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Utilizing Systems Thinking Approach to Enhance Veteran Outreach and Physician Wellness for the Development of an AI Assisting Tool

Branson Owens, Kayla Sin, Dylan D'Agostino, Reginal Sarsah, Joseph DeMartino, and Dr. Ahmed Bahabry

Department of Systems Engineering, United States Military Academy, West Point, New York 10996

Corresponding author's Email: sin.kayla@gmail.com

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Abstract: Artificial Intelligence (AI) is reshaping decision-making within the healthcare sector and operational efficiency within the Department of Defense (DoD). AI accomplishes this by supporting physicians in diagnostics. AI can enhance physician wellness by reducing administrative burdens and providing decision support. Within the DoD, AI's ability to efficiently process large datasets can improve access to care for service members. This paper captures the complexity of the pharmaceutical industry interactions using the system thinking DSRP (Distinctions, Systems, Relationships, and Perspectives) methodology, adding the perspective of leveraging AI in provider prescription practices. This paper uses a Systemigram to visualize the development of an AI to assist Army medical providers, which is translated into a functional hierarchy as a blueprint for this generative AI tool. This tool would document notes and generate recommendations for physicians to reduce physician workload. This paper synthesizes current research to identify AI's potential development and application in future work.

Keywords: Artificial Intelligence (AI), DSRP Methodology, Systemigram, Stakeholder Analysis, Physician, Pharmaceutical Industry, Visual Model.

1. Introduction

The healthcare sector, particularly within the Department of Defense (DoD), operates within a complex and evolving landscape shaped by operational demands, resource limitations, and advancements in medical technology. While AI has begun transforming diagnostics, treatment protocols, and patient care, its potential to enhance physician wellness and operational efficiency remains underutilized. Despite significant technological advancements, administrative processes, and physician support; systems have remained relatively unchanged, necessitating an adaptation to improve efficiency and reduce physician burnout (Morgan, 2022). To address these challenges, healthcare systems, including those within the DoD, are turning to artificial intelligence to enhance physician support and wellness. AI's advanced data analysis, machine learning (ML), and natural language processing (NLP) capabilities offer new ways to streamline medical documentation, improve diagnostic accuracy, and support clinical decision-making (Kassem et al., 2022; Han & Lee, 2021). These technologies optimize resource allocation, mitigate operational risks, and provide predictive insights into patient outcomes and system performance, enhancing both physician well-being and healthcare delivery (Rane et al., 2024).

Physician burnout has been linked to increased turnover, reduced patient satisfaction, and worsened safety outcomes (Shapiro et al., 2018). The Federation of State Medical Boards (FSMB) has recognized physician wellness as a patient safety issue, emphasizing the need for systemic strategies to mitigate burnout and improve physician well-being (FSMB, 2018). AI-driven solutions can support these efforts by reducing administrative burdens, streamlining workflows, and enhancing decision-making processes. AI-powered electronic health records (EHR) systems, automated documentation, and virtual assistants can alleviate cognitive overload and allow physicians to focus more on patient care rather than clerical tasks (Shapiro et al., 2018). Furthermore, AI can help identify early signs of burnout through data analytics and predictive modeling, enabling proactive interventions to support physician wellness.

In the context of Veteran Affairs healthcare, "The US Department of Veterans Affairs National AI Institute" proposed a Trustworthy AI Framework tailored for federal healthcare with six principles: purposeful, effective and safe, secure and private, fair and equitable, transparent and explainable, and accountable and monitored. This framework aims to manage risks and build trust, which is essential given the vulnerable nature of the veteran population and the sensitivity of their medical

histories (Isaacks, 2015). Establishing trust within these AI systems is crucial before their full-scale implementation in VA healthcare settings.

This paper applies the DSRP framework and systems thinking approach to analyze the pharmaceutical industry as a holistic system, providing stakeholders with a structured perspective on AI's potential impact. Using Systemigram modeling, we visualize the intricate relationships between pharmaceutical companies, healthcare providers, insurers, regulatory bodies, and patients, highlighting how AI can optimize decision-making, resource allocation, and patient engagement.

