WHITE PAPER

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Artificial Intelligence In Healthcare Worker Sourcing And Staffing

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The healthcare sector is undergoing a chronic labor shortage with a systematic training lag limiting the expansion of the skilled workforce for the foreseeable business cycle. This includes physician, pharmacist, nursing and support roles. In this environment, sourcing (recruitment) and staffing have gained critical importance. Artificial intelligence (AI) enabled sourcing and staffing solutions in this space represent a growth avenue worth consideration alone or as part of a larger platform. Target analysis in this environment requires an understanding of not only market, but federal and state regulatory and legislative trends shaping this emerging technology. Herein, we explore the opportunities and regulatory challenges of AI-integrated solutions in healthcare worker sourcing and staffing solutions.

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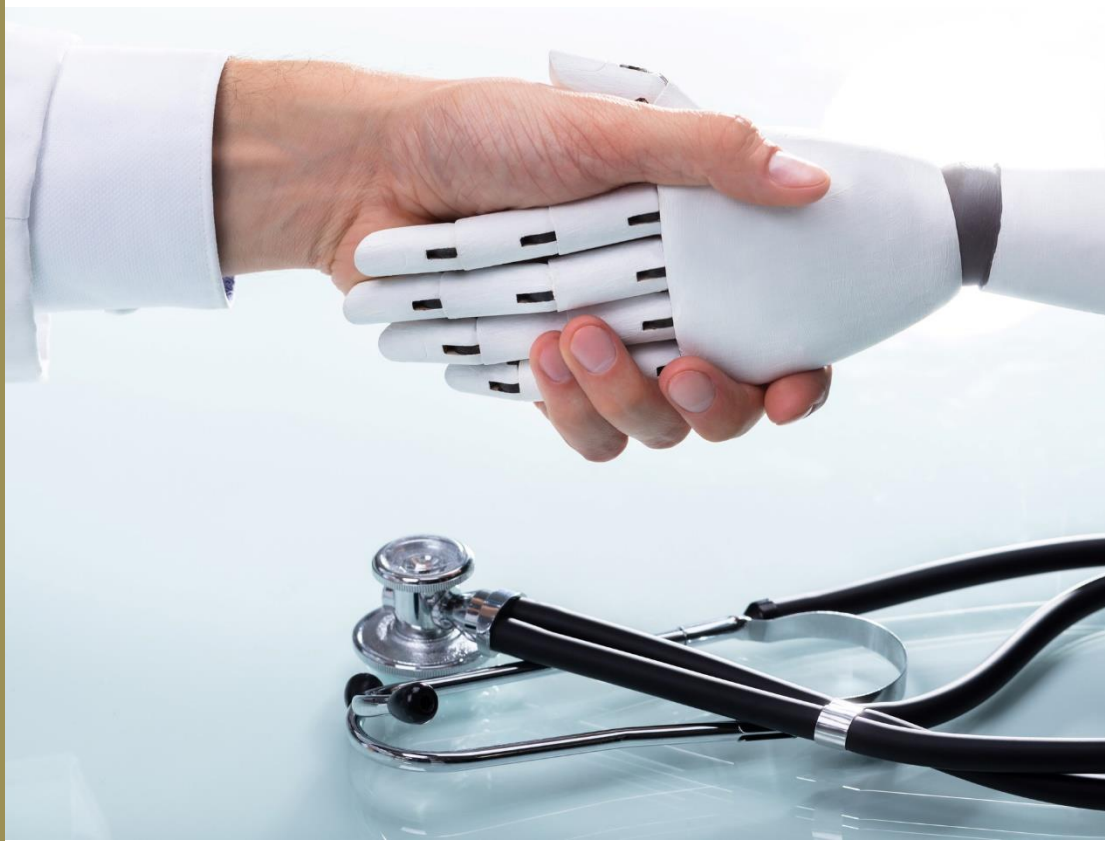

I. Growing Provider Shortages Demand Efficiency Solutions

The US faces provider shortages, from physicians to nurses to pharmacists and ancillary care providers. The Association of American Medical Colleges forecasts a deficit of ~18K–48K primary care physicians and ~21K–77K non-primary care physicians over the next 12 years.[1] The Health Resources and Services Administration estimates a pharmacist shortage of between ~18K–57K by 2030.[2] The trend is even more pronounced in nursing, where the US could see a deficit of ~200K–450K registered nurses available for direct patient care by 2025, a 10–20% gap that places great demand on the nurse graduate pipeline over the next three years.[3] Together, a two-fold challenge exists 1) identifying and recruiting qualified candidates and 2) staffing healthcare workers efficiently to prevent burnout and cover labor limitations.

