

White Paper

Hospital Capacity Management: Making Best Use of Available Resources

Using effective capacity management to thrive in a time of resource scarcity

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Introduction

The pandemic in many ways showcased the extraordinary capabilities, commitment, and responsiveness of healthcare systems and healthcare workers, but it also mercilessly exposed the underlying vulnerabilities that had been building up for years.

Hospitals and hospital workers were at the forefront of the battle and are now facing the long-term fallout of treatment backlogs, exacerbated staff shortages, and tight budgets due to lost revenue and increased costs.

The wider perspective is challenging as well. Underlying long-term trends of demographic change and more advanced, but also more expensive, therapies test the affordability of healthcare systems, and the post-pandemic fallout along with a global economic downturn mean governments will have little spare cash for healthcare budget increases.

For hospitals, this means they not only have to maintain high standards of care, they also have to compete as employers and provide a good patient experience all with the current level of resources. To prevail, hospitals will have to become considerably more efficient in the way they operate. Effective capacity management is one of the key components that hospitals will need in their toolkit to achieve peak resource efficiency and thrive in this harsh environment.



Health systems under stress

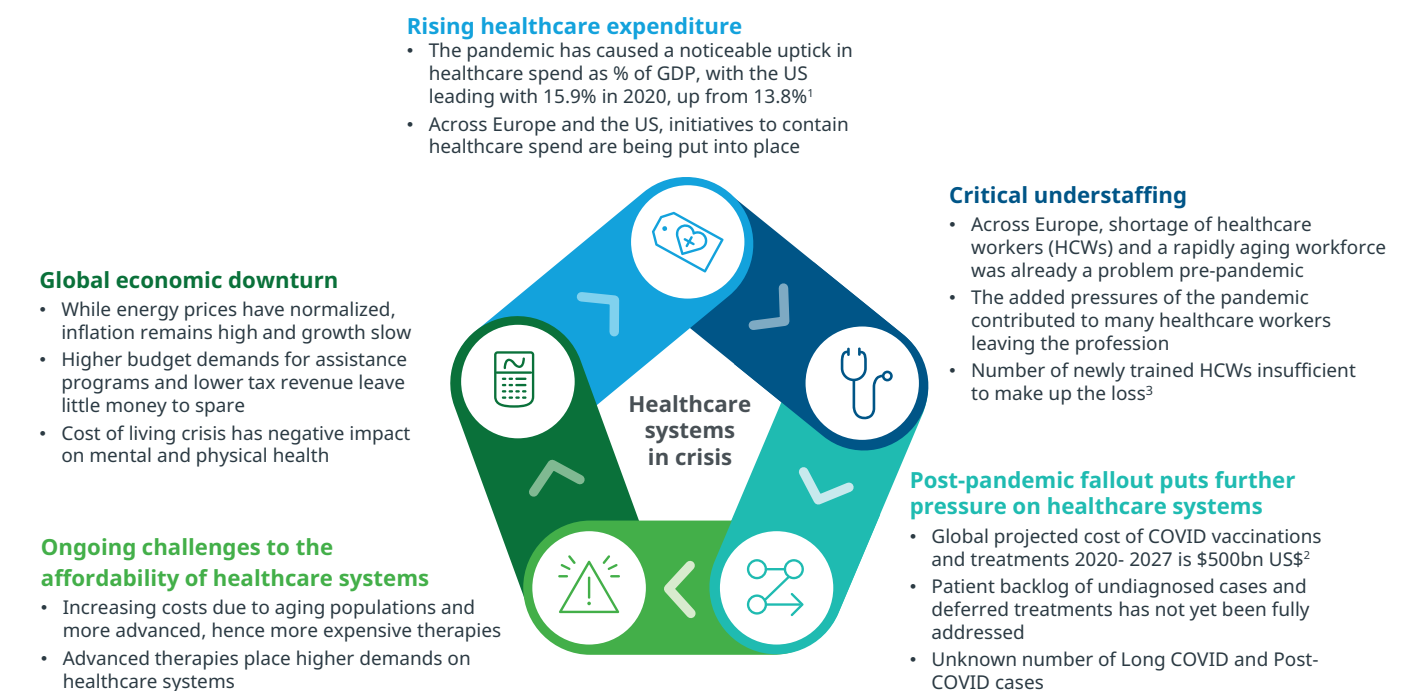
Health systems globally are under severe stress resulting from the global economic crisis, understaffing, post-pandemic fallout, and budget constraints.

