to 50 virtual beds per 100,000 people by December 2023,[10] which could allow more than 17 percent of total admissions to be treated in virtual hospitals. The time and cost to set up a virtual hospital are also substantially lower than that required to build new hospital infrastructure.

[8] Fadesola Adetosoye, Danielle Hinton, Gayatri Shenai, and Ethan Thayumanavan, "Virtual health for all: Closing the digital divide to expand access," McKinsey, March 16, 2023; Jack Eastburn, Alex Harris, Neeraja Nagarajan, and Jennifer Rost, "Is virtual care delivering on its promise of improving access?," McKinsey, January 9, 2023.

[9] Based on analysis that considered the incidence of diagnosis-related groups (DRGs) across Australian public hospitals and the ability to treat each DRG at home with virtual-hospital care. Virtualizability assessments were based on a clinically backed model validated through about 1,000 US-based physicians and tested with Australian physicians. It was assumed that not all patients were eligible for virtual hospital, as virtualizability in practice depends on individual patient encounters.

[10] "Enablers for success: Virtual wards including hospital at home," NHS, April 25, 2022.

In Australia, in state-run hospital systems, where performance targets are not always met, our analysis found that an estimated 11 percent of inpatient hospital admissions could be virtualized through a general acute-care-delivery model.[11] We found that if a single virtual-hospital service provider within a major Australian city directed care toward high-volume diagnosis-related groups (DRGs),[12] it could treat 9,500 patients virtually instead of in brick-and-mortar settings each year. This would unlock 130 beds in traditional hospitals, freeing 47,500 bed days per year for state public hospitals (Exhibit 1).[13]

Greater patient satisfaction and outcomes

Despite the medical prowess of traditional hospitals, many patients, particularly those suffering from chronic disease and comorbidities, would rather receive care at home. The US annual Consumer Assessment of Healthcare Provider and Systems (CAHPS) survey, which measures patient perceptions of healthcare plans and the quality of care they receive, has noted a recent period of stagnation in patient satisfaction followed by a decrease in satisfaction during the pandemic.[14]

Patients are also concerned about hospital-acquired infections. According to the US Centers for Disease Control and Prevention, hospital-acquired infections from Staphylococcus aureus, commonly known as "golden staph," have increased since the pandemic began.[15] In response to these and other concerns, patients and providers are looking to virtual and home-based care alternatives as a way of improving patient experience and satisfaction.

Exhibit 1

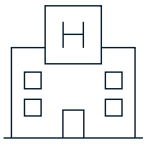
Virtual acute care could unlock bed capacity and reduce the need to build new hospitals.

9,500[1]

Treating 9,500 patients virtually instead of in brick-and-mortar settings each year could save approximately 47,500 bed days[2]

130 beds[2]

Saving 47,500 bed days is equal to unlocking brick-and-mortar ward capacity of 130 beds



~AU $90 million[3]

Unlocking brick-and-mortar ward capacity reduces the need for infrastructure expenditure to build new hospitals, which is equivalent to ~AU $90 million

[1]Virtual-hospital aspiration set by South Australia correlating to 4.7% of overnight acute admissions in public hospitals.
[2]Assuming average length of stay is 5 days, the average for an Australian state.
[3]Weighted average for overhead costs across all diagnosis-related groups in Australian public hospitals is AU $1,913 per day; cost avoidance is quantified as the minimum operational costs to keep a hospital ward open, proxied by overhead.
Source: "National Hospital Cost Data Collection (NHCDC) public hospitals report—round 23 (financial year 2018–19)," Independent Health and Aged Care Pricing Authority, February 16, 2021