2. DSRP Methodology

By distinguishing how the different sectors in the healthcare system interact, we can better assess how AI enhances healthcare management and pharmaceutical outreach, particularly within the Department of Defense (DoD) medical system. In this system, key distinctions include AI as a support tool rather than an autonomous decision-maker. This differentiation is crucial in ensuring that physicians remain the final authority in making medical decisions. Additionally, we must distinguish between AI's ability to recognize patterns in medical data and its limitations in clinical judgement, which will remain a human function. AI introduces distinct advantages in prescription analytics and physician decision-making that set it apart from traditional methods. Conventional approaches rely on physicians to manually write doctor notes that take lots of time and contribute heavily to the burnout. AI, on the other hand, can enable rapid data processing and patterns recognition, thus allowing for the identification of optimal treatment regimens that are tailored to individual patients. In this context, "optimal" refers to improving efficiency by reducing administrative workload for physicians while maintaining patient safety and ensuring insurance integration. It does not imply fully autonomous AI-driven decision-making but rather an augmentation of clinical judgement. AI has the ability to analyze extensive biological and clinical data like prescription trends and patient records that assist physicians in selecting the most effective medications while also mitigating risks (Vora et al., 2023).

Viewing AI as an integral part of the broader healthcare system highlights its role in the healthcare environment. AI acts as a real-time analytical tool embedding into the electronic health record infrastructure, helping providers assess historical prescribing patterns and flag potential drug interactions. The pharmaceutical and medical sectors encompass research, diagnostics, treatment planning, and prescription monitoring. AI enhances these processes by assisting physicians in evidence-based decision making by improving compliance with treatment protocols and personalized medical plans based on patient history. Within the DoD medical system, AI facilitates the coordination of care for service members and veterans by optimizing supply chain logistics for military pharmacies (Paul et al., 2021). By reducing human workload and accelerating timelines, AI acts as a unifying force that enhances the efficiency of each component while contributing to the industry's overall productivity (Paul et al., 2021). This interconnected application of AI ensures that all parts of the pharmaceutical system, including research, development, and product management, function synergistically to achieve better outcomes in shorter timeframes (Paul et al., 2021).

The action-reaction dynamic between AI and data processing showcases how the technology interacts with the industry's core functions. The relationship between AI and physicians is symbiotic. AI assists in pattern recognition and treatment recommendations, but physicians validate and apply clinical expertise. AI also interacts with pharmacists, who verify prescriptions for compliance and safety. Patients engage with AI through adherence-tracking applications, which send medication reminders and monitor side effects. These interconnected relationships define the role AI plays in assisting healthcare decision making. By enabling the rapid processing of large datasets, AI accelerates data analysis and also create ripple effects across related activities. This capability is especially critical in the military where rapid deployment scenarios and limited access to specialists is common. AI applications in drug discovery further enhance military healthcare by identifying potential treatments for combat-related injuries, PTSD, and battlefield infections. Additionally, AI streamlines medication adherence monitoring by integrating with wearable technology, allowing DoD healthcare providers to track service members' adherence to prescribed regimens and intervene when necessary (Rahane, Shukla, & Patil, 2018). AI models can quickly analyze data from multiple experiments and identify the most promising formulations which makes medication testing and production much more efficient (Prusty, Panda, 2024). These interactions underscore the broader relationships between AI and each function in the industry, revealing how AI's presence prompts an adaptive response that leads to improved efficiency, effectiveness, and responsiveness within the pharmaceutical and DoD ecosystem (Rahane, Shukla, & Patil, 2018).

Different stakeholders perceive AI's role in prescription management through distinct lenses with different views. Physicians may see AI as a time-saving tool that reduces administrative burden, whereas hospital administrators may focus on cost-efficiency and scalability. Patients might be skeptical of AI-driven recommendations due to concerns over data privacy and trust. Policymakers and regulators emphasize safety, ensuring AI recommendations comply with medical ethics and legal requirements. These varying perspectives must be considered to implement AI in a way that balances efficiency, safety, and trust. Our team conducted an interview with a retired Army physician who now practices in the private sector. He explained that physician burnout stems from long hours spent on administrative work. He also emphasized that AI has the potential to be

a transformative tool in healthcare by improving EHR documentation, personalizing treatment, and enhancing prescription safety (Haque, Mohamad). AI-driven analytics empower military and civilian doctors to be able to adjust their treatment plans dynamically based on evolving patient data. AI is a means to alleviate some of the burden physicians face which compounds over time. This point of view positions AI as essential for achieving long-term goals in a landscape that is constantly evolving and facing pressure to meet both regulatory standards and patient expectations.

