Investing in AI: Proven Strategies to Fuel Transformation in Hospital Operations

Deploying artificial intelligence and machine learning to transform hospital operations for better care and cost

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Introduction

In today's volatile health care environment, the country's most forward-thinking, technologically savvy health systems are already using artificial intelligence (AI) to unlock tremendous new value. I know—we are working with them.

Our team at SCP Health has fully embraced AI, furthering operational goals, improving efficiency, and enhancing the patient experience for our hospital and health system partners. The tools of artificial intelligence—large data warehouses, sophisticated algorithms, digital twin technologies, and affordable computing power—are now being adopted for an increasingly diverse range of use cases in U.S. health care.

Health care executives are interested. They understand that AI is here, but the true power of the use cases and specific applications for these tools remains obscure to many.

In other industries, including aviation, banking, automotive, and retail, executives and their organizations have already benefited from these tools for years. Health care leaders are now applying those lessons to some of the industry's most challenging, costly, and important problems. I myself previously worked at GE, where I watched the application of AI transform entire markets, drive enormous efficiency, and create tremendous new value.

Yet, as often is the case with modern technology adaption, U.S. health care has been a laggard. That time is over. The time has come to embrace artificial intelligence for an ever-growing number of powerful use cases.

This paper will:

- Explain how to apply AI in healthcare operations.
- Describe AI-specific tools that are critical to success.
- Reveal new hospital operations use case that employs AI.

Those who do not adopt AI as an integral part of their hospital operations will eventually fail. They will lose market share to a more forward-thinking competitor or simply fail to optimize costs at a time when financial burdens have never been more pressing.

Health care today is far too dynamic and volatile to manage with yesterday's methods. This paper will light the way forward for those wondering how artificial intelligence tools can avoid those near-certain fates.

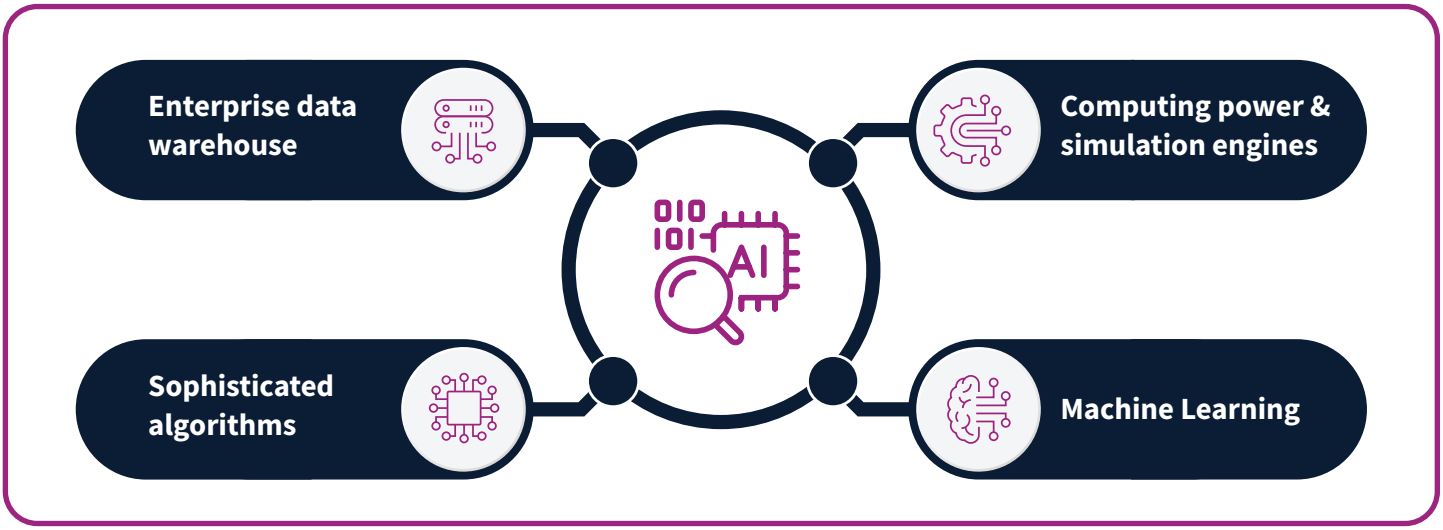
The Tools: Success Criteria for Artificial Intelligence

It is said that artificial intelligence is neither artificial nor intelligent. Nevertheless, the phrase captures the sheer power of a suite of tools which, over the past decade, have begun to transform industry after industry.