McKinsey & Company

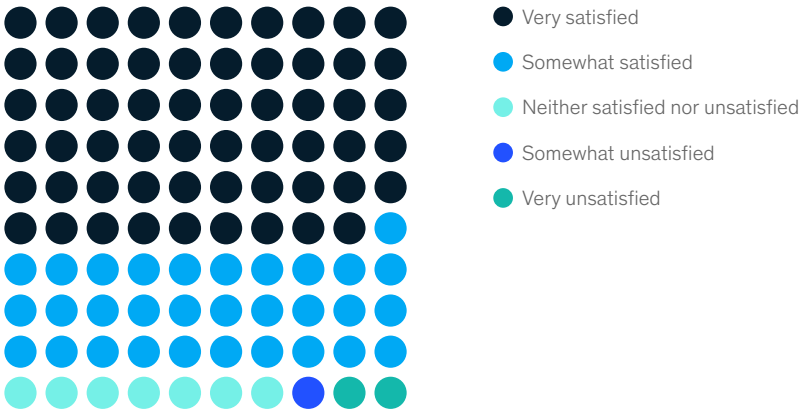
[11] "National Hospital Cost Data Collection (NHCDC) public hospitals report—round 23 (financial year 2018–19)," Independent Health and Aged Care Pricing Authority, February 16, 2021; based on public Australian national separations from the top 200 diagnosis-related groups (DRGs); DRGs with an average length of stay of less than 1.2 days are considered nonvirtualizable.
[12] DRGs classify patients based on their diagnoses to provide a clinically meaningful way to relate or group the number and type of patients treated as well as the resources required in treatment.
[13] Assuming average length of stay is five days, the average for an Australian state; "National Hospital Cost Data Collection (NHCDC) public hospitals report—round 23 (financial year 2018–19)," February 16, 2021.
[14] CAHPS Health Plan Survey Database, Agency for Healthcare Research and Quality, accessed March 3, 2023.
[15] Chris Dall, "Healthcare-associated infections rose in 2020, CDC says," Center for Infectious Disease Research & Policy, September 2, 2021.

Nearly 80 percent of surveyed Australian consumers have either heard of or used virtual care, and 90 percent of those who have used it report being "somewhat" or "very" satisfied (Exhibit 2). Among the most substantial benefits cited were convenience (72 percent), avoidance of in-person care settings (57 percent), and flexibility (50 percent), highlighting a continued preference for care settings that are easily accessible and do not involve the inconvenience of visiting or staying in the hospital.[16]

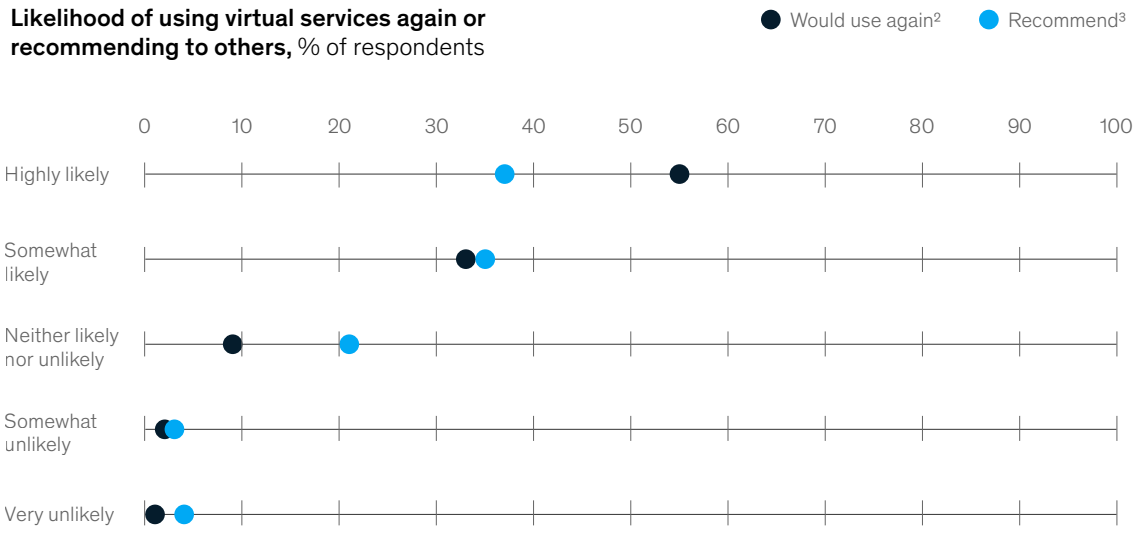
Exhibit 2

Most patients are satisfied with virtual-care services and would use them again or recommend them to others.