Although the global economic outlook has improved with energy and food prices dropping from 2022 highs, economic recovery remains fragile with significant downside risks.

Governments will have to contend with higher costs driven by inflation as well as reduced growth prospects affecting tax revenue while having to provide support for those most affected by the downturn, leaving little money to spare for increased healthcare budgets.

These developments take place against a background of ongoing issues driven by demographic change and medical advances which challenge the overall affordability of healthcare systems.

Figure 1: Healthcare systems under stress



Source: ¹Our World in Data; ²IQVIA Institute Report “Global Use of Medicines 2023” ³WHO “Health and care workforce in Europe: time to act”

Post-pandemic fallout

The pandemic has caused a noticeable uptick in government healthcare spend as percentage of GDP, with the US leading with 15.9% in 2020, up from 13.8%. For Germany, the figures are 11% in 2021 and 9.8% in 2019, for the UK 9.9% and 7.8%.²

The post-pandemic fallout puts further pressure on healthcare systems. The global projected cost of COVID vaccinations and treatments until 2026 is 251bn US\$, with cost for medicines 133bn US\$ higher than the pre-pandemic estimate.³ Developing treatments for COVID and Long COVID can be expected to divert resources away from other areas of unmet need. There is also the backlog of undiagnosed

cases as well as deferred treatments and surgeries still to be fully addressed. Due to the delays caused by the pandemic, patients present at more advanced stages of diseases, with worse treatment outlooks and potentially higher cost.

For many hospitals, the pandemic has caused severe budget deficits. Deferred and cancelled routine treatments such as elective surgeries caused revenue shortfalls while the measures taken to avoid the spread of COVID-19 among patients and staff, as well the often long drawn-out and care-intensive treatment of COVID-19 patients, placed not only additional stress on healthcare workers but also generated considerable cost.

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Healthcare workers are an increasingly scarce resource

Healthcare systems were already reporting staffing shortages before the pandemic, but this has been exacerbated by the pandemic which took a massive toll on healthcare workers, with high physical and mental pressure sometimes resulting in workers leaving the sector and also, tragically, high death rates.

The wellbeing of those healthcare workers who stayed in the profession has also suffered, with many struggling with burnout, psychological and physical manifestations of stress and overwork, reduced motivation, and other issues. Hospital staff will also be affected by the wider disengagement of healthcare providers observed in primary research surveys. Among the prime stressors reported by a majority of Healthcare Professionals (HCPs) are the workforce shortage, the increased workload resulting from the post-pandemic patient backlogs, and the lack of work-life-balance. Worryingly, HCPs report that this has had a negative impact on their ability to care for their patients.⁴

According to the WHO, not only have many healthcare workers left the sector, many more are considering leaving which will increase the pressure on those who remain. At the same time, newly trained healthcare workers are entering the sectors in insufficient numbers to make up for those leaving or retiring.⁵

National statistics support this picture.

In September 2022, the NHS in England reported 133,446 vacancies representing a 9.7% vacancy rate against 103,800 vacancies representing 7.9% the previous year.⁶ At the same time, the number of people on waiting lists for hospital treatments has been increasing since 2012, with a sharp upturn during the pandemic, and has now reached 7.2 million in January 2023. Similarly, the number of people waiting longer than four hours in hospital A&E and over 62 days for starting cancer treatment (measured from urgent GP referral) have reached record highs.