By applying the DSRP framework to AI's role in physician decision-making reveals its broad impact on military and civilian healthcare. Distinguishing between AI-driven and traditional methods highlights AI's superiority in predictive accuracy and safety. The systems view underscores AI's function as an integrative force linking physicians, pharmacists, and healthcare administrators, ensuring seamless success. Relationships within the system reveal how AI-driven analytics prompt adaptive responses in clinical practice, leading to more effective medication selection, improved patient adherence, and enhanced safety monitoring. By incorporating AI into management, military and civilian physicians alike can deliver more precise and effective patient-centered care.

3. Systemigram

To better fully understand the complexity of the system, a visual diagram was constructed based on the DSRP analysis, shown in Figure 1 below. This maps out key components of the pharmaceutical marketplace and highlights important connections amongst a variety of interrelated groups. This Systemigram below provides an aid for ease of understanding and interpretation.

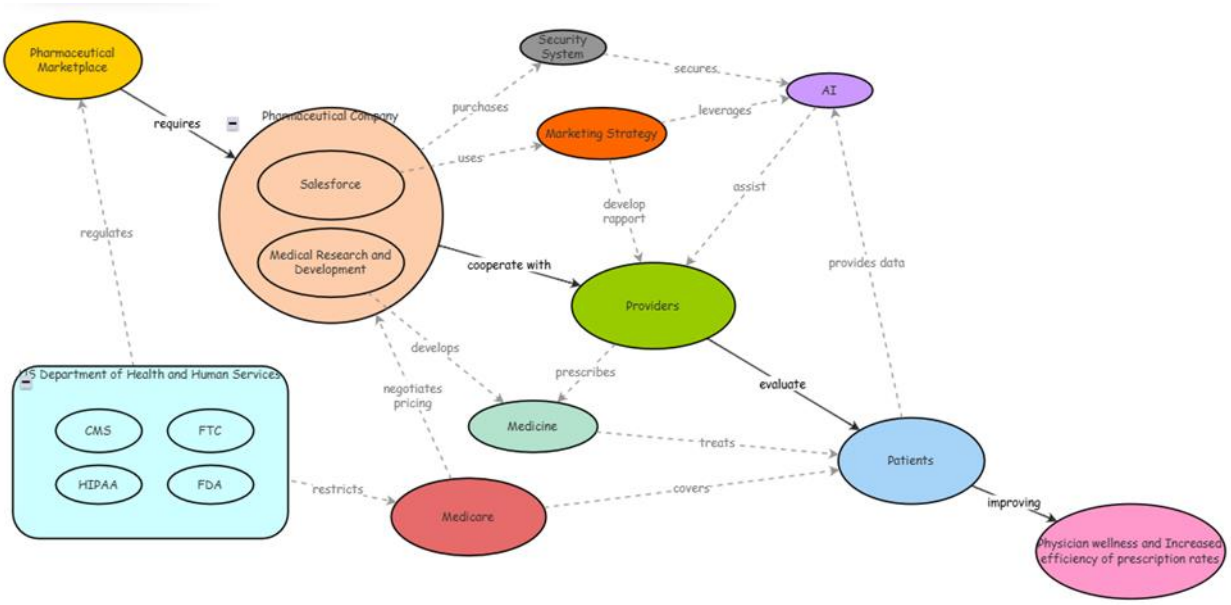

Figure 1. Systemigram of Pharmaceutical Marketplace Incorporating AI

A Systemigram is a visual diagram that narrates a system to make it more understandable. The bolded diagonal from top left to bottom right is called the mainstay, which defines the system's purpose. This diagonal starts with the System of Interest and ends with the end goal of the System of Interest (Sauser, 2019). According to Figure 1, the story of the system is that the pharmaceutical marketplace requires a pharmaceutical company to cooperate with providers that evaluate patients improving physician wellness and increasing the efficiency of prescription rates. The other nodes all represent various entities that influence the system. Each node is a noun and each connecting arrow is the action it performs. The influential nodes were chosen based off research on how the pharmaceutical marketplace functions. The key node to note is the AI node, which is what we propose can help achieve the proposed end state.