Artificial Intelligence (AI) is being utilized to improve these processes beyond human resource limitations of involvement and analysis. AI is designed to operate with varying levels of autonomy for explicit or implicit objectives to generate predictions, recommendations, or decisions.

II. Improving Healthcare Employee Sourcing Through AI

Overall hospital staff turnover is at 22.7% (2022), up from 17.8–19.5% between 2018–2020. On average, hospitals are experiencing a 22.5% nurse turnover rate (2022), up from 17.2–18.7% in 2018–2020.[4] Furthermore, healthcare is facing a retirement time bomb, wherein the average age of nurses is 57,[5] compared to 53.2 among physicians[6] and only 41[7] among pharmacists. Filling these roles is both time consuming and expensive. The average time to fill a position in health care is 49 days, compared to only 36 days[8] across industries in the US. The average time to recruit a RN range from 2–4 months.[9] Herein lies opportunities to leverage technological solutions to improve employee sourcing in healthcare. Indeed, the American Hospital Association has emphasized the need for technological solutions in its short- and long-term strategies to strengthen the healthcare workforce.

Traditional candidate sourcing is typically limited to the number of channels a hiring manager can manage to comb through. Those channels seldom change over time and eventually dry up of new, qualified candidates.

[1] www.aamc.org/news/press-releases/aamc-report-reinforces-mounting-physician-shortage [6/2023]
[2] bhw.hrsa.gov/sites/default/files/bureau-health-workforce/data-research/pharmacists-2016-2030.pdf [6/2023]
[3] www.beckershospitalreview.com/workforce/us-faces-deficit-of-450-000-nurses-by-2025.html [6/2023]
[4] 2022 NSI National Health Care Retention and RN Staffing Report.
[5] www.medpagetoday.com/nursing/nursing/104053 [6/2023]
[6] www.beckersasc.com/asc-news/physicians-average-age-by-specialty.html [6/2023]
[7] www.zippia.com/retail-pharmacist-jobs/demographics/ [6/2023]
[8] www.viventium.com/understanding-time-to-fill-in-health-care [6/2023]
[9] www.beckershospitalreview.com/workforce/the-cost-of-nurse-turnover-in-24-numbers-2023.html [6/2023]

TABLE 1: Artificial Intelligence Enabled Sourcing And Staffing Platforms

Company *Website*	Healthcare AI Enablement		Description
	Sourcing	Staffing	
Arena *arena.io*	√		The platform uses cutting-edge predictive analytics and AI to help employers better discover and retain talent while mitigating bias in the hiring process.
Besthires.ai *besthires.ai*	√		An AI-based hiring platform using sophisticated machine learning to pinpoint best candidates for jobs. The technology analyzes a person's personality, needs, values and past performance to help match the best candidate to the best job.
Paycor *paycor.com*	√		An AI-fueled bot that helps hospitals and health systems identify and recruit talent.
Vivian Health *vivian.com*	√		The marketplace allows hospitals and staffing agencies to hire the most relevant and qualified candidate for a specific role as quickly and cost-efficiently as possible. Real-time messaging, recruiter templates, and AI-based matching allow employers to cut down on unnecessary and time-consuming back-and-forth that is all too common in the healthcare recruiting industry.
HireVue *hirevue.com*	√		A talent experience platform designed to automate workflows in order to improve the scaling of hiring. Features improve how a Company can engage, screen, and hire talent with text recruiting, assessments and video interviewing software including conversational AI.
PandoLogic *pandologic.com*	√		A programmatic job advertising and vendor management platform. Big data, AI, and proprietary cognitive engines enable companies to source quality applicants more effectively and efficiently. The platform automates and optimizes job advertising; from the early stages of job classification and targeted distribution to real-time budget allocation and dynamic bidding across diverse job categories.
DirectShifts *directshifts.com*	√	√	The platform is an AI-powered healthcare recruitment platform that streamlines and modernizes the process of matching clinicians to jobs and on-boarding them.
Retrain.ai *retrain.ai*	√	√	A talent intelligence platform designed to help enterprises hire, retain, and develop their workforce, intelligently. Leveraging the power of AI and real-time market data, enterprises unlock key talent insights and optimize the hiring and upskilling of their workforce. For employees, our Talent Intelligence Platform seamlessly assesses the skills they have today, the skills they need for the future and delivers the resources they need to get them there.
Beeline *beeline.com*		√	The platform offers workforce intelligence solutions for companies to manage their contractor and project-based labor force. At the heart of their internal AI platform is the Beeline Knowledge Graph. A Knowledge Graph platform treats all of an enterprise's data as an actionable asset and as a whole.
Polaris Health *polarishealth.ai*		√	The platform analyzes and automates scheduling to deliver efficiencies and savings. It uses AI to predict a department's peaks and valleys, then load your data to identify the perfect staff schedule for their patient volume.