Level of satisfaction with virtual-care services,[1] % of respondents



Likelihood of using virtual services again or recommending to others, % of respondents



[1]Question: How satisfied were you with the virtual-care service you received?
[2]Question: Would you use virtual-care services again?
[3]Question: Would you recommend virtual-care services to others?
Source: McKinsey 2022 Australia Consumer Digital Care Survey, n = 503

McKinsey & Company

[16] McKinsey 2022 Australia Consumer Digital Care Survey, n = 503.

Patient preference for virtual care is driving increased openness among physicians to digital alternatives to in-person care. More than 95 percent of surveyed Australian physicians who have used digital offerings are "very or somewhat satisfied" with providing digital care. Three-quarters of physicians said patient preference for digital alternatives was a key incentive to continue providing care in this new way.[17]

Beyond convenience and flexibility, an emerging literature base supports the case that virtual and at-home care can be safe and effective. We identified reduced readmission rates, greater improvements in quality-adjusted life years (QALYs), and lower rates of hospital-related complications as reported benefits of acute virtual and at-home care in crucial high-volume indications, such as pulmonary disease and heart failure.[18] The use of virtual emergency services has also reduced the need for ambulance calls and hospital visits. For example, an in-home COVID-19 care program in London redirected 125 patients to their homes, and patients stayed in the program for an average of seven days, saving 875 hospital occupied-bed days. This is equivalent to unlocking capacity of a 28-bed hospital ward for 31 days for every 125 patients needing treatment.[19]

Lower costs for providers and patients

The high cost of healthcare has long been a major concern for providers and patients. In nearly every OECD country, prepandemic forecasts predicted health spending would outpace GDP growth by the early 2030s.[20] However, virtual hospitals deliver direct cost savings and cost avoidance savings. Independent of the reduction in hospital capacity demand, virtual-hospital-unit costs (costs per episode of care) are approximately AU $1,000 lower than comparable inpatient unit costs, primarily due to reductions in medical and other clinical labor costs. This is because virtual hospitals have the advantage of being able to scale up clinician-to-patient ratios (Exhibit 3).[21]

Patient preference for virtual care is driving increased openness among physicians to digital alternatives to in-person care.

[17] McKinsey 2022 Australia Physician Digital Care Survey, n = 517.

[18] Marc A. Silver and Konstantinos V. Voudris, "Home hospitalization for acute decompensated heart failure: Opportunities and strategies for improved health outcomes," *Healthcare (Basel),* March 2018, Volume 6, Number 2; Karen Brewin et al., "Early supported discharge/hospital at home for acute exacerbation of chronic obstructive pulmonary disease: A review and meta-analysis," *COPD: Journal of Chronic Obstructive Pulmonary Disease*, 2016, Volume 13; Kathleen L. Bagot et al., "Cost-effectiveness of the Victorian Stroke Telemedicine program," *Australian Health Review*, 2022, Volume 46, Number 3; Sarah Klein, "'Hospital at Home' programs improve outcomes, lower costs but face resistance from providers and payers," Commonwealth Fund, accessed March 2, 2023.

[19] "Victorian Virtual Emergency Department," *On the Record*, Australian Nursing & Midwifery Foundation, May 4, 2022; Paul McEnhill et al., "Hospital at Home: Another piece of the armoury against COVID-19," *Future Healthcare Journal*, March 2022, Volume 9, Number 1.

