DATA

Why Hospitals Need Better Data Science

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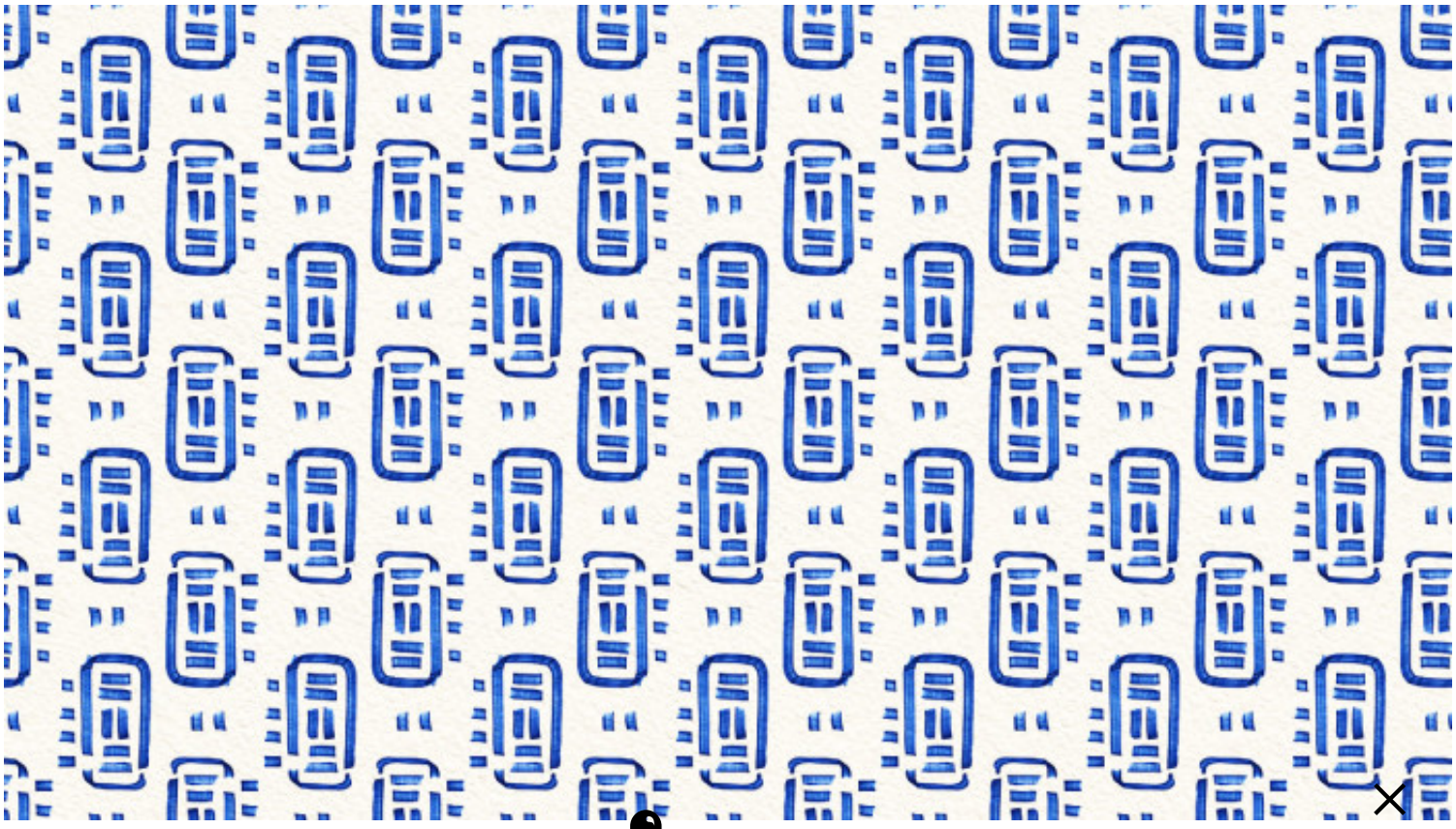

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good management and health care.

Airlines are arguably more operationally complex, asset-intensive, and regulated than hospitals, yet the best performers are doing a better job by far than most hospitals at keeping costs low and make a decent profit while delivering what their customers expect. Southwest Airlines, for example, has figured out how to do well the two operational things that matter most: Keep more planes in the sky more often, and fill each of them up more, and more often, than anyone else. Similarly, winners in other complex, asset-intensive, service-based industries — Amazon, well-run airports, UPS, and FedEx — have figured out how to over-deliver on their promise while staying streamlined and affordable.

These examples are relevant to health care for two reasons.

First, hospital operations are in many ways like airline and airport operations and transportation services. There are many steps in the service operation (check-in, baggage, the security line, gates), high variability at each step (weather delays, congestion, mechanical issues), multiple connected segments in the user journey — and all these operations involve people, not just machines. In mathematical terms, hospital operations, like airlines and transportation, consist of hundreds of mini-processes, each of which is more stochastic and less deterministic than, say, the steps in assembling a car.