AI-powered hiring software allows organizations to broaden their candidate sourcing and their talent pools by searching sources such as social media networks, professional communities, portfolio sites, resume databases and job boards for qualified candidates (TABLE 1). The software has the power to review millions of profiles in seconds based on dozens of data points to identify more candidates than manual sourcing could ever allow. This includes locating passive candidates which make up the lion share of talent. The acceptance of these measures has been prompted by the increasing integration of AI across various industries, including healthcare, as well as within departments such as human resources (HR).

A recent survey in the United States revealed that 98% of HR professionals already "somewhat" rely on HR software and algorithms when making decisions related to reducing labor costs.[10] Stanford Health Care and Mercy Health System are two examples that utilize AI to seamlessly identify and connect with active and passive candidates. Both employing AI chatbots, the latter noted a 10% increase in nursing hires and 14% increase in hires overall.

AI-enabled solutions focus on different aspects of hiring, from sourcing to retaining skilled employees. Vivian Health, Paycor and PandoLogic are two examples of companies working to improve employee sourcing.

Vivian Health boasts 1M+ healthcare professionals on their platform which utilizes AI-based matching to reduce recruitment time.

Paycor's AI-powered platform taps into 1.5B profiles, eliminates old and discriminatory keyword searches, and prioritizes talent. Through a fully automated process, Paycor engages with hundreds of candidates per job and boosts the interview pipeline.

PandoLogic's programmatic job advertising solution pandoIQ uses predictive capabilities to recommend an optimal budget, job title and expanded location radius. In one example, the Company worked with a Southern Illinois-based healthcare system to reshape their recruitment strategy following a loss of staff members during the second COVID surge. The Company claims to have increased traffic to their career site by 314% and cut down hire time to 8 days.

III. Improving Healthcare Employee Staffing With AI

Even as the COVID-19 pandemic has waned, staff shortages and an increasingly exhausted workforce has remained persistent. Even large health systems have largely failed to automate staffing, scheduling and timekeeping. The loss to efficiency has been describe as staggering. In early 2022, almost one in two (47%) healthcare professionals reported feeling burned out, up from 42% the prior year.[11]

[10] www.capterra.com/resources/recession-planning-for-businesses/ [6/2023]
[11] Medscape Physician Burnout & Depression Report 2022: Stress, Anxiety and Anger.

Staff shortages are now the number one concern among hospital executives.[12]

Many hospitals are identifying the issue and turning to AI to help predict and manage capacity, staying ahead of unpredictable circumstances by using scheduling and backlog management tools. With the help of machine learning algorithms, AI can analyze data to predict future staffing needs. This enables healthcare organizations to proactively plan their staffing requirements and ensure they have enough staff to meet patient needs. Predictive analytics can also help identify high-risk patients, which can help healthcare organizations allocate staff more efficiently.

Several examples are emerging of hospitals that have been successful at utilizing AI as part of their medical staffing solutions **(TABLE 1)**. The University of California, San Francisco medical school and hospital has seen improved patient satisfaction, reduced staffing costs and improved utilization of staff members. By using AI, medical facilities can ensure that they are getting the most out of their sometimes limited staffing resources. For Baptist Health, where persistent staffing challenges existed, smart scheduling tools yielded an 11.1% increase in prime time utilization (PTU) from Q1 FY21 to Q1 FY22.[13]

Examples of product features in action include Polaris Health and Retrain.ai. Polaris Health's AI solution predicts patient volume to the hour and the number of physicians and nurses needed to meet patient demand for up to four weeks in advance. The platform also optimizes scheduling of existing provider resources. Retrain.ai assisted a healthcare system to map the skills in their organization and engage their workforce in order to identify and motivate internal candidates for career growth and retention.

IV. The Regulatory Environment Is Rapidly Evolving At A State And Federal Level

The US Equal Employment Opportunity Commission (EEOC) recently announced that it intends to increase oversight and scrutiny of AI tools used to screen and hire workers. As part of that effort, the EEOC held a public hearing on January 31, 2023 to explore the potential benefits and harms of AI in hiring situations.

