



How to Right-size Hospital Staff in the Face of Nursing Shortages

Proactive capacity and census planning can help hospitals manage staff levels and deliver quality patient care. Here's how.



Nurse Staffing Shortages are Reaching Crisis Levels. How Did We Get Here?

Nurse staffing shortages were already on the rise well before the COVID-19 pandemic. But the healthcare crisis exacerbated the already escalating challenge.

There are several prominent factors that have fed into the current situation—and will continue to impact it in the future.

Burnout has caused a substantial increase in the number of nurses leaving the profession.

According to one study, more than 30% of nurses report high stress levels, and more than 44% report being overworked.¹ These pressures have caused at least 22% of nurses to consider leaving the profession.²

Nurses who are still left are working more shifts and longer hours—and are also getting burnt out.

More nurses leaving the profession due to overwork and burnout have caused the remaining staff to take on more shifts, exacerbating their own stress levels and causing them to take leave. In fact, the American Association of Colleges of Nursing estimates that one million nurses will retire by 2030.³

A growing “baby boomer” population will put more strain on nurses.

One study⁴ shows “baby boomers”—people born between 1946 and 1964—comprise more than 21% of the U.S. population. That generation is aging and more will require care in the years ahead, resulting in a lot more work for the people who tend to them—nurses included.

Let’s dig deeper into the nursing shortage and how new technologies, including predictive analytics and digital twins, can help hospitals proactively plan staffing levels to reach maximum efficiency and provide exceptional care.



The challenges have gotten so bad that patients are taking notice. According to one report,⁵ staffing shortages and healthcare workers’ mental health statuses are now patients’ top healthcare safety concerns.

Hospitals are Under Pressure to Fill Coverage Gaps. That Comes at a Cost.

Hospitals are losing nurses, and they're having trouble finding staff to replace them. When they do, it comes at an exorbitant cost.

For years, labor has accounted for more than 50% of hospitals' expenses.⁶ But hospitals have now resorted to using more contract nurses, often referred to as traveling nurses. Contract nurses can charge upwards of \$200 an hour. They exemplify healthcare workers who are —understandably— trying to maximize their value as much as possible given high demand and staffing shortages.

Then, there are picket lines. In 2021, the U.S. Bureau of Labor Statistics recorded four strikes⁷ involving 1,000 or more healthcare workers. Those numbers will likely grow as more nurses demand better pay

According to a report from KaufmanHall, Labor Expense per Adjusted Discharge has risen more than 13% year-over-year.⁸ This is putting enormous financial pressure on hospitals.



Still, Hospitals Can't Afford NOT to Have the Right Number of Nurses

Not when there's the threat of seasonal waves of COVID-19, the flu, and other RSVs. And not when KaufmanHall⁹ is noting an average increase of about 8% in Average Length of Stay for hospitals with 300 – 499 beds.

Nursing pools are required in every hospital, but hospitals still need to know in advance how many nurses they will need on hand. This is particularly important in units that specify how many nurses are required per bed. If those units do not have the right number of nurses per bed, they cannot fill those beds.

In some cases, patients need to be laterally transferred or even diverted to other facilities in the system due to capacity limits or insufficient staffing. This creates even greater cost management and capacity planning challenges.

Consider a recent study from the University of San Francisco^{10t}, which identified several issues related to patient transfers:

- An acute tertiary medical center experienced an average of 2.4 transfers within the hospital
- Each of those transfers required about 2.5 hours of a nurse's time
- As a result, Length of Stay doubled, and adverse events increased by 25%

The study also found that an average 300-bed hospital incurs an additional \$622,000 in nursing costs due to wrong placements.





Matching Nurses to Patient Mix is **Also Important**

Understanding how censuses will change in the next day, weeks, or months is critical to having the right number of nurses in a facility. Too few, and a hospital loses revenue and cannot treat patients appropriately. Too many results in excess costs and inefficiencies.

And yet, it's not just about ensuring that hospitals have right number of nurses on staff; it's equally important to ensure those nurses adequately match the hospitals' mix of patients. Nurses can be highly specialized and focused on a particular discipline (surgical or ICU nurses, for example). These nurses are typically compensated at higher rates.

Hospitals need to plan to have the right nurses on hand so they can provide the right level of care to

the right patients. But getting the right nurse-to-patient-mix is also important because it helps ensure hospitals meet required ratios and deliver the best care.

Clearly, hospitals must get their census and staff planning right. That way, they can make sure they have the right beds, and the right nurses, to deliver the right care.

Current Patient Flow Processes Won't Solve These Challenges

Preferably, hospitals should be able to optimize staffing levels and calculate nurse-to-patient-mix in the short, mid, and long-terms. Unfortunately, that's difficult to do with current processes:

Manual census planning is rife with potential risks, including human error, and is enormously time-consuming. Plus, it is often focused exclusively on short-term census planning—trying to predict which patients will move through the hospital and need services or beds within the next few hours.