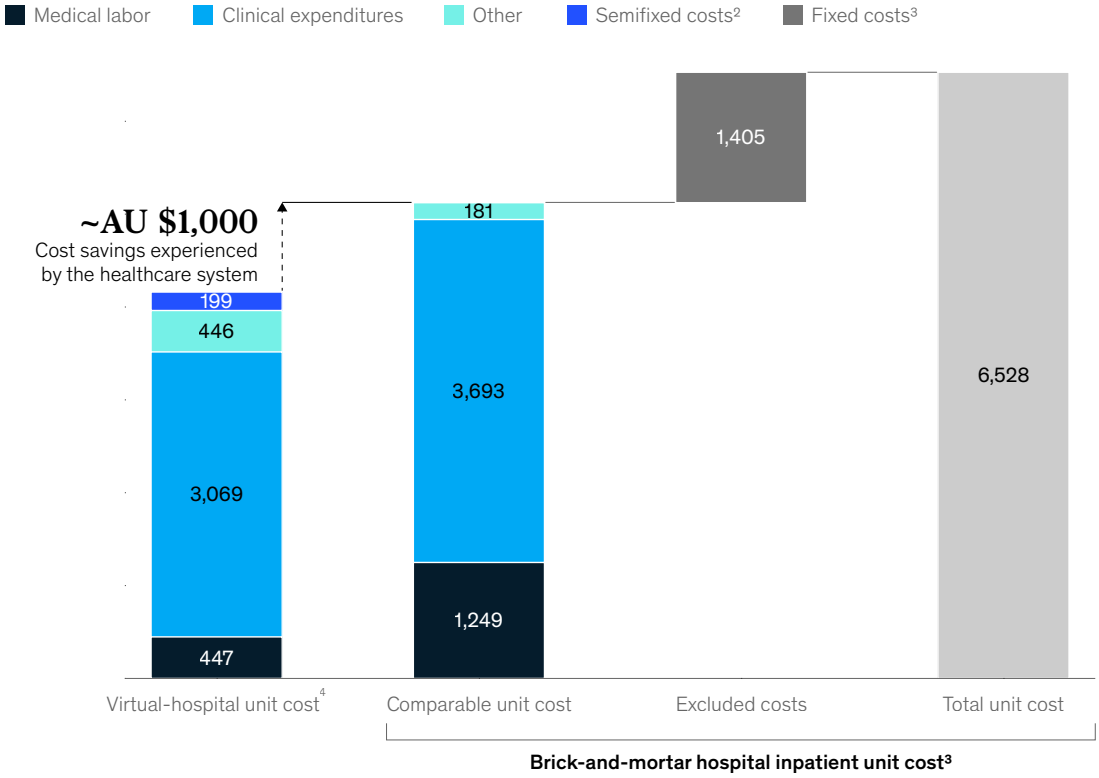
[20] "Health spending set to outpace GDP growth to 2030," OECD, July 11, 2019.

[21] Average costs are based on a provider's predicted costs to deliver virtual hospital acute care for 28 high-volume DRGs in Australia. Average public-hospital overhead for these 28 DRGs is approximately AU $2,000 per episode; see "National Hospital Cost Data Collection (NHCDC) public hospitals report—round 24 (financial year 2019–20)," Independent Health and Aged Care Pricing Authority, March 11, 2021; McKinsey analysis of virtual-hospital provider pricing.

Exhibit 3

Cost savings could be realized per episode of care because ward rounds by virtual-hospital staff are the most cost-effective.

