



Diagnosing the Future: The Impact of AI, Robotics, and Automation on Healthcare Staffing

WHITE PAPER

Introduction

The future of healthcare is here. Thanks to the advent of artificial intelligence (AI), robotics, and automation, a patient's journey through the healthcare system is no longer guided by a doctor's clipboard but by the integration of advanced technology. In medical facilities around the world, AI-powered diagnostics help physicians prescribe novel treatment plans tailor-made for patients' specific circumstances. In operating rooms, robots operate alongside skilled surgeons, achieving a level of precision that — until now — has been unfathomable. Behind the scenes, automation is making it all possible, streamlining everything from administrative workflows to medication delivery.

Defining Healthcare Innovation

Artificial Intelligence (AI): AI in healthcare refers to the use of algorithms and machine learning to analyze complex medical data and provide insights. It can assist with diagnosing diseases, predicting patient outcomes, and personalizing treatment plans based on vast amounts of patient data.

Robotics: Robotics in healthcare involves physical machines designed to perform specific medical tasks, often with a high degree of precision. These can range from robotic surgical systems like the da Vinci robot, which helps surgeons perform minimally invasive procedures, to robots that assist in-patient rehabilitation or deliver medication within a hospital.

Automation: Automation in healthcare refers to the use of technology to perform repetitive or routine tasks with minimal human intervention. This can include processes like scheduling, billing, and patient record management, as well as clinical tasks like monitoring patient vitals or dispensing medications.

For employers and employees alike, the implications are clear. Innovation at this scale has the potential to allow healthcare professionals to focus on what truly matters most: delivering compassionate, patient-centered care with greater efficiency and accuracy. However, achieving this outcome will require a strategic approach to workforce planning backed by skilled talent that can meet the needs of tomorrow. While some roles may become obsolete, new opportunities will emerge in tech-driven fields like health informatics, telemedicine, and digital care coordination. For employees, this evolution offers the potential for more flexible, dynamic roles but also demands adaptability as the future of staffing in healthcare becomes increasingly intertwined with innovation.

At All's Well Healthcare Services, we've guided countless healthcare organizations through times of change through a staffing approach that's designed for the future. Part of the ActOne Group family, we offer comprehensive, 24/7 recruitment solutions year-round, ensuring that our clients have the talent they need whenever they need it. Our creative, cost-effective staffing solutions cover a wide range of healthcare professionals, including nurses, allied health workers, therapists, dental specialists, and healthcare administrative management personnel. By delivering quality talent tailored to meet the evolving demands of healthcare, we help our clients maintain operational excellence and patient care standards.

In *Diagnosing the Future: The Impact of AI, Robotics, and Automation on Healthcare Staffing*, we explore how these innovations are revolutionizing patient care and redefining the healthcare ecosystem, making it more efficient, personalized, and accessible for all. Presented in partnership with AllSTEM Connections, a full-service staffing company focused on placing qualified professionals in STEM roles, this whitepaper addresses the challenges and opportunities technology will create for the healthcare workforce and how companies can prepare for change.

About All's Well Healthcare Services

All's Well Healthcare Services is a privately held, diversified service organization comprised of a cohesive team of innovative people dedicated to providing the highest quality healthcare staffing services with the greatest value. We provide cost-effective solutions to all levels of healthcare staffing. We bring "around the clock" recruitment solutions 365 days a year to our healthcare clients through creative, cost-effective, quality staffing of nurses, allied health professionals, therapists, dental, and healthcare administrative management personnel.

ABOUT AllSTEM Connections

AllSTEM Connections takes the time to understand the needs of STEM professionals and companies to make the best connections in STEM-related industries. We are part of the ActOne Group of companies, whose mission is to become the business community's global partner in providing forward-thinking talent and resource-management solutions. By leveraging the expertise of the various companies of the ActOne Group, our clients can access the powerful potential of today's diverse global workforce.