In the old way, leaders managed with glorified spreadsheets, and individuals making human-powered predictions. They looked at data, entered it into spreadsheets, created simple trend lines, and judged how to respond. If the future did not pan out according to the prediction, the human at the helm would revise and try to do better next time. Keep in mind that the complexity and speed of data in the past were a fraction of what we see today, and trends were stable.

With the new methods, all of that is now different—and indeed, obsolete. The new tools are integrated to create what we now refer to as artificial intelligence:

- **Enterprise data warehouse: accumulating and storing data.** AI cannot work without access to enormous amounts of data. In U.S. health care, many larger hospitals and systems have had access to such data for decades. Yet, they have been unable to properly leverage that data to build anything other than rudimentary dashboards or glorified spreadsheets.
- **Sophisticated algorithms: ensuring efficient processes and continued learning.** The new field of data science has been instrumental in helping organizations begin to put this data to effective use. "The era of big data" would not be an era without the expertise of data scientists to make sense of it. In this sense, "artificial" is not artificial at all: AI still relies on the judgments of those who build the algorithms. Yet those judgments must be informed by data science, statistical analysis, and strategic leadership decisions.
- **Computing power & simulation engines: enabling performance and scale.** The industries that led the change for AI invested millions of dollars into their own gigantic servers. The purpose of all that computing power is to run hundreds of thousands—even millions—of simulations. The more complex the environment being simulated; the more power is needed. Until recently, this amount of computing power has been inaccessible or cost-prohibitive for all but the largest, most well-resourced organizations. In the last 3-5 years, that has changed. Cloud-based computing power is much more accessible, making these simulations available to many more sectors.
- **Machine Learning: leveraging data, algorithms, and models.** Machine learning, a phrase often intended to be synonymous with artificial intelligence, is the outcome of the above three components. Computer systems that can learn and adapt, by data, algorithms, and models, can draw inferences and create predictions useful for decision making.



The power of AI is not just to make one prediction or inform one decision. More importantly, AI starts a process of continual learning, testing, and optimization.

Machine learning can help an organization learn, evaluate, and optimize all the time, not just at an annual strategic planning session or a single board meeting. It elevates your organization's ability to respond proactively to events as they unfold and is the strategic equivalent of moving from analog to digital, from Blockbuster to Netflix.

In this new, AI-enabled world, previous dashboards and spreadsheets become the brick-and-mortar equivalent: suitable for a boutique operation but incapable of competing with powerful new models.

The Use Case: Matching Patient Volume to Operations

What do the aviation industry and U.S. health care have in common?

Complexity. High fixed and high labor costs. Variable and unpredictable demand. Difficulty in adopting technology. However, in the use case described below, aviation has been well ahead of health care. In fact, the airlines use AI to predict the predictable, optimize operations, and balance cost against customer satisfaction. Aviation is an excellent analog for understanding the challenges many hospitals face today.

The Aviation Analog

Airlines may sometimes seem stuck in old ways, but many have been on the leading edge of artificial intelligence and machine learning for years. The comparison to a major health system is useful. Consider that each airline operates in multiple (if not hundreds) of sites spread across the country. At each site, there are dozens of gates. Each gate has a specific capacity to handle airplanes. Each type of airplane requires specific pilots with specific training to fly it. Each requires a certain number of flight attendants, each with specific training. And each plane can carry a certain number of passengers who may be connecting through other sites around the country, all on a set schedule.

Now, a line of thunderstorms comes through to disrupt operations at one or multiple airports in a particular region. The airline responds by making use of the tools of machine learning to determine, in real-time, what to do: how many flights to cancel vs. delay, where to re-route planes with the least disruption, and—most importantly—how to balance the cost of cancellations or delays with the costs of customer dissatisfaction.

Humans do not make these decisions with spreadsheets and gut feel. A suite of technologies enables airlines to automate decision-making in real-time. Similar technologies are now becoming essential to solving a parallel set of problems in health care.