Unit savings directly realized by delivery of the virtual-hospital service compared with brick-and-mortar hospital inpatient costs,[1] AU $



[1]A unit is an episode of care, assuming the referral pathway is diversion from the hospital so that entire episode of care is virtual.
[2]Virtual hospital 24/7 command center personnel and technological solution. Estimated unit cost is based on the predicted volume of patients served by an Australian virtual hospital (~AU $199 per episode of care).
[3]Hospital overhead (ie, cost representative of minimum operating expenditure costs for the ward). On average in Australian public hospitals, overhead represents 27% of total unit costs.
[4]Average costs are based on a provider's predicted costs to deliver virtual-hospital acute care for 28 high-volume diagnosis-related groups in Australia (converted to United States dollars, assuming average 2022 exchange rate).
Source: "National Hospital Cost Data Collection (NHCDC) public hospitals report—round 24 (financial year 2019-20)," Independent Health and Aged Care Pricing Authority, March 11, 2021; McKinsey analysis of virtual-hospital provider pricing

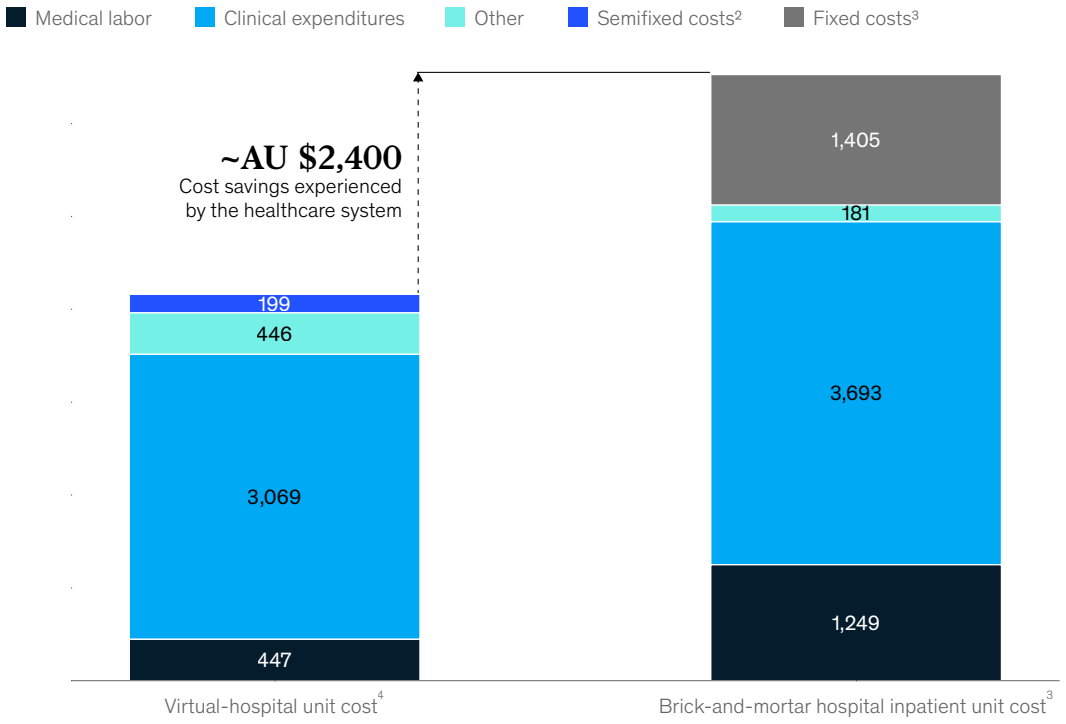
McKinsey & Company

Where care can be virtually scaled up to a level required to reduce the need to add new hospital beds, additional fixed-cost savings could deliver an average unit cost reduction of approximately AU $2,400 (Exhibit 4). In our analysis of an Australian state model—in which 9,500 patients could be diverted from traditional hospitals to virtual settings—we calculated annual cost avoidance savings of approximately AU $90 million resulting from reductions in expenditure on new hospital wards.[22]

Exhibit 4

If delivery of virtual-hospital service reduces the need to build new physical hospital beds, there are additional cost avoidance savings.