Achieving the ‘Quadruple Aim’ of Healthcare Using Technology

The Quadruple Aim of Healthcare¹



IMPROVING POPULATION HEALTH

Preventing and managing prevalent, costly, and chronic diseases.^{2,6}



REDUCING COST OF CARE

Reducing resource utilization and readmissions while assuming greater risk²



ENHANCING THE PATIENT EXPERIENCE

Motivating and engaging patients to play an active role in their care to improve outcomes and safety⁶



IMPROVING PROVIDER SATISFACTION

Providing access to tools and resources to address provider burden and burnout³

QUADRUPLE AIM³

Healthcare systems worldwide are striving to achieve the “quadruple aim” of healthcare: improving population health, enhancing the patient experience, improving provider satisfaction, and reducing healthcare costs.² However, aging populations, the rising burden of chronic diseases, and escalating costs make these goals increasingly difficult. Governments, payers, and providers face pressure to not only perform — but transform — delivering high-quality care while adopting new, scalable solutions. Complicating matters, by 2030, the world will face a shortage of 18 million healthcare professionals, including 5 million doctors, with especially large gaps in developing countries.³ The global pandemic has further exposed critical shortages in the healthcare workforce and inequities in access to care, emphasizing the need for urgent and innovative reforms.

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Against this backdrop, technology offers promising solutions to these challenges. By leveraging multimodal data — such as genomics, demographic, and clinical information — combined with advances in mobile technology, Internet of Things (IoT), computing power, and data security, a convergence is well underway.

The following pages highlight how technology is being used to support healthcare's quadruple aim, with a focus on advancements in artificial intelligence, robotics, and automation.

Spotlight on Artificial Intelligence

Use cases: Widescale adoption and application of artificial intelligence in healthcare⁵

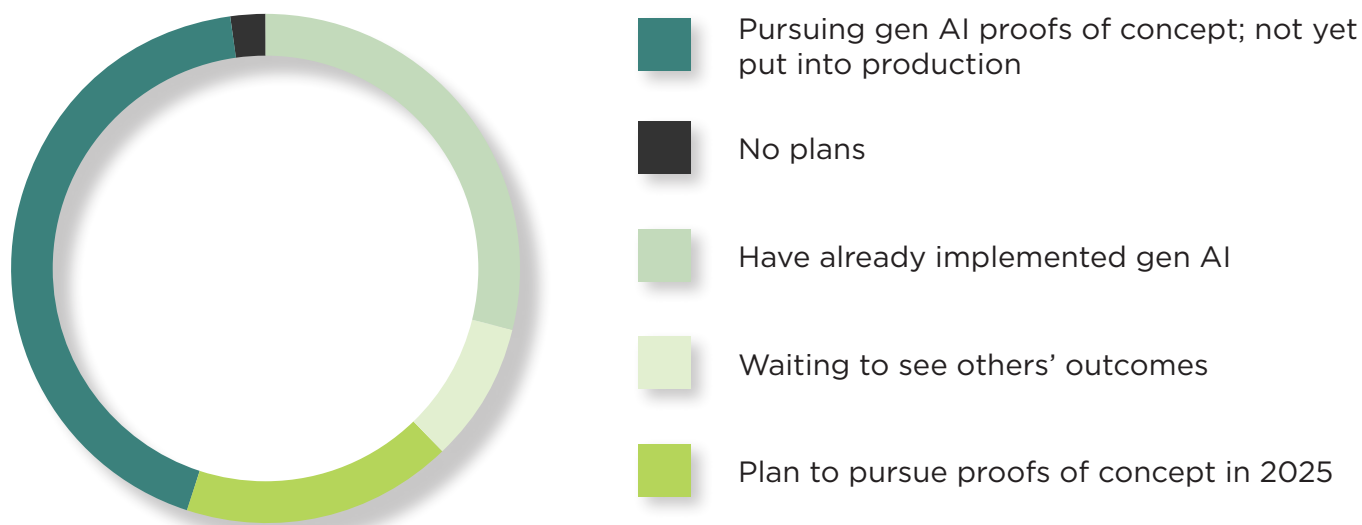
Timeline	Connected/ augmented care	Precision diagnostics	Precision therapeutics	Precision medicine	Summary
Short term 0-5 years	Internet of things in healthcare Virtual assistants Augmented telehealth Personalized mental health support	Precision imaging (eg diabetic retinopathy and radiotherapy planning)	CRISPR (increasing use)	Digital and AI enabled research hospitals	AI automates time consuming, high volume repetitive tasks, especially within precision imaging
Medium term 5-10 years	Ambient intelligence in healthcare	Large-scale adoption and scale-up precision imaging	Synthetic biology immunomics	Customization of healthcare Robotic assisted therapies	AI uses multi-modal datasets to drive precision therapeutics
Long term 10+ years	Autonomous virtual health assistants, delivering predictive and anticipatory care Networked and connected care organisations (single digital infrastructure)	Holographic and hybrid imaging Holomics (integrated genomic/ radiomic/ clinical/ immunohistochemical data)	Genomics medicine AI driven drug discovery	New Curative treatments AI empowered healthcare professionals (eg digital twins)	AI enables healthcare systems to achieve a state of precision medicine through AI-augmented healthcare and connected care