The Emergency Department

For decades, patient volume and acuity in the nation's ERs were predictable. Each year, volumes went up with demographic trends. There were seasonal flu patterns and variations and differences in case mix depending on the size and location, but volumes were predictable.

In the last five years, this began to change. And, with the COVID pandemic, it transformed. Volume is no longer as predictable. Volatility is up. And it is not simply different strains of the COVID virus, or other contagious diseases, impacting different regions at various times. In the last three years, wholesale changes in society have made predicting volumes in the ED more complex than ever before.

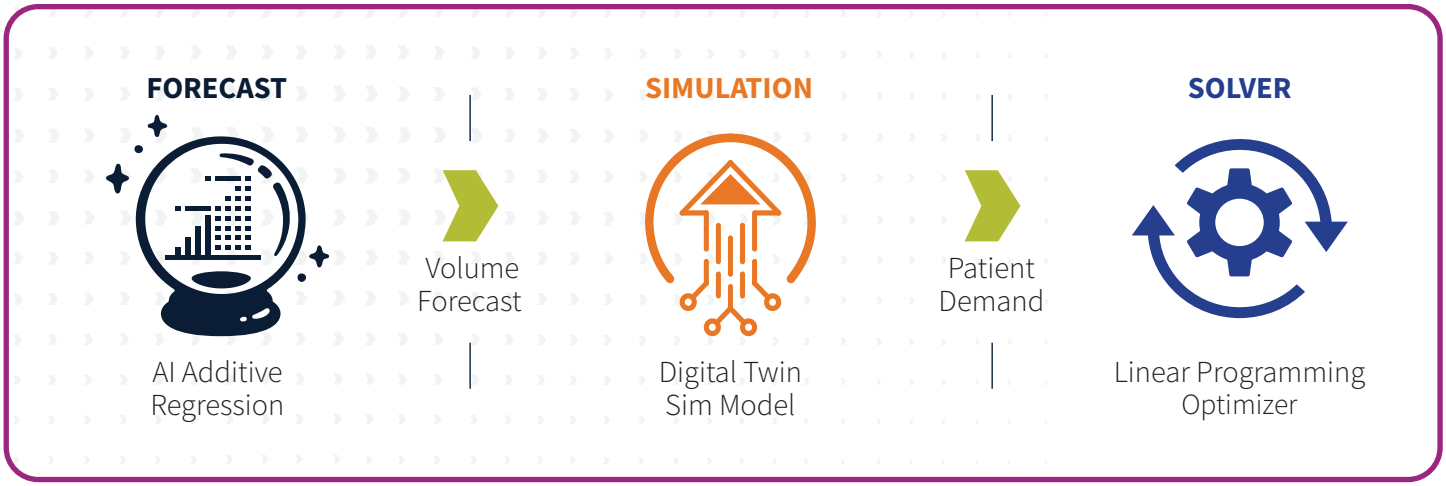
Work from home, changing travel patterns, misinformation, rising high-deductible health plans, millions of people changing jobs, and a range of psychological challenges—all these factors mean that Americans are making different judgments about when and where to go for care. These dynamics dramatically impact the emergency room and by extension, the hospital. And these judgments change month to month and year to year.

This volatility is the new normal.

The New Model: Leveraging AI to Unlock Value in Hospital Operations

How can hospitals and health systems be more like airlines in such an environment? How can we both predict changing volumes in real time and match our staffing levels to optimize efficiency while balancing operational priorities such as patient satisfaction and throughput?

Over the past year, SCP Health has built proprietary tools to help our hospital and health system partners do precisely this:



The team built an AI model with deep data and algorithms, creating the baseline. The AI model in operation predicts volume with 90-95% accuracy and is improving every day.

1. **Leveraging data to predict volume.** We use historical volume data to train sophisticated algorithms designed to predict volume into the future. Our goal is to predict volume 60 to 90 days in advance: specifically, the number of patients on an hourly and daily basis, in 15-minute increments. Machine learning gets smarter over time by looking at the actual volumes and incorporating that into continuously refining its predictive model.