At the same time, although NHS vacancy rates have increased, so have staff numbers, with 24% more hospital staff since 2010 and with an increase of 37% for doctors and 16% for nurses.⁷

The situation in Germany is similar: most hospitals struggle with staff shortages and high staff turnover as well as a high level of sick leave. According to the German Hospital Institute (DKI, Deutsches Krankenhausinstitut), in 2022, there were 20,600 vacancies for nursing staff on general care wards, a vacancy rate of 8%, and 9,500 vacancies on intensive care wards, a 14% vacancy rate. Both figures had increased compared to 2021 when vacancy rates were 6% and 12% respectively.⁸ But in Germany, too, hospital staff numbers have increased while the numbers of hospitals and hospital beds have

shrunk, increasing the staff-to-patient ratios. Since 2010, overall hospital staff numbers have increased by 22%, doctors by 37% and nursing staff by 22%. Meanwhile, the number of hospital beds has dropped by 4%, from 502,749 to 483,606.⁹

These statistics suggest that it is not just staffing levels which are the problem but also internal inefficiencies, high administrative load, lack of an integrated IT infrastructure and other factors which lead to overworked staff, long wait lists, and insufficient care levels for patients. Resolving these inefficiencies must be a high priority for hospital management everywhere, especially given the WHO's prediction on the future numbers of available healthcare workers.

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Effective capacity management as a route to better resource utilization

Not surprisingly, capacity planning is a major activity for hospitals but also one which for many organizations presents a significant challenge due to the multiple variables involved. It has moved far beyond mere nurse-to-patient ratios and patient classification systems which were found to be insufficient predictors of demand; instead, multiple indicators at patient and ward level are required to adequately forecast workload and staffing requirements.¹⁰ In addition, adequacy of staffing levels is perceived differently by the various stakeholders within the hospital organization — nurses will have a different perspective based on their day-to-day work experience from schedulers or nursing management. In order to ensure a satisfactory definition and implementation of adequate staffing, these divergent perspectives must be taken into account. Finally, a prerequisite for effective capacity management is a solution that encompasses the entire organization since it is often the transitions between different organizational units that create delays in the patient flow and therefore unforeseen peaks in demand — for instance, if a patient's discharge is delayed, that bed is not available and incoming patients can't be admitted as planned. Similarly, if planning for diagnostic procedures is not aligned with treatment schedules, patients' stays are unnecessarily extended, and bottlenecks occur.

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Managing variability

Why variability matters

Capacity and quality management are intricately linked to variability. In fact, managing variability and patient flow are key not only for quality and safety of care, but also for a good patient experience as well as a satisfactory work environment, and, last but not least, efficient resource use.

While in an ideal world, hospitals would be able to staff for peak demand, this is not feasible financially, nor are there sufficient numbers of healthcare workers available. At the same time, demand troughs mean resources are underutilized. So, while hospitals tend to staff to meet average demand, reducing variability is crucial to minimize the stress and loss of quality of care that comes with excessive demand peaks while not letting valuable resources go idle.

In addition to improving patient outcomes and the work environment for hospital staff, the capacity gains realized through lower variability also benefit hospital budgets since patient stays are shorter and more patients can be treated with the same resources, resulting in increased revenue and lower costs per patient.

Managing variability is not just a question of staffing levels but of matching demand for the various resources available; in addition to medical and non-medical staff, these include surgery theatres, diagnostic capabilities, patient beds, etc. Accurate capacity forecasting is the key to the effective planning and scheduling of these resources which in turn minimizes variability.