AI is making significant inroads in healthcare, offering numerous benefits across the continuum of care. According to a comprehensive report from the National Academy of Medicine, AI has the potential to improve outcomes for both patients and clinical teams, lower healthcare costs, and enhance population health.⁶ From preventive screenings to diagnosis and treatment, AI is increasingly being integrated into various aspects of healthcare delivery to support better decision-making and outcomes.

AI is particularly useful in cancer screenings that utilize radiology, such as mammograms or lung cancer screenings, where it helps to produce results faster. For instance, in the case of polycystic kidney disease (PKD), researchers found that total kidney volume is a key indicator of how rapidly kidney function will decline. Traditionally, assessing total kidney volume involves analyzing numerous kidney images, a time-consuming process taking around 45 minutes per patient. Thanks to innovations at the PKD Center at Mayo Clinic, researchers now use AI to automate this assessment, generating results within seconds. Additionally, AI can assist radiology professionals by performing repetitive tasks such as tracing tumors and measuring fat and muscle, which saves time and allows clinicians to focus on more complex analyses.⁷

In some scenarios, AI has demonstrated greater accuracy than human experts. For example, AI has outperformed current pathology methods in predicting survival outcomes for malignant mesothelioma, a type of cancer affecting internal organs. AI is also employed in identifying colon polyps, significantly improving the accuracy of colonoscopies and matching the effectiveness of skilled endoscopists. Moreover, a study of a social media forum revealed that users seeking healthcare information often preferred responses from AI-powered chatbots over those from physicians, rating the chatbot's answers as higher in quality and empathy.⁸

Healthcare organizations' plans to use generative AI (gen AI)⁹



Recognizing the potential benefits, many organizations are already taking steps toward adoption. A recent survey found that more than 70% of respondents from healthcare organizations — including payers, providers, and healthcare services and technology (HST) groups — are either pursuing or have implemented AI capabilities, with most still in the proof-of-concept stage as they weigh the trade-offs of returns, risks, priorities, and governance. Yet, despite this interest, a consistent portion of respondents have no immediate plans for AI, instead maintaining a cautious, wait-and-see approach. Among the hurdles that might be giving them pause, risk concerns top the list — whether related to privacy, clinical outcomes, or regulatory compliance — underscoring the need for robust governance and mitigation strategies. Other significant barriers include insufficient technical capabilities, data and infrastructure limitations, and proving value, reflecting a broader issue of limited tech readiness and skilled talent in deploying AI solutions. Of those surveyed who are implementing AI, 59% are partnering with third-party vendors to create customized solutions, while 24% plan to build in-house, leaning on skilled talent from outside partners.¹⁰

NOTEWORTHY ROBOTICS ADVANCEMENTS IN HEALTHCARE

Today, healthcare facilities have access to a range of medical robots designed to perform specific functions.