A digital twin simulation tool accurately predicts volume and case mix—and helps operational leaders respond to volatility in real-time.

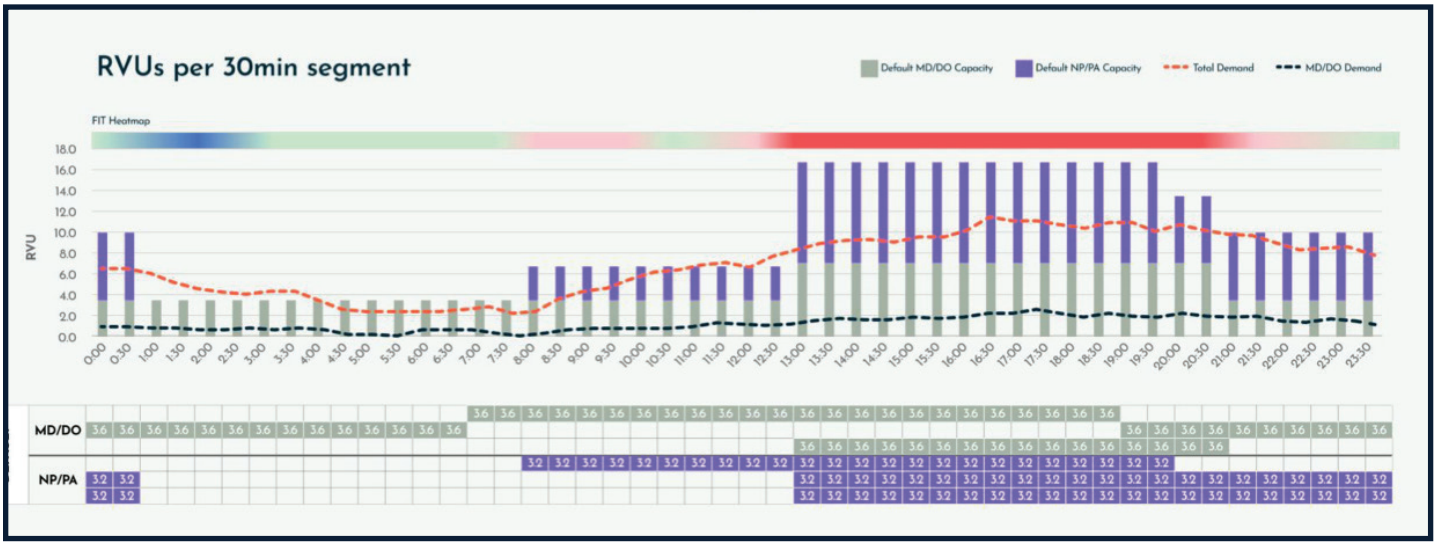
2. **Using "digital twin" simulation engines to predict case mix.** So-called "digital twin" simulations work in real-time to emulate a virtual representation of a real-life system. For example, airlines run a digital simulation of every plane engine currently in the air. Those engines send back continuous data as they fly. Suppose the real-time data that comes back is different from the digital copy. In that case, that alerts airlines to potential problems which need to be addressed in real-time, whether it is a vibration sensor that is picking up a mechanical issue or a heat sensor that signals a need for future maintenance.

   In health care, the cloud-based computing power has now enabled leveraging these powerful simulation engines to mirror hospital operations. The simulation engine will run hundreds of thousands of potential scenarios for who will show up to the ED, at what times, and at what levels of acuity (or "intensity of clinical intervention") until it arrives at the most likely pattern—and it learns over time.