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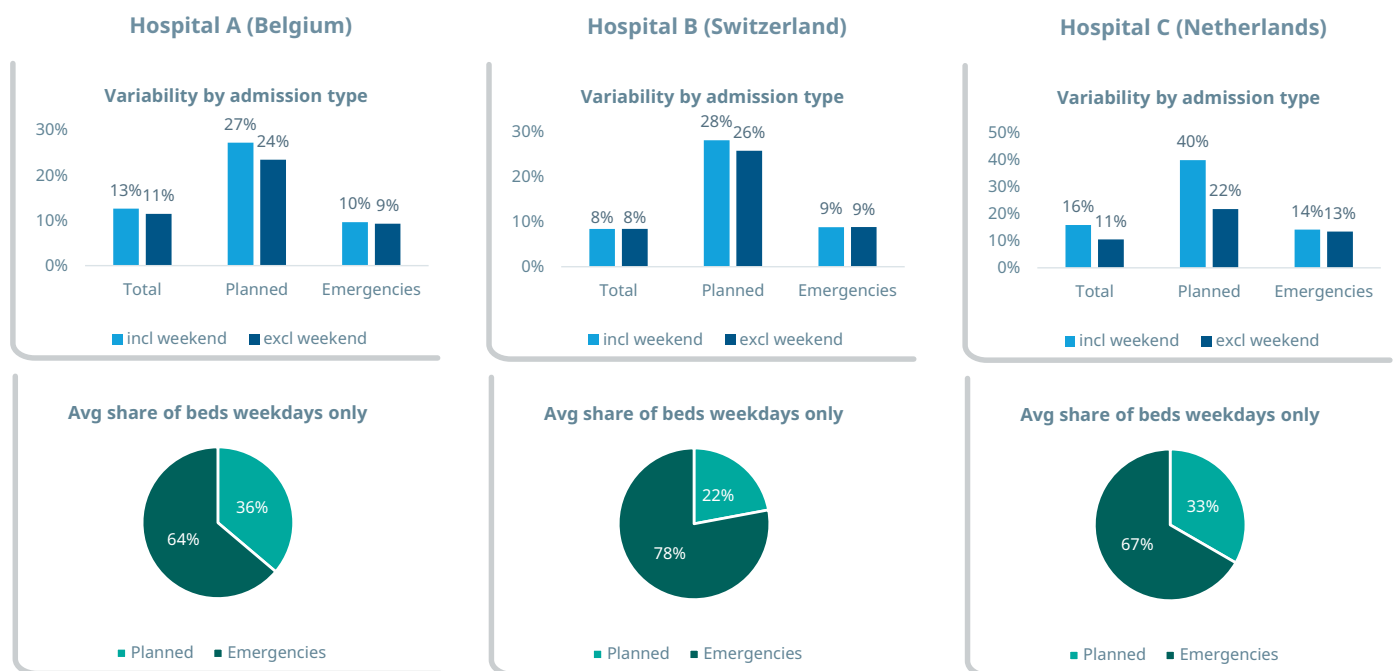
Drivers of variability

Closely linked to the problem of variability management is the issue of patient flow, since inadequately managed patient flows are a major factor in variability and uneven resource utilization. In fact, inefficient capacity coordination and inefficient patient transfer processes are among the leading causes of delays in moving patients through the hospital efficiently. Underlying causes are not only staffing issues, but also inadequate planning as well as insufficiently defined process routines, lacking IT functions and alignment between diagnostic and imaging facilities and treatment teams. Process and planning improvements are therefore key to increased hospital productivity. The first step to realizing these improvements is pinpointing variability and capacity misalignment.

An IQVIA analysis of selected wards at several major hospitals in Belgium, Switzerland, and the Netherlands investigated variability by admission type (emergency vs planned) and weekdays vs weekends and found that variability at hospital level can range from under 10% to as high as 40%. At ward level, however, the variability is considerably higher.

The analysis at ward level in a number of different nursing units including surgery, orthopedic surgery, internal medicine, cardiology, and pediatrics found that there is a considerable range of variability not only between nursing units but also within units depending on days of the week and planned admissions versus emergency admissions. At the high end, variability for planned admissions is 48% during weekdays and on the same ward 79% if weekends are included. The lowest variability is 29% for planned admissions during weekdays and 31% if weekends are included.