• || TYPES OF ROBOTS || •

Robots are revolutionizing healthcare by providing greater precision, reliability, and support in medical procedures. From performing complex surgeries to assisting in rehabilitation, medical robots are becoming indispensable tools in hospitals and clinics worldwide. Their ability to deliver precise, minimally invasive procedures helps improve patient outcomes, reduce recovery times, and alleviate the workload of healthcare professionals. With innovations like robotic-assisted surgery systems, remote-controlled telemedicine robots, and AI-driven diagnostic tools, healthcare is embracing a new era where technology enhances human capabilities.

By 2025, the robotics market is projected to be worth \$12.7 billion, driven by the demand for improved medical services and technological advancements.¹¹

The rapid growth of the medical robotics market highlights the potential for even greater integration of these technologies into patient care. By 2025, the robotics market is projected to be worth \$12.7 billion, driven by the demand for improved medical services and technological advancements.¹² Hospitals are leading the way, incorporating robots to enhance surgical capabilities, streamline administrative tasks, and provide personalized care. As medical robots continue to evolve, they promise to make healthcare more efficient and accessible, ultimately allowing doctors and caregivers to focus on providing excellent patient care.

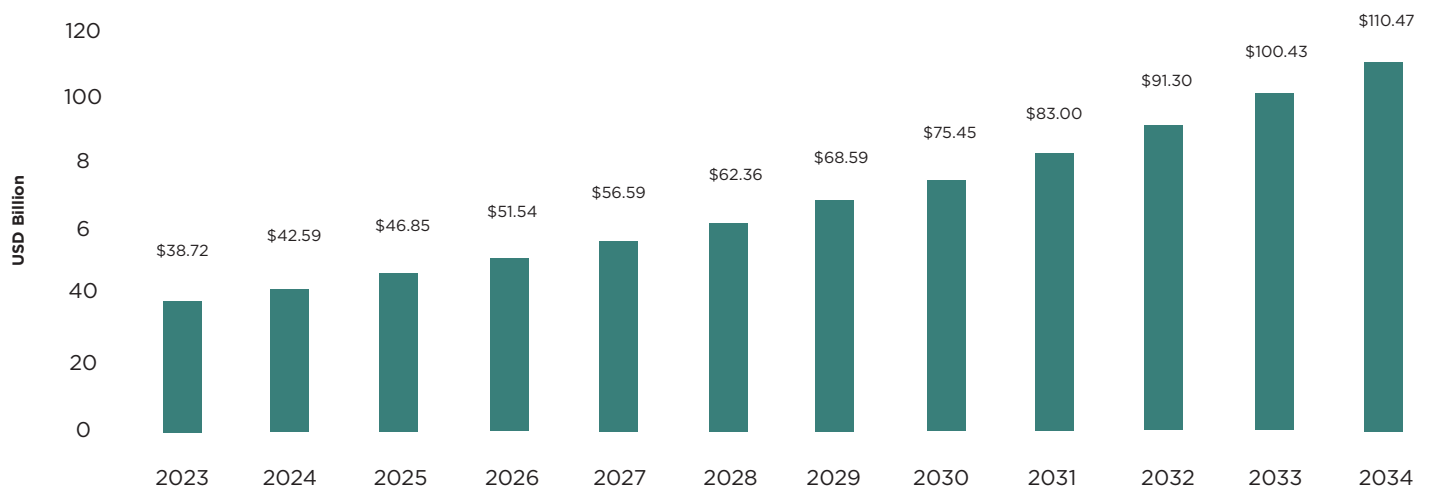
As healthcare systems face increasing pressure from disruptive forces like the COVID-19 pandemic, cutting-edge technologies are emerging as powerful tools to alleviate the strain. Robotics is at the forefront of these innovations, playing a crucial role in transforming various aspects of patient care and improving efficiency. For example, diagnostic robots such as DAISY — the Diagnostic AI System for Robot-Assisted A&E Triage — have the potential to streamline the triage process in emergency rooms by swiftly collecting patient data, which can help medical professionals make more informed decisions faster. Innovations like these reduce waiting times and help healthcare staff focus on treating those with the most critical needs.¹³