4. Functional Hierarchy

By utilizing the Systemigram presented in Figure 1, a functional hierarchy for the AI tool will enable a comprehensive approach to development and implementation, ensuring that all aspects of the pharmaceutical marketplace are thoroughly considered. The functional hierarchy broadly defines the fundamental objective which is broken down into functions that articulate how the system must operate to fulfill that objective. Subfunctions are a means to accomplish the main function. The fundamental objective is to "Develop an AI tool that documents notes and generates recommendations for physicians to reduce physician workload". To do so, the system shall collect patient data, secure patient data, analyze symptoms and medical history, generate treatment plans, manage insurance integration, and comply with regulatory healthcare organizations as seen in Figure 2 below. Under each high-level function is a set of their respective subfunctions which will help accomplish the main function. The purpose of creating this functional hierarchy is to define the system's capabilities while also ensuring that all functions are aligned with the overall goal of the system.

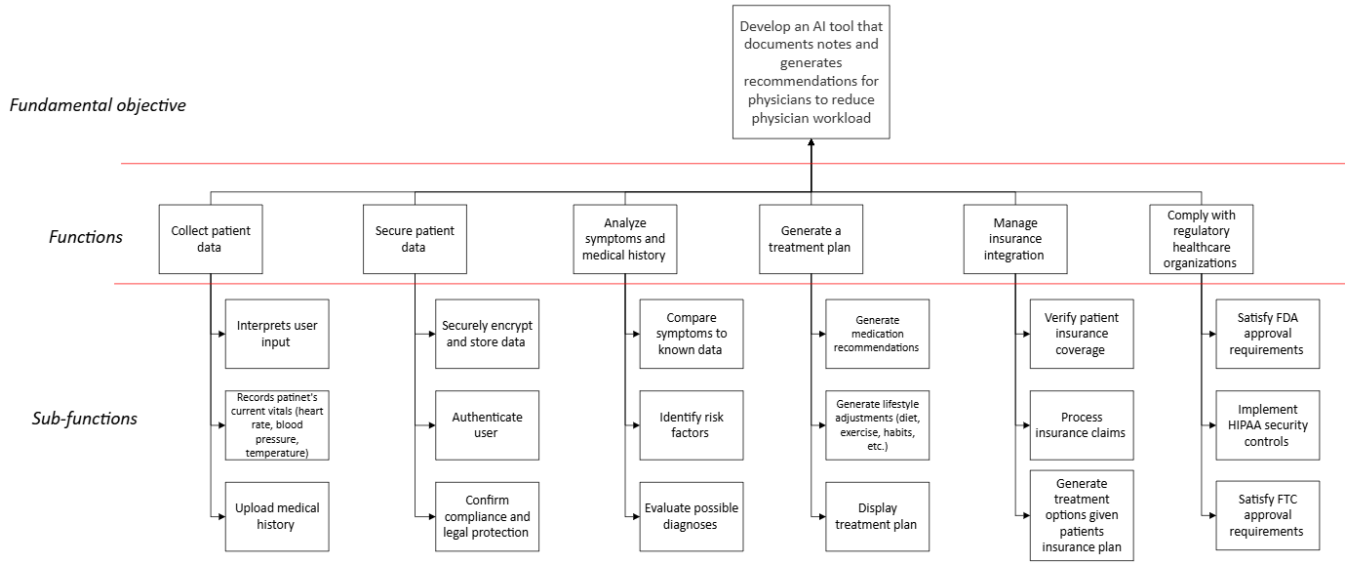

Figure 2. Functional Hierarchy Diagram of AI System

5. Discussion

All nodes of the Systemigram are points of consideration for the development of an AI tool. The system represents a pharmaceutical marketplace and incorporates how the proposed AI system should operate within it. The US Department of Health and Human Services is an entity that regulates the pharmaceutical marketplace, restricts insurance companies, and may be influenced by patient advocacy groups when drafting policies. This government agency node has four main subcategories: Centers for Medicare and Medicaid Services, Federal Trade Commission, Health Insurance Portability and Accountability Act, and the US Food and Drug Administration. These specific organizations enforce protective policies for how the pharmaceutical marketplace operates, focusing greatly on the welfare of the end consumer and ethical considerations.