Figure 2: Variability is driven by weekday planned admissions



By far the largest drivers of variability are planned admissions. Improvements to the patient flow for planned procedures are therefore a good starting point for quick capacity gains. For most nursing units, emergency admissions variability is lower than that for planned admissions, sometimes considerably lower. Where emergency admissions variability is high, the number of beds occupied by emergency admissions is very low both in absolute terms and as a proportion of total beds. Overall, variability is higher on weekends both for planned and emergency admissions.

If variability is to be addressed, starting with the variability in bed occupancy caused by weekday planned admissions is an approach that will therefore yield the biggest capacity gains.

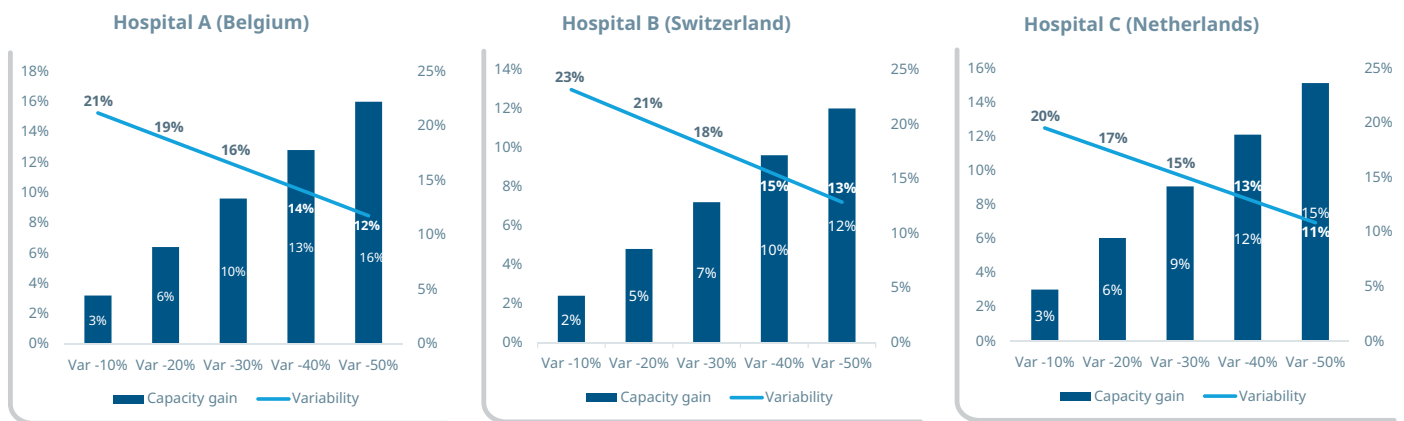
For the hospitals analyzed, weekday variability for planned admissions was between 16% and 26% although on individual wards, variability can be considerably higher. Reducing variability by 30% to 40% to around 15% would result in capacity gains of between 7% and 14%, equivalent to freeing up three to 13¹ beds.

However, even a more moderate 20% reduction in variability would free up between two and nine beds per site, a capacity increase of five to seven %.

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¹ This relatively large range is due to the fact that the sites vary considerably in number of beds included in the original analyses.