Unit savings directly realized by delivery of the virtual-hospital service compared with brick-and-mortar hospital inpatient costs,[1] AU $



[1]A unit is an episode of care, assuming the referral pathway is diversion from the hospital so that entire episode of care is virtual.
[2]Virtual hospital 24/7 command center personnel and technological solution. Estimated unit cost is based on the predicted volume of patients served by an Australian virtual hospital (~AU $199 per episode of care).
[3]Hospital overhead (ie, cost representative of minimum operating expenditure costs for the ward). On average, overhead represents 27% of total unit costs in Australian public hospitals.
[4]Average costs are based on a provider's predicted costs to deliver virtual-hospital acute care for 28 high-volume diagnosis-related groups in Australia (converted to US dollars, assuming average 2022 exchange rate).
Source: "National Hospital Cost Data Collection (NHCDC) public hospitals report—round 24 (financial year 2019–20)," Independent Health and Aged Care Pricing Authority, March 11, 2021; McKinsey analysis of virtual-hospital provider pricing

McKinsey & Company

[22] Weighted average for overhead costs across all DRGs in Australian public hospitals is AU $1,913 per day.

A typical patient journey in a virtual hospital

Virtualizing hospitals requires providers to rethink how care is administered but could provide equivalent or better care outcomes as in-patient care. Consider the five-day journey of an 85-year-old female with minor-complexity cellulitis who requires support with her activities of daily living (ADLs).

Day one. The patient goes to a general practitioner (GP) for an inflamed leg and mobility issues. The GP refers the patient to higher-acuity care and uploads clinical information and images of her leg to an electronic health record (EHR). A case coordinator receives the referral and screens the information for high-risk indicators.

The patient is deemed eligible for virtual-hospital care and is admitted, remaining at home. The admitting physician in the virtual command center develops an initial assessment and treatment plan. The patient is assessed as medium clinical severity, and the treatment plan includes intravenous antibiotics, daily blood draws, wound swabs, and imaging. The virtual case coordinator completes admission from the virtual command center; this includes recording relevant patient medical history, confirming at-home support, and arranging relevant allied health and nursing staff, equipment, and medication.

An initial in-person nursing visit is completed within eight hours of admission given the assessed clinical severity. At this visit, digital devices, including remote monitoring and a tablet for communications, are set up in the home. Additional equipment such as mobility aids, intravenous access, and infusion pumps are set up as required. Clinical care begins with vital-sign checks, cellulitis border marking, initial bloodwork, wound swabs, and intravenous antibiotic administration, with notes uploaded to the EHR in real time.

At the first visit, nurses also provide education about treatment and remote monitoring. The patient and next of kin are instructed how to operate equipment and provided with an overview of the treatment plan. Next, nurses or paramedics can request a lower-limb ultrasound while pathology is processed with an internal or external provider.[23] A daily physiotherapy or occupational therapy plan is developed for ADL support and mobility assistance.

Days two, three, and four. Doctors review the case every day during virtual ward rounds, and nursing staff provide in-person care up to twice per day to administer antibiotics intravenously and draw blood. On-call virtual nursing is provided as required to assist, for example, with troubleshooting problems with lines or other equipment or devices. Physiotherapy and occupational therapy, ultrasounds, and wound swabs are also provided.

Day five. The patient has recovered and is ready to be discharged. Postdischarge service information is provided to the patient and next of kin, including oral antibiotics, a follow-up plan, monitoring, and contact information in case of complications.

A discharge plan is sent to a primary-care provider who takes over the case and continues providing care as needed. Postadmission data is recorded and aggregated for analysis. Mobility aids, infusion pumps, and in-home technology are removed, cleaned, and prepared for future use. The patient is discharged from the virtual hospital, staying in her home for the full duration of her stay.

[23] Erik J. Blutinger, "How paramedics can reduce emergency department visits," *Philadelphia Inquirer*, July 11, 2022.

A four-step process for considering a virtual hospital

Providers contemplating the kind of care described above can begin to consider setting up a virtual hospital by engaging in a four-step diagnostic process that examines their operations.