Robotics is also reshaping the surgical landscape, mobility support, telemedicine, and medical training. Robotic-assisted systems like the Da Vinci and Stryker's Mako are revolutionizing surgeries by allowing greater precision and minimally invasive procedures, improving patient outcomes, and reducing recovery times. Outside of the operating room, exoskeletons and advanced prostheses are providing new mobility opportunities to disabled individuals, enhancing their quality of life. In telemedicine, robotics are pushing the boundaries of remote care, with innovations like the PillBot enabling patients to undergo endoscopic procedures from home. Additionally, training initiatives like a humanoid robot from the University of California San Diego are equipping medical students with realistic, hands-on experience, further preparing them for the complexities of patient interactions.¹⁴

Spotlight on Automation

Automation is transforming healthcare in unprecedented ways, driving solutions to some of the sector's most persistent challenges. Faced with rising costs, expanding patient populations, and the critical issue of staff burnout, healthcare providers are increasingly turning to automation to streamline processes, enhance efficiency, and ultimately improve patient outcomes. From automating administrative tasks to harnessing the power of AI in diagnostics, automation promises to free healthcare professionals from repetitive duties, allowing them to deliver high-quality patient care.

Healthcare Automation Market Size and Forecast 2024 to 2034¹⁵



These promises are fueling a surge in the healthcare automation market, which is projected to grow from \$42.59 billion in 2024 to approximately \$110.47 billion by 2034. This growth is driven by the increasing adoption of telemedicine services, cost-reduction initiatives, personalized treatment, and improved data management practices. North America is currently at the forefront of this movement, bolstered by advancements in medical technology, heightened government funding, and a growing demand for more efficient healthcare solutions. In the U.S., a high number of ongoing clinical trials and the increasing adoption of cutting-edge healthcare devices are further propelling this growth, solidifying the region's role as a leader in healthcare automation.

What is healthcare automation?

Automation in healthcare goes beyond robots. It includes diverse technology solutions that reduce human intervention using AI, machine learning, and data analytics to improve workflows and decision-making.

Examples include:

- 1 Software:** Automating administrative tasks like scheduling, billing, and reporting.
- 2 AI tools:** Analyzing medical images, identifying patient data patterns, and aiding diagnoses.
- 3 Robotic systems:** Assisting surgeries, dispensing medication, and automating lab processes.

Data interoperability is another critical area in which automation is reshaping healthcare. Traditionally, patient data has been siloed across multiple sources, forcing physicians and caregivers to piece together information to create a complete picture of a patient's health. This costs valuable time, with physicians spending an average of four hours per day reviewing and updating healthcare records. Investing in healthcare data interoperability can open new doors to improving outcomes and, quite literally, saving lives. Improved data sharing across platforms can significantly enhance a physician's ability to make timely and informed decisions, which directly impacts patient survival and quality of care.

The rise of automation in healthcare is driven by the significant benefits it provides to various stakeholders within the system. By automating tasks like scheduling, billing, and reporting, healthcare providers can allocate more time to patient care, improving both efficiency and productivity. Automation also enhances data accuracy, minimizing errors and supporting better-informed clinical decisions. Meanwhile, patients benefit from increased satisfaction and engagement through features like automated reminders and online communication tools. Alleviating administrative burdens also aids in reducing staff burnout, fostering a more positive work environment.

Navigating A Digital Skills Gap in Healthcare

In a recent survey of healthcare organizations, 43% of respondents identified the lack of specialized talent as the primary hurdle to digital progress.¹⁶

The healthcare industry is facing a growing challenge in finding professionals with the necessary digital skills to support its rapid technological transformation. In the wake of COVID-19, the demand for tech-savvy specialists surged, yet a significant skills gap remains. In a recent survey of healthcare organizations, 43% of respondents identified the lack of specialized talent as the primary hurdle to digital progress, followed by funding constraints and organizational silos. This shortage has been a persistent barrier since 2020, as healthcare's reliance on technology continues to expand.¹⁷