And second, hospitals today face the same cost and revenue pressure that retail, transportation, and airlines have faced for years. As Southwest, Amazon, FedEx, and UPS have demonstrated, to remain viable, industries that are asset-intensive and service-based must streamline operations and do more with less. Health care

providers can't keep spending their way out of trouble by investing in more and more infrastructure; instead, they must optimize their use of the assets currently in place.

To do this, providers need to consistently make excellent operational decisions, as these other industries have. Ultimately, they need to create an operational "air traffic control" for their hospitals — a centralized command-and-control capability that is predictive, learns continually, and uses optimization algorithms and artificial intelligence to deliver prescriptive recommendations throughout the system. Dozens of health care organizations are now streamlining operations by using platforms from providers including LeanTaaS, Intelligent InSites, Qgenda, Optum, and IBM Watson Health. What these solutions have in common is the ability to mine and process large quantities of data to deliver recommendations to administrative and clinical end users.

Improving hospital operational efficiency through data science boils down to applying predictive analytics to improve planning and execution of key care-delivery processes, chief among them resource utilization (including infusion chairs, operating rooms, imaging equipment, and inpatient beds), staff schedules, and patient admittance and discharge. When this is done right, providers see an increase in patient access (accommodation of more patients, sooner) and revenue, lower cost, increased asset utilization, and an improved patient experience. Here are a few examples:

Increasing OR utilization. For a resource that brings in more than 60% of admissions and 65% of revenue at most hospitals, current block-scheduling techniques fall far short in optimizing operating-room time and in improving patient access, surgeon satisfaction, and care quality. Current techniques — phone calls, faxes, and emails — make block-schedule changes cumbersome, error prone, and slow. Using predictive analytics, mobile technologies, and cloud computing, providers are mining utilization patterns to dramatically improve OR scheduling.

For example, mobile apps now allow surgeons and their schedulers to request the block time they need with one click. At UCHealth in Colorado, scheduling apps allow patients to get treated faster (surgeons release their unneeded blocks 10% sooner than with manual techniques), surgeons gain better control and access (the median number of blocks released by surgeon per month has increased by 47%), and overall utilization (and revenue) increases. With these tools, UCHealth increased per-OR revenue by 4%, which translates into an additional $15 million in revenue annually.

Slashing infusion center wait times. Infusion scheduling is an extremely complex mathematical problem. Even for a 30-chair center, avoiding the 10 AM to 2 PM "rush hour" in a patient-centric way requires picking one of a googol (10^{100}) of possible solutions. Faced with this challenge, NewYork-Presbyterian Hospital applied predictive analytics and machine learning to optimize its schedule templates, resulting in a 50% drop in patient wait times. In addition to improving longer-term patient scheduling, these technologies help schedulers manage an infusion center's day-to-day uncertainty — last-minute add-ons, late cancellations, and no-shows — as well as optimize nurses' workloads and the timing of breaks.

Streamlining ED operations. Emergency departments are famous for bottlenecks, whether because patients are waiting for lab results or imaging backed up in queues or because the department is understaffed. Analytics-driven software that can determine the most efficient order of ED activities, dramatically reducing patient wait times. When a new patient needs an X-ray and a blood draw, knowing the most efficient sequence can save patients time and make smarter use of ED resources. Software can now reveal historic holdups (maybe there's a repeated Wednesday EKG staffing crunch that needs fixing) and show providers in real time each patient's journey through the department and wait times. This allows providers to eliminate recurring bottlenecks and call for staff or immediately reroute patient traffic to improve efficiency. Emory University Hospital, for example, used predictive analytics to forecast patient demand for each category of lab test by time of day and day of week. In so doing, the provider reduced average patient wait times from one hour to 15 minutes, which reduced ED bottlenecks proportionally.

ED to inpatient-bed transfer. Predictive tools can also allow providers to forecast the likelihood that a patient will need to be admitted, and provide an immediate estimate of which unit or units can accommodate them. With this information, the hospitalist and ED physician can quickly agree on a likely onboarding flow, which can be made visible to everyone across the onboarding chain. This data-driven approach also helps providers prioritize which beds should be cleaned first, which units should accelerate discharge, and which patients should be moved to a discharge lounge. Using a centralized, data-driven patient logistics system, Sharp HealthCare in San Diego reduced its admit order-to-occupy time by more three hours.

Accelerated discharge planning. To optimize discharge planning, case managers and social workers need to be able to foresee and prevent discharge delays. Electronic health records or other internal systems often gather data on "avoidable discharge delays" — patients who in the last month, quarter, or year were delayed because of insurance verification problems or lack of transportation, destination, or post-discharge care. This data is a gold mine for providers; with the proper analytics tools, within an hour of a patient arriving and completing their paperwork, a provider can predict with fairly high accuracy who among its hundreds of patients is most likely to run into trouble during discharge. By using such tools, case managers and social workers can create a shortlist of high-priority patients whose discharge planning they can start as soon as the patient is admitted. Using discharge analytics software, MedStar Georgetown University Hospital in Washington, DC, for example, increased its daily discharge volume by 21%, reduced length of stay by half a day, and increased morning discharges to 24% of all daily discharges.

Making excellent operational decisions consistently, hundreds of times per day, demands sophisticated data science. Used correctly, analytics tools can lower health care costs, reduce wait times, increase patient access, and unlock capacity with the infrastructure that's already in place.

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