Step one: Explore the feasibility and attractiveness of establishing a virtual hospital. This involves assessing options within acute care, determining the theoretical number of patients, and selecting an "aspirational archetype" service (see sidebar, "Five natural-care archetypes in the virtual-care landscape"). In this step, potential patient cohorts can be defined by prioritized DRGs. The characteristics of the proposed geography, including the existing virtual and at-home care landscape, patient and physician experience, and funding environment will influence the feasibility of a virtual hospital.

Step two: Define how to measure success. This entails considering issues such as adoption, patient experience and outcomes, financial impact, ease of execution, escalation rates, workforce experience, operations, and equity of access. In this way, providers could reimagine core patient journeys and establish success metrics and targets in line with their stated objectives for virtual hospitals.

Step three: Assess readiness to begin implementation. Providers could perform maturity assessments to define their current situations and determine key milestones required to launch or reach a desired steady state. For example, providers should establish interoperability among virtual-hospital operational-data systems, EHRs, and remote patient monitoring. Other aspects to consider include governance systems, clinical pathways, provider partnerships, and logistics.

Step four: Plan to increase efforts. Providers could aim to develop a plan to scale their services to maximize long-term financial and nonfinancial benefits and assess change-management risks. As providers roll out their services, they should

Five natural-care archetypes in the virtual-care landscape

Organizations exploring virtual hospitals could consider the levels of acuity they would treat. These levels could include emergency care for inpatients with ongoing requirements. They could also treat otherwise-well patients with specific specialty indications, patients with multiple comorbidities, patients with complex infections, and so on.

Triage and emergency management. Patients with lower-acuity illness and minimal in-person care requirements could be diverted to efficient, accessible, and integrated community diagnostics and virtual short-term care services. Common indications might include minor trauma, asthma exacerbation, nausea, and vomiting.

Inpatient step-down service. Inpatients with ongoing care requirements could be stepped down to home-based care with ongoing virtual oversight from inpatient physicians. Examples include postsurgical or postintervention patients, post-traumatic infection, and wound management.

Narrow specialty-care service. Uncomplicated, otherwise-well patients with specialty indications could be managed at higher volume and lower cost through efficient, hybrid (both virtual and in-person) home-care pathways. Common indications might include COVID-19 or other respiratory infections, oncological exacerbations, and cardiovascular conditions.

General acute-care delivery. Patients with multiple comorbidities and allied health requirements could avoid or shorten protracted inpatient admissions through comprehensive, at-home general medical and allied healthcare. Common indications might include complex infections such as septic arthritis, pneumonia, exacerbations of chronic conditions, and complex activities of daily living and social needs.

Comprehensive acute-care system. Single virtual-hospital services coordinate comprehensive care delivery, technology, and infrastructure through in-house and partnered services, typically across emergency, acute, and post-acute care. This can include all indications across archetypes.

consider relevant DRG cohorts as well as the regions they want to cover. The presence of other virtual-care services and the maturity of existing clinical-data systems might also influence a provider's decision to serve particular regions.

Moving from treating acute-care patients in hospitals to treating them virtually is a major shift. And despite some indications that physicians and patients are ready to further embrace virtual care, the deeply entrenched belief that sick people belong in a brick-and-mortar hospital will be challenging to overcome. Yet the case for virtual hospitals is too strong to ignore. The prospect of lower costs, better patient outcomes, and respite for overwhelmed health systems will become more appealing as pressures continue to build.

Oscar Boldt-Christmas is a senior partner in McKinsey's Gothenburg office, **Rebecca Kannourakis** is an associate partner in the Melbourne office, **Madeline Maud** is an associate partner in the Brisbane office, and **Drew Ungerman** is a senior partner in the Dallas office.

The authors wish to thank Liz Bennett, Jennifer Fowkes, Florence Ho, Ashley James, Eric Liu, and Josh Talbot for their contributions to this article.