The accelerated adoption of digital solutions, such as AI-driven applications and remote care technologies, has heightened the need for employees who can seamlessly integrate these innovations into daily operations. Many healthcare workers, however, lack experience with these tools, exacerbating the problem. As AI-based solutions, like virtual nursing and patient monitoring, gain prominence, the shortage of skilled professionals capable of implementing and maintaining these systems is becoming even more pressing. The post-pandemic shift toward hybrid and remote work has also contributed to the demand for skilled employees who can manage these new work environments.¹⁸

In-Demand Technology Jobs in Healthcare¹⁹

1	Business Analysts	6	Credentialing Specialists
2	Data Analysts	7	Software Engineers
3	Directors of Business Development	8	Network Engineers
4	Application Analysts	9	Research Fellows
5	Business Systems Analysts	10	Systems Analysts

To address these challenges, healthcare organizations must invest in upskilling and reskilling initiatives, ensuring that their workforce is prepared to handle emerging technologies. Educational methods need to evolve, incorporating digital literacy and career flexibility into training programs. Retention strategies should also focus on combating burnout, as many healthcare professionals are stretched thin due to staffing shortages. Innovative solutions like generative AI, which could augment up to 40% of all working hours in healthcare, offer a potential lifeline — but only if workers are equipped to harness its capabilities.²⁰

To navigate the challenges of a rapidly evolving industry, healthcare institutions are increasingly recognizing the importance of skill gap assessments. Yet, fewer than 1-in-5 medical groups currently utilize them, according to industry data. Among those who do, many highlight their value in improving both clinical and administrative outcomes. For example, one respondent shared how regular assessments of revenue cycle staff led to more accurate payer loads and faster claims processing, ultimately reducing accounts receivable. Meanwhile, leveraging clinical assessments — particularly for nurses and medical assistants — has proven equally beneficial, leading to reduced patient harm and higher staff engagement.²¹ By prioritizing these kinds of continuous learning strategies, healthcare organizations can ensure a skilled, adaptable workforce, enhancing both patient care and operational efficiency.

Solutions

Integrating AI, robotics, and automation in healthcare hinges on having the right workforce to implement, manage, and work alongside these technologies. It's ultimately a staffing challenge, requiring skilled professionals who can adapt to new roles, understand advanced systems, and bridge the gap between technology and patient care.

All's Well Healthcare Services has guided countless healthcare organizations through times of change through a staffing approach designed for the future. Together with AllSTEM Connections, a leading staffing company for STEM fields, we are uniquely positioned to assist providers in realizing a vision for a future of healthcare powered by technology.

These are five of the top solutions we're recommending to help our clients embrace the future of AI, robotics, and automation in healthcare:

- 1. Conduct skills gap assessments:** Pinpoint areas where staff may need training to use AI, robotics, and other automation tools effectively. Despite their importance, fewer than one in five medical groups currently utilize skills gap assessments, according to industry data. Among those who do, many report improvements in both clinical and administrative outcomes, highlighting the value of proactively addressing skill shortages.
- 2. Focus on upskilling and reskilling:** Develop upskilling and reskilling programs to prepare your workforce for a future of healthcare powered by technology. Investing in continuous learning opportunities will help bridge skill gaps and enable staff to confidently work alongside emerging technologies, ultimately enhancing patient care and operational efficiency.
- 3. Break down silos:** Encourage collaboration between IT specialists and medical professionals. By fostering cross-functional teamwork, healthcare workers can learn from each other, bridging gaps between clinical expertise and technological fluency, which can help speed up the rate of innovation.
- 4. Pilot the use of new technology:** Provide hands-on experience with AI, robotics, and automation, allowing healthcare workers to build confidence in using these tools effectively. By integrating technology use into day-to-day operations and structured training scenarios, staff can learn by doing, which accelerates their comfort and competence with advanced systems, leading to better patient outcomes.
- 5. Develop third-party partnerships:** Partner with universities and academic training centers to create specialized curricula on healthcare technology and its applications. These collaborations help cultivate a pipeline of tech-savvy professionals who are ready to embrace automation and innovation in the healthcare sector, thereby meeting the growing demand for technologically skilled healthcare workers.

About All's Well

www.allswell.com

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