Figure 3: Potential capacity gains through reduced variability

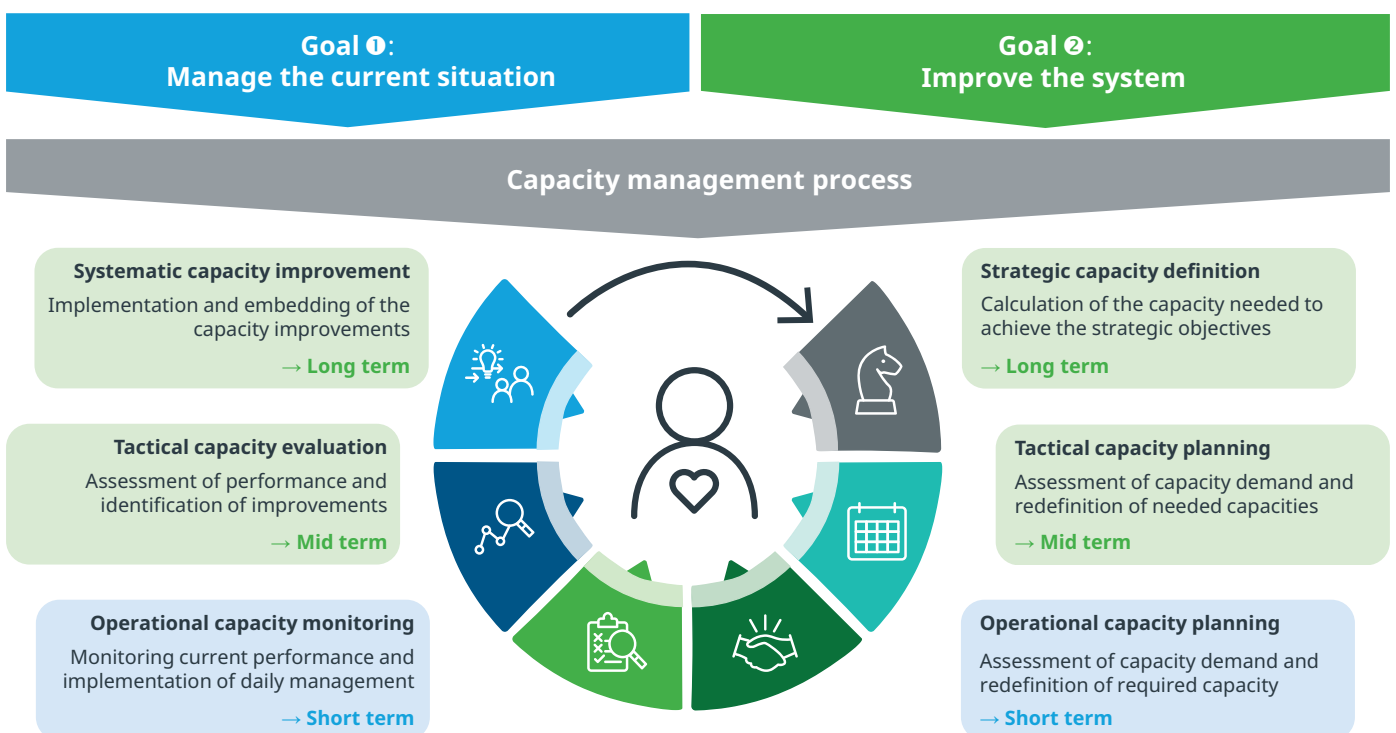


IQVIA Health Flow as a fully integrated capacity management solution

The objectives for effective capacity management are twofold: the more immediate aim is to understand, manage, and plan the short-term capacity utilization which entails keeping a multitude of moving parts

in balance. The second objective is to forecast future demand and optimize capacity utilization by analyzing the sources of variability, optimizing processes and routines, and simulating possible demand scenarios. Both objectives must be addressed for the entire hospital organizations, in a setting where hospitals cooperate to manage patient load, since bottlenecks are frequently found between different organizational units rather than within an individual unit.

Figure 4: A capacity management solution must enable operational, tactical, and strategic planning



A solution such as IQVIA Health Flow is set up to do just that.

- It provides a real-time view of ongoing capacity utilization as well as detailed capacity planning tools for short-term demand based on real-time data combined with forecast data
- IQVIA Health Flow simulates capacity needs for the coming months. A Digital Twin of the hospital based on historical data coupled with additional information provided by the user enables scenario planning without affecting the hospital's live environment
- The real-time view combined with the capacity simulation enables the user to anticipate potentially critical situations and take corrective actions before they occur
- The solution includes dashboards tailored to specific user roles within the hospital organization to enable employees to view the data and respond based on their specific roles and needs — a head nurse will need different insight from an admissions manager or a capacity planner and this is reflected by the customizable views provided
- The Digital Twin also provides insights for tactical and strategic planning and process improvements