On April 27, 2023, the White House released a request for information (RFI) on how AI is "being used to surveil, monitor, and manage workers." Congress is also considering the Algorithmic Accountability Act, which, if passed, would require employers to perform an impact assessment of any automated decision-making system that has a significant effect on an individual's access to, terms, or availability of employment. Identical versions of the Algorithmic Accountability Act enjoyed broad Democratic support in both the Senate and the House during the

[12] www.fiercehealthcare.com/hospitals/hospital-ceos-workforce-shortages-outweigh-financials-top-concern-2021[6/2023]
[13] www.chiefhealthcareexecutive.com/view/how-health-systems-can-use-ai-to-overcome-staffing-shortages [6/2023]

117th Congress, but neither version was able to obtain any Republican cosponsors.

More broadly, federal lawmakers and policymakers have expressed increasing alarm about AI. On May 16, 2023, the Senate Judiciary Committee's Subcommittee on Privacy, Technology, and the Law and the Senate Homeland Security and Governmental Affairs Committee held public hearings to discuss AI issues. On June 21, 2023 Senate Majority Leader Chuck Schumer (D-NY) announced a broad, open-ended plan for regulating artificial intelligence. The plan, according to Schumer will begin with at least nine panels to identify and discuss the hardest questions that regulations on AI will have to answer, including how to protect workers

Action has been most swift at the state level. The NYC 144 law requires employers to notify candidates if they are using AI-based hiring tools and give them the option to learn which data is collected. The law also requires these companies to hire independent auditors to annually review their AI tools for potential bias; the reports of these audits must be published publicly. New York City joins a growing list of jurisdictions that are enacting legislation to govern the use of AI in the workplace. California, New Jersey, New York, Vermont and the District of Columbia are also working on laws to regulate AI in hiring. Illinois and Maryland have enacted laws limiting the use of specific AI technologies, often for workplace surveillance and the screening of job candidates.[14]

Overseas, the European Parliament voted (June 2023) to confirm its negotiating mandate for the AI Act, a major milestone which unlocks the next stage of negotiations toward a pan-EU rulebook for artificial intelligence. The law assigns applications of AI to three risk categories. Among them, high-risk applications, such as a CV-scanning tool that ranks job applicants, are subject to specific legal requirements.[15]

V. Future Considerations

Target analysis in this environment requires an understanding of federal and state regulatory and legislative policies guiding use of AI and digital enablement, as well as a European perspective on emerging legislation which may impact policy development in the US. It also requires market access knowledge of provider dynamics and strategic analysis on the AI landscape in healthcare applications, in addition to market size and growth. With extensive experience in digital enablement of sourcing, staffing and workplace efficiency, Marwood's services connect policy with market dynamics and strategy. Our performance improvement arm routinely engages clients in operational & financial performance studies including revenue cycle management, cost reduction, integration and strategic plans drawing upon knowledge of efficiency mechanisms, which increasingly include AI.

[14] www.nytimes.com/2023/05/25/technology/ai-hiring-law-new-york.html [6/2023]
[15] artificialintelligenceact.eu/ [6/2023]

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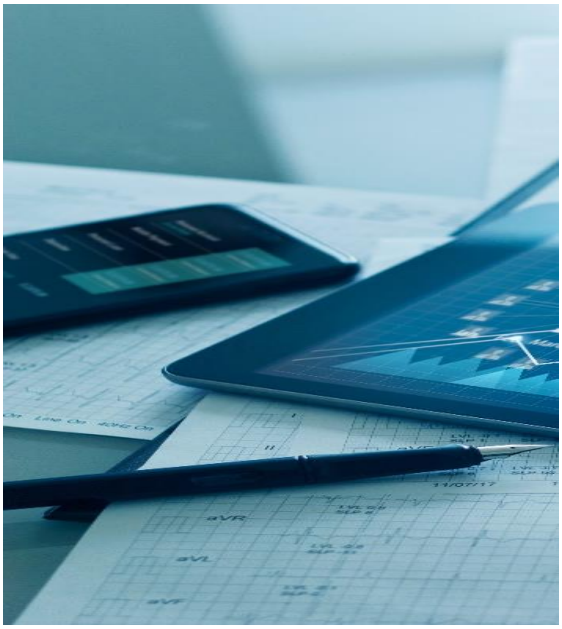

DISCLOSURES