Within the pharmaceutical company, there are two main departments: Salesforce and Medical Research and Development. In the proposed system, Salesforce uses a marketing strategy that should leverage AI to assist and develop rapport with Army providers. This can help increase prescriptions of their manufactured drugs over competing brands. The Medical Research and Development branch develops medicine for providers to prescribe. The pharmaceutical company also should purchase a reliable security system to protect the information stored in the AI. Ethical concerns increase as healthcare delivery systems expand and security breaches become more common. AI developers must develop strong security measures within these systems to ensure customer privacy and build trust with healthcare providers (Anom, 2020).

While Medicare is restricted by government agencies, it also negotiates the pricing of drugs with pharmaceutical companies. This affects which pharmaceutical drugs are available to military servicemembers and how much the government

pays to cover the cost for the patient. If not under Tricare, there are still copayments veterans must pay. The amount covered by insurance can impact the likeliness of being prescribed or purchasing that specific drug. Insurance only covers patients to a certain extent, depending on military status, which is impacted by how much the pharmaceutical company is willing to price their medications.

Army healthcare providers should be assisted by AI to evaluate patients better and prescribe medicine. AI would be fed patient data securely to reduce note taking work for physicians and use the patients' information and insurance status to better recommend prescription options to the provider. This can make the process more efficient and contribute to the end state of increased physician wellness. Patients are the overall end consumers as they are purchasing and using the prescribed medicine. Patient willingness to purchase prescribed medicine or refill their products is significantly influenced by their insurance coverage, specifically the out-of-pocket costs associated with purchasing medicine. A pharmaceutical company's deals with Medicare and provider's recommendations can increase consistent prescription rates, influencing patients to adhere to their prescribed medical evaluation, which is an aspect of the system's end state.

The translation of the Systemigram to a functional hierarchy more concretely defines objectives for how AI should operate in the pharmaceutical marketplace. The fundamental objective aims to assist Army healthcare providers and optimize their administrative work and prescribing practices. The function "Collect patient data" is derived from the relationship of patients providing data to AI in the proposed Systemigram. The visual diagram also demonstrates how the security system should secure AI, which manifests as the function of "Secure patient data." The story point of AI assisting providers to evaluate patients and prescribe medicine is accomplished by the following two functions: "Analyze symptoms and medical history" and "Generate a treatment plan." As displayed in Figure 1, Medicare covers patients and influences the pricing of medicine, which is something that must be considered when a patient decides to purchase medicine and when a physician decides which medication options to consider more favorably. This signifies the importance of how the AI shall "Manage insurance integration." Lastly, it is important that the AI stays up to date with new government regulations on the pharmaceutical marketplace enforced by government agencies like HIPAA and FDA. This is shown in the function of "Comply with regulatory healthcare organizations."

6. Conclusion & Future Work

Research shows that AI is an emerging technology that improves efficiency across various fields. This can be applied to the pharmaceutical marketplace to improve the efficiency of Army healthcare providers' practices. There is little research or application done regarding this specific use case. This paper explored how AI can be implemented considering all stakeholder groups. After performing the steps of the DSRP theory and constructing a visual diagram to analyze each stakeholder's relationship and the environment surrounding pharmaceuticals, we were able to conclude how AI can be implemented to optimize the process of patients receiving the medical care and drugs they need. The Systemigram derived a simple storyline from the DSRP analysis to further contextualize how the pharmaceutical marketplace would function with the implementation of AI, specifically to increase Army physician wellness and increase prescription rates for current and former servicemembers.

The team translated the Systemigram into a functional hierarchy for the design of a generative AI to aid physician efficiency in prescribing medication and to foster the relationship between pharmaceutical companies. This customized AI for the Army accounts for the external entities of the mainstay in the Systemigram such as security systems, government agencies, and Medicare. It functions by optimizing physician's workload which ultimately gives time back to them and alleviates workload and stress. This also keeps the patient as a priority by quickly accounting for their health data and comparing it to current medical research as well as what medications are covered. This can increase the likelihood of adherence to prescribed medications.

Future work would expand upon this background and stakeholder analysis to apply and test AI on a small scale. An AI can be purchased and trained on small datasets representative of the larger ones identified previously. For example, the AI would refer to specific controlled sources such as patient data, medical research, insurance coverage, and government regulations. A physician prompts the AI with recommendations for prescriptions and the output would be various recommendations based on reliable data sources. From there it is up to the physician's discretion to prescribe the best medication for their patient. The AI would be tested for proper cybersecurity and analyzed for ethical considerations, following the Trusted AI Framework proposed by Veteran Affairs.

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