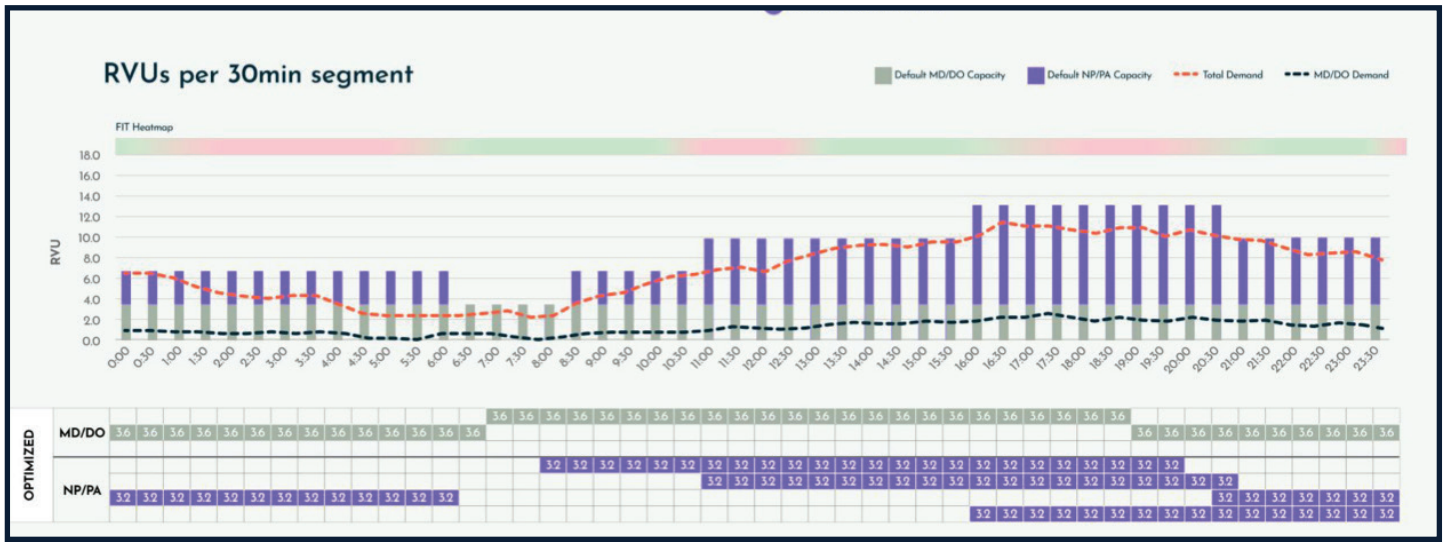
Algorithms help balance operational priorities such as patient satisfaction, throughput, quality, and cost.

3. **Using sophisticated algorithms to optimize staffing levels.** Once we know volume, acuity, and arrival patterns, we can then use algorithms designed by data scientists, in coordination with operational priorities, to automatically generate a clinical staffing plan.

DEFAULT SCHEDULE



OPTIMIZED SCHEDULE



Crucially, these staffing plans are not designed only to maximize efficiency or reduce cost. Instead, like the airlines weighing the potential damage of cancellations to customer satisfaction, the algorithms aim to further the operational goals of hospital leaders, whether that is improving patient satisfaction, maximizing throughput, impacting clinical quality, reducing unnecessary staffing costs, or balancing all four.

While the new model driven by AI is a game changing differentiator, it is important to accompany technology deployments with change management efforts. SCP Health employs its expertise using the principles of change management to drive the adoption of these modern technology tools within the hospital. As with any meaningful change, the process of educating, training, and earning buy-in from clinical and operational leaders is essential to maximizing the positive impacts on patient care, productivity, and clinician satisfaction.

The Time Is Now

The above use-case is just the beginning. In the coming years, AI will address an ever-expanding list of hospital challenges, improving operations and reducing costs.

In a world with an exceptionally tight supply of clinical resources, eliminating latent capacity and optimizing the utilization of a hospital's most expensive resources is an imperative, an absolute "must." There is too much at risk.

The forever-expanding complexities of health care require an innovative approach that cannot be managed manually by humans alone. Now and in the future, complex algorithms, simulation models, and artificial intelligence will be the tools that unlock value in patient satisfaction, clinical outcomes, and productivity.

Unlocking the power of AI will set some hospitals and health systems on a course toward thriving in an ever-more complex world—while leaving those that do not adopt and adapt in the dust. The stakes are simply too high. Hospitals are running at margins that are too thin and are relying on archaic data processes. The pandemic has driven unprecedented risk for volatile, unpredicted surges in volume and acuity. Mismatches in volume and staffing often result in excessive costs or conversely, create untoward clinical risks and poor satisfaction.

Neither are acceptable. Neither need to happen. Precision is paramount. AI can unlock the necessary power in your hospital's operations.

The time is now.

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