Current methodologies are inadequate. Monte Carlo simulations and other mathematical algorithm models do not consider all possible interdependencies and the complexities of a typical hospital environment, especially when increasing numbers of systems and data points come into play.

There's only so much data scientists and nurses can do during periods of high patient volume. They, along with other staff, will likely find themselves in catch-up mode and struggling to keep pace with demand.

The answer: predictive analytics and digital twins, which hospitals can use to get both real-time information on current census needs, and proactively plan for future capacity and staffing needs.

How can hospitals optimize their resources to provide excellent patient care—without overworking their nurses and contributing to the burnout crisis?



Predictive Analytics: The Power of Prediction

Using predictive analytics, hospitals can leverage data to forecast future hospital capacity and census planning needs in a much more accurate and efficient manner than manual methods.

Predictive analytics and what/if scenarios allow for the ability to reference past information from electronic health records, create different levels of impact (i.e., “What if the flu creates a 10% jump in our census? How do we staff accordingly to meet that surge?”), and test out different plans. Hospitals can then plan staffing levels for the most likely case—but also prepare for the worst possible outcomes.

What are predictive analytics?

Predictive analytics is a form of AI that continually takes raw, historical data and applies it to machine learning algorithms to provide actionable intelligence that can be used for census planning. The more information the system ingests, the smarter it becomes—and the more accurate the recommendations it provides.



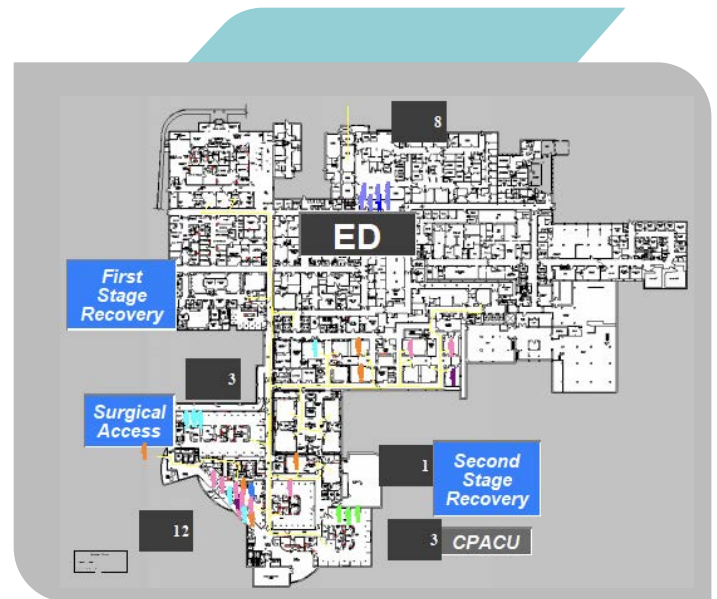
Digital Twins: Accurately Modeling Hospital Capacity

Predictive analytics can be paired with digital twins to create powerful and accurate insights into both the current and future states of a hospital's census. Think of a digital twin as a replica of the hospital – a virtual environment for data and processes.

The Power of Twins

By creating a digital twin of a hospital—or even multiple hospitals, as would be the case with a hospital network (Integrated Delivery Network, or IDN)—healthcare providers can get a global view of census and capacity, including details like:

- How many patients are currently in the hospital
- How they're entering and exiting the hospital
- How quickly they're moving through the hospital
- Where they're likely to go next
- How long they're likely to stay in the hospital
- Predictions on what the census will be in a few hours, a few days, or months ahead
- How different what/if scenarios could impact the hospital



A visual representation of patients as they move through a hospital.

What is a digital twin?

A digital twin is a virtual replica of a physical object or system—for example, a hospital facility, or the components of that facility and its processes (exam rooms, hospital rooms, and patients). Digital twins can be automatically updated from electronic medical records or other information systems as patients flow into and through the hospital, giving providers near real-time census status views along with future census predictions.