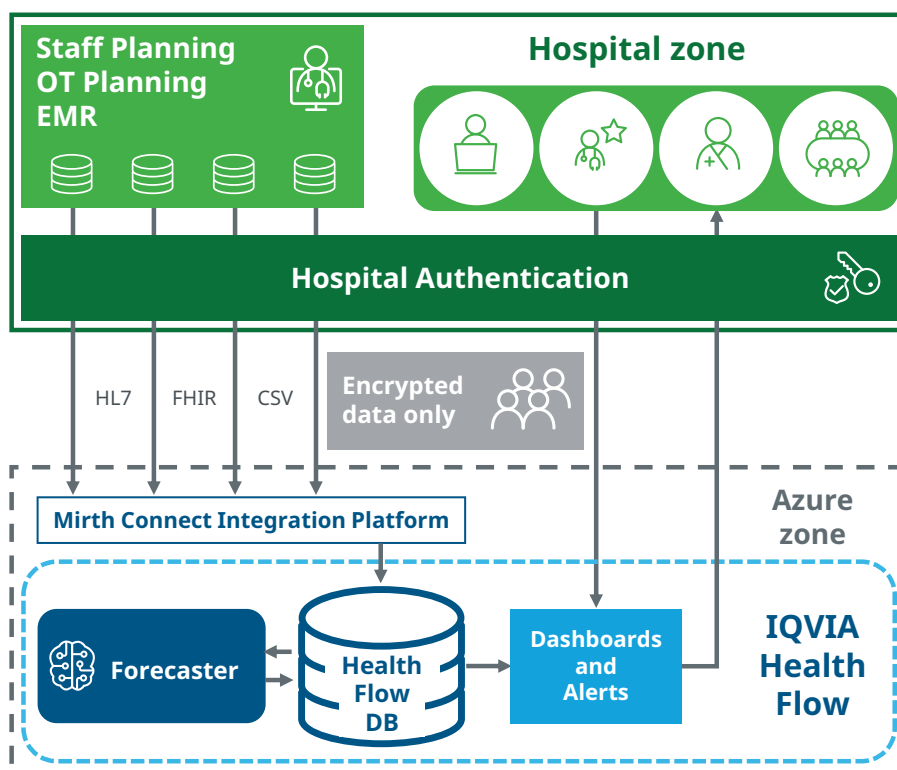
to remove roadblocks to a smooth patient flow. It enables the long- and mid-term capacity simulation for different scenarios, e.g., planning for an additional operating theatre, scenario planning for seasonal infectious disease waves etc.

- IQVIA Health Flow is fully customizable. Implementation involves detailed analysis of the hospitals' specific needs in close consultation with the hospital organization

Even though a capacity management system brings clear benefits, hospital managers are understandably reluctant to allow major disruption to their existing IT systems to adopt them. A system that is minimally disruptive, both at initial installation and in subsequent scale-up is therefore critical.

Because IQVIA Health Flow is set up as SAAS, it is easily scalable and places very limited demands on the hospital IT infrastructure while being easily accessible from anywhere with an internet connection. Requirements for data from the hospital system to enable real-time monitoring as well as forecasting are deliberately kept to a minimum to satisfy data privacy concerns and data is cleaned and encrypted before being fed into the IQVIA Health Flow system.

Figure 5: Health Flow schematic



KEY BENEFITS

IQVIA Health Flow combines operational, tactical, and strategic planning in one tool which can be scaled and customized to suit the needs of different types and sizes of organizations, from small local hospitals to healthcare systems encompassing multiple providers.

It generates visibility at a very granular level, down to individual beds, and enables staff at all levels to take appropriate and timely actions. It uses data-driven insights to align resources, processes, and planning across the hospital organization, minimize variability, and optimize resource utilization.

Health Flow also enables not just forward planning based on key indicators, performance goals, and anticipated future events, it also allows for scenario planning and systemic evaluation and improvement based on historic data.

