Analyzing the Inefficiencies and Manual Challenges in Prior Authorization Processes
(Technical Topic)

Unraveling the Sociotechnical Roots of Inefficiency in Prior Authorization
(STS Topic)

A Thesis Project Prospectus
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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

Imagine a 47-year-old mother of three presenting with basal cell carcinoma on her nasal bridge. After years of undergoing treatment, her surgeon is ready to complete a necessary procedure, but a prior authorization (PA) requirement halts the process, putting the surgeon in a difficult position: either sending the patient home and risk complications, or proceeding without authorization and risk non-payment and legal implications. This narrative illustrates the inefficiency and human costs of the current PA system (Hruza, 2020). PA is a requirement by health insurance companies for healthcare providers to obtain approval before providing certain medical services, medications, or treatments to patients. While PA aims to manage healthcare costs and ensure treatments are used in accordance with medical guidelines (Forrester, 2020), the manual PA process is time-consuming, error-prone, and often leads to delays in patient care. Furthermore, the lack of trust and collaboration between healthcare providers and payers exacerbates these issues, creating a frustrating experience for all involved parties.

The current situation calls for attention and action to address the inefficiencies in the PA process. If left unaddressed, these issues will continue to result in delayed patient care, increased administrative burdens on healthcare providers, and higher healthcare costs (Casalino et al., 2009). In response to these challenges, this prospectus proposes two complementary approaches that address different facets of the PA process. The first approach aims to leverage artificial intelligence (AI) to streamline and automate the prior authorization process. The second approach aims to foster trust and collaboration between healthcare providers and payers through improved communication and data sharing. These approaches are the technical and STS topics of this paper, respectively.

Technical Topic: Analyzing the Inefficiencies and Manual Challenges in Prior Authorization Processes

Prior authorization is a complex process that involves multiple steps, including the submission of patient information, medical necessity documentation, and back-and-forth communication between healthcare providers and payers. The inefficiencies of manual prior authorization processes have significant costs and consequences for patients, providers, and payers (Spear et al., 2023). Patients may experience delayed care, worsening health conditions, and increased out-of-pocket expenses. Healthcare providers face increased administrative burdens, reduced productivity, and potential revenue losses. As noted by Hruza (2020), "[t]he 2018 AMA survey of 1,000 physicians found that 92% felt that PA has a negative impact on patient care" (Unintended Consequences of Prior Authorization). Even payers may incur higher costs due to the manual processing of prior authorization requests and the potential for inappropriate or unnecessary care. If the status quo persists, the healthcare system will continue to suffer from these inefficiencies at a greater level.

One of the primary issues with manual PA processes is the heavy reliance on human intervention and paper-based documentation. Healthcare providers often need to fill out extensive forms, gather supporting evidence, and engage in multiple rounds of communication with payers to obtain approval for necessary treatments (Berg, 2023). This administrative workload can be a significant drain on healthcare providers' time and resources, taking away from their ability to focus on direct patient care (Lenert et al., 2023).

Moreover, the manual nature of PA processes makes them prone to errors, inconsistencies, and delays. The lack of standardization and interoperability among various

healthcare information technology systems further exacerbates these challenges (Health Information Technology Advisory Committee, 2022). Healthcare providers may need to navigate multiple systems and follow different procedures for each payer, leading to confusion and inefficiency (Kyle & Song, 2023).

To address these challenges, AI emerges as a new technology that is poised to automate and streamline the PA process (Jeong, 2023). This project builds upon existing research and technologies to create a more efficient electronic PA (ePA) system. The implementation of ePA systems involves leveraging advancements in artificial intelligence (AI) techniques, such as large-language models (LLMs), retrieval-augmented generation (RAG), machine learning classifier algorithms, and AI agents, fine-tuned to automate and simplify various aspects of the PA process. LLMs have the capability to analyze and generate text, and using RAG, their functionality can be extended to simulate a working memory. Moreover, fine-tuning LLMs would enable them to conduct highly specific tasks accurately, such as sifting through large corpuses of text and extracting key information. This is directly applied to parsing through PA requests and extracting key medical terms and patient information.

Previous research has shown that AI-powered solutions can reduce PA processing times, improve accuracy, and enhance decision-making. In Figure 1 below, Al-Haque (2022) illustrates an AI-enabled PA workflow that substantially reduces the processing time by eliminating manual review for straightforward cases that meet predefined criteria, as well as enhancing the accuracy and consistency of decisions (Nigam, 2023).