Digital Twins: Contingency Planning, Weeks and Months Ahead

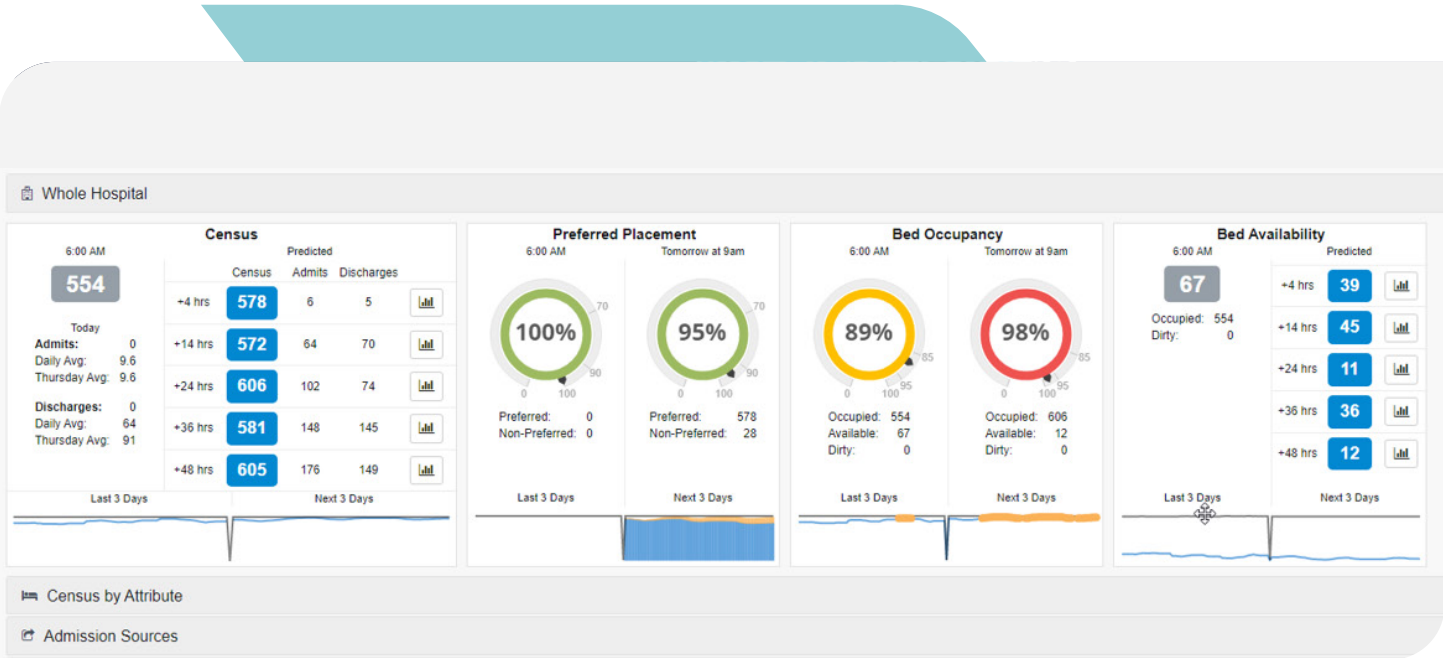
Digital twins can give accurate visual representations of how capacity needs are likely to look in the future through a process of discrete-event simulation (DES). DES is a way to simulate the behavior of a real-life process using data and create predictive models that consider all complexities and interdependencies.

For example, a nurse manager could set a timeframe to look at possible census scenarios from September to February. They can see how their hospital’s census is likely to fluctuate based on the fall and winter seasons when viruses are more likely to be prominent. In the digital twin, they can understand where patients are likely to go and how long they’ll be hospitalized.

Nurse managers can also use the digital twin for what/if scenarios. These allow hospitals to see

potential impacts and determine contingency plans. For instance, hospitals can hire for the most likely scenario, but still be prepared to staff up if the worst were to happen.

Users can adjust the timeframe as needed to look at the short-term (hours to days), mid-term (weeks to months), and long-term (months to years). Whatever the timeframe, they’ll have the power to proactively anticipate future surges and prepare for them accordingly.



An example dashboard showing projected discharges. Note the high bed occupancy flagged in red.

It's Time to Break the Staff Shortage Cycle

The nursing shortage has taken a toll on everyone. Hospitals are struggling to predict staffing needs, manage limited capacity, control costs, get the right nurse-to-patient ratio and care mix, and even deal with the potential for strikes. Meanwhile, patients are worried about the levels of care they're receiving, and nurses are getting stressed and burnt out.

It's a vicious cycle that needs to be broken.
It can be done by:

- **Proactively plan** out the number of hospital beds, ICU units, and staff needed to accommodate surges
- **Derive insights** from data and glean actionable intelligence—making planning more accurate and census forecast meetings more productive
- **Create what/if scenarios and contingency plans** that will enable them to become more prepared, and efficient and uphold high standards of care
- **Implement a digitally driven process** that allows them to know, with minimal uncertainty, that their scenarios and plans will work as expected

A proactive approach based on actual data will result in less stress on nurses and fewer and more productive patient bed huddles. Staff will no longer be continuously playing catch-up, and fewer decisions will be based on guesswork.

At the same time, hospitals will gain significant efficiencies. They'll be able to accurately plan and map out staffing needs in advance, ensuring they have the right amount of nursing staff to treat patients, even during surges.

In short, hospitals will be able to implement a more efficient system that puts less pressure on current staff and the entire system. Everyone—including administrators, patients, and, especially, nurses—will benefit.



Want to learn more about how to proactively predict your hospital's census needs?

Contact BigBear.ai today to find out how you can leverage predictive analytics and digital twins to plan for capacity surges due to COVID-19 and the flu.

Endnotes

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6. American Hospital Association, [Massive Growth in Expenses and Rising Inflation Fuel Continued Financial Challenges for America's Hospitals and Health Systems](#), 2022
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