For hospitals, this spells reduced financial stress since the immediate capacity gains through better alignment

and planning result in shorter patient stays and higher numbers of treated cases with the same level of resources. Improved capacity planning also leads to a less stressful working environment for staff by levelling out the demand peaks and helps hospitals position themselves as attractive employers in an increasingly competitive market. In addition, reduced demand peaks and less harried staff mean better quality care and an improved patient experience, giving hospitals a competitive edge in a healthcare system that increasingly places patients' needs at the center.

Beyond the short-term benefits, effective capacity planning is a key pillar in hospitals' toolkits to master the ongoing and future challenges of the changing healthcare environment. Hospitals face a future of tighter budgets, stronger competition for fewer healthcare workers, and increasing demand due to an aging population and medical advances, on top of the pandemic legacy.

The upshot of this is that hospitals will have to get better at managing capacity since "doing more with less" will be the maxim for the foreseeable future.



Conclusion

Healthcare systems find themselves at a point where demand growth exceeds funding growth in an environment that has already been characterized for some time by budgetary pressures and increasingly scarce human resources. This situation cannot be expected to get better anytime soon – the post-pandemic pressures coupled with an economic downturn exacerbate already existing pressures on healthcare systems and threaten their long-term financial stability.

For hospitals, this means they cannot go on operating as they have in the past if they want to survive in this setting. They will have to learn to meet rising demands without a concomitant increase in resources

and will have to contend with higher expectations not only of the quality of treatment and care, but also increasingly of the quality of the patient experience and workplace environment.

Excellent capacity management is an essential part of the operational and strategic toolkit for individual hospitals of all sizes and networks of multiple providers alike. It is key to achieving optimum resource utilization through aligning resources, processes, and planning across individual providers and networks and is a fundamental component in any strategy to future-proof hospitals in a world of scarcer resources and higher demands.

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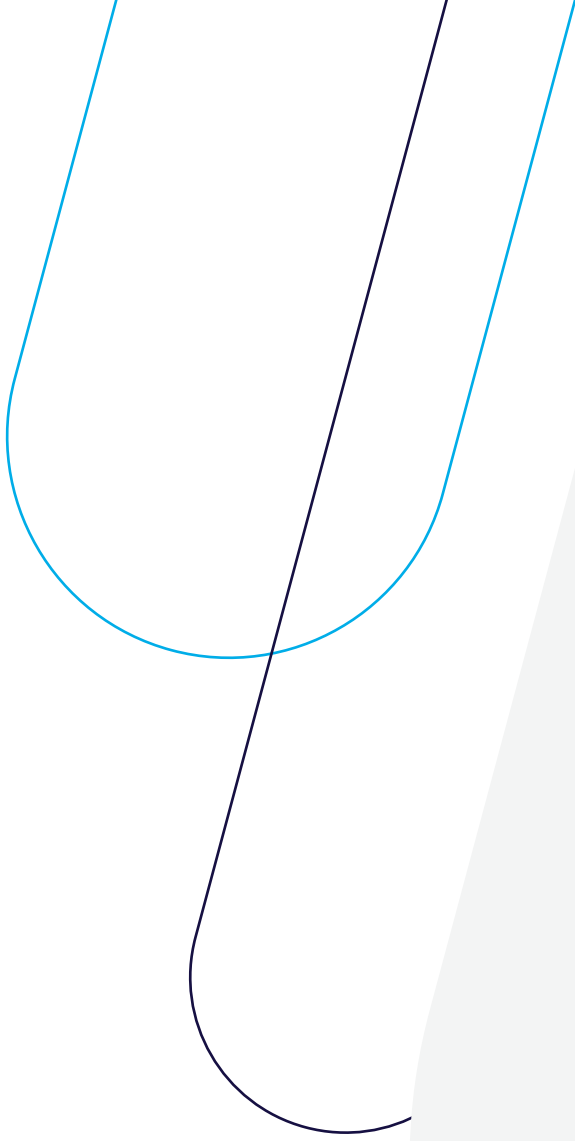
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