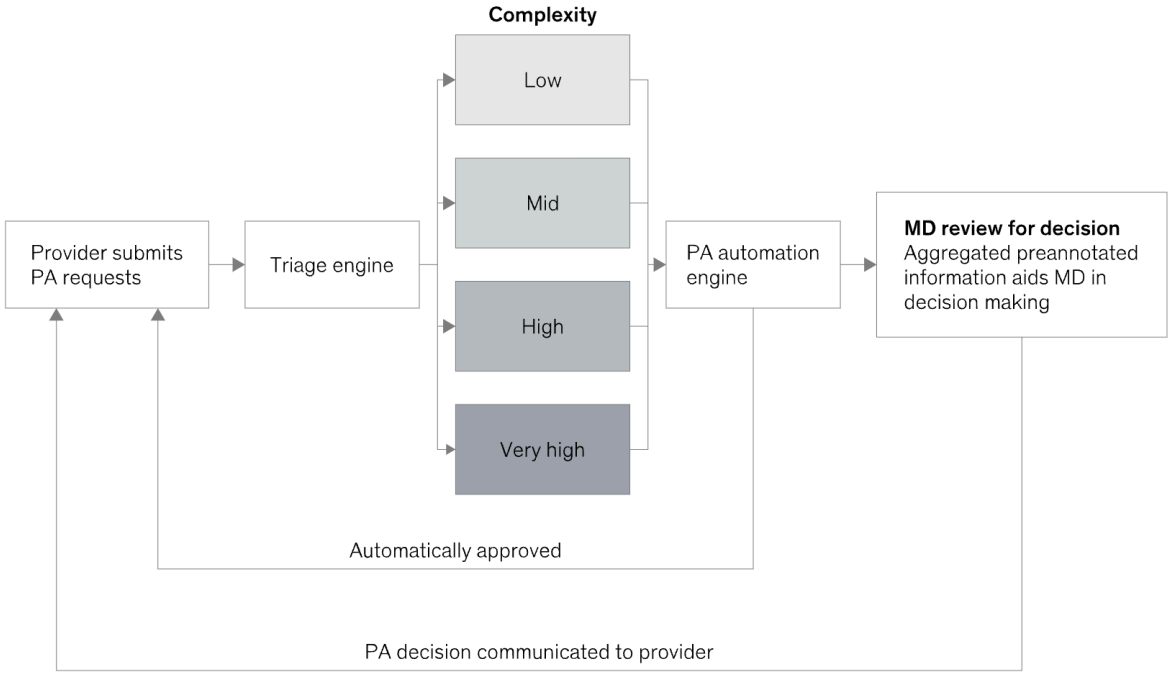

Figure 1. Flow of a PA through the AI-enabled PA automation. The flow of PA requests is seen as they enter the triage engine, are classified, and resolved/elevated. This flow mirrors the manual PA process, highlighting how convoluted it is (Adapted from Al-Haque et al., 2022, Enabling PA automation with AI).

This prospectus proposes building on existing AI frameworks and machine learning algorithms to develop a solution that can extract relevant information from medical records, evaluate medical necessity based on payer policies, and provide real-time authorization decisions. However, the primary challenges in implementing such a system include ensuring data privacy, maintaining interoperability among diverse healthcare information technology (IT) and electronic health record (EHR) systems, and overcoming resistance to adoption from healthcare providers wary of new technologies. Additionally, validating the accuracy and reliability of the AI models is paramount (Al-Haque et al., 2022).

STS Topic: Unraveling the Sociotechnical Roots of Inefficiency in Prior Authorization

The healthcare ecosystem is a complex sociotechnical system involving multiple stakeholders, including healthcare providers, payers, patients, and regulators. Evidently, each of these organizational actors have separate agendas: healthcare providers strive to deliver comprehensive, potentially costly, treatments they deem best for patient outcomes, while payers, typically insurance companies, aim to control costs by ensuring treatments are medically necessary and grounded in evidence-based practices (United States Government Accountability Office, 2018).

The tension between ensuring cost-effective care and upholding the quality of patient treatment manifests prominently in the process of PA (Berg, 2023). Intended as a cost-control measure, this procedural hurdle creates frustration among providers that are faced with bureaucratic delays and non-transparent decision-making processes. This results in an atmosphere where providers may feel that payer policies restrict their ability to offer optimal care, while payers are concerned with managing resources and preventing unnecessary spending. It also contributes to provider burnout, as healthcare staff spend significant time navigating complex PA processes and appealing denied claims (Lenert et al., 2023).

Through the lens of actor network theory (ANT), we see the discord between providers and payers extends beyond PA. This tension is part of a deeper, systemic issue: a lack of transparency and mutual understanding. The extent of this issue becomes even more evident when Beveridge et al. (2016) reveals that “41% of physicians not in a value-based relationship cite distrust of insurers as their biggest obstacle,” (2. Why aren’t all physicians adopting value-based payments?). The lack of trust and collaboration between providers and payers has

several costs and consequences. Providers lament the administrative burden, the intrusion on the patient-provider relationship, and cost to their practices, as seen in Figure 2 below. Conversely, payers struggle with the absence of visibility into the decision-making rationale of healthcare providers (Joseph, 2023). It leads to a fragmented and inefficient healthcare system, where providers and payers work in silos rather than collaborating to improve patient outcomes and reduce costs. Technologies currently used to facilitate communication, including EHRs, phones, emails, and insurance submission portals, often fall short in supporting real-time, transparent communication. This shortfall necessitates a need for a new solution.

Perceptions Of Change In The Cost To Physician Practices Of Interacting With Health Plans, 2006

	During the past two years, the costs of dealing with health plans have										
	Decreased a lot		Somewhat decreased		Not changed much		Somewhat increased		Increased a lot		
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Mean score
Physicians	7	1.1	19	3.0	92	14.4	228	35.6	294	45.9	4.2
Administrators	6	2.8	15	6.9	52	23.9	84	38.5	61	28.0	3.8
Total	13	1.5	34	4.0	144	16.8	312	36.4	355	41.4	4.1
Aggregated total	47[a]	5.5[a]			144	16.8	667[b]	77.7[b]			

Figure 2. Perception changes on costs incurred from insurance plan interactions to practices. The table illustrates how many physicians and administrators believe costs of interacting insurance plans have risen (Adapted from Casalino et al., 2009, p. w539).

The significance of resolving this conflict is immense. The absence of trust and effective collaboration not only exacerbates inefficiencies but also hinders the adoption of new technologies like AI, which have the potential to streamline PA processes and improve patient outcomes (Kyle & Song, 2023). Furthermore, a persisting lack of collaboration can lead to decreased patient satisfaction and a deterioration in the quality of care provided, as the healthcare

system remains entrenched in operational inefficiencies and misaligned incentives (Lenert et al., 2023). As such, addressing this sociotechnical challenge necessitates moving beyond the surface-level procedural fixes to foster a foundational level of trust and collaboration.

To address this issue, this prospectus proposes conducting STS research to understand the root causes of the lack of trust and collaboration between providers and payers, develop a set of strategies for fostering trust and collaboration, and identify actionable steps to reforming the flawed system. The STS research can leverage ANT to identify relevant human and non-human actors, classify those actors into technical, organizational, and cultural (TOC) categories, and analyze the agendas of said actors. Additionally, building on the work of Joseph (2023), exploring the possibility of a dedicated health information network for payers and providers can create a more transparent, efficient, and mutually beneficial system. The main challenges include accessing relevant stakeholders, translating research findings into actionable recommendations, and reforming a long-standing system that may be resistant to change.

Conclusion

Simplifying the PA process and fostering the collaboration between healthcare providers and payers are complementary and intertwined. The deliverables from both the technical project — an AI-enabled PA automation — and the STS research — a set of strategies, best practices, and actionable steps for fostering trust and collaboration between healthcare providers and payers — aim to smoothen the healthcare landscape. If successfully completed and implemented, these deliverables have the potential to significantly contribute to the resolution of the problems presented earlier.

The AI-powered PA platform can address the inefficiencies and challenges of manual PA processes, reducing care delays, administrative burdens, and costs. The evidence-based strategies and best practices for fostering trust and collaboration can help break down the silos between providers and payers, leading to a more efficient and patient-centered healthcare system.

By addressing both the technical and sociotechnical aspects of the PA process, this work has the potential to drive meaningful change in the healthcare industry, ultimately improving patient outcomes and reducing healthcare costs. (1703 words)

References

Al-Haque, S., Khanna, V., & Mandal, S. (2022, April 19). *Ai ushers in next-gen prior authorization in Healthcare*. McKinsey & Company. https://www.mckinsey.com/industries/healthcare/our-insights/ai-ushers-in-next-gen-prior-authorization-in-healthcare [Consulting Agency Report]

Berg, S. (2023, September 11). *What doctors wish patients knew about prior authorization*. American Medical Association. https://www.ama-assn.org/practice-management/prior-authorization/what-doctors-wish-patients-knew-about-prior-authorization [Blog]

Beveridge, R. A., Happe, L. E., & Funk, M. (2016). The physician-insurer dynamic must shift to successfully implement value-based payments. *Healthcare*, *4*(4), 282–284. https://doi.org/10.1016/j.hjdsi.2016.06.004

Casalino, L. P., Nicholson, S., Gans, D. N., Hammons, T., Morra, D., Karrison, T., & Levinson, W. (2009). What does it cost physician practices to interact with health insurance plans? *Health Affairs*, *28*(Supplement 1), 533–543. https://doi.org/10.1377/hlthaff.28.4.w533

Forrester, C. (2020). Benefits of prior authorizations. *Journal of Managed Care & Specialty Pharmacy*, *26*(7), 820–822. https://doi.org/10.18553/jmcp.2020.26.7.820

Health Information Technology Advisory Committee. (2022, March 10). *Final Report of the Health Information Technology Advisory Committee in Response to ONC's Electronic Prior Authorization Request for Information*. Office of the National Coordinator for Health Information Technology. https://www.healthit.gov/sites/default/files/page/2022-03/2022-03-10_ePA_RFI_Recommendations_Report_Signed_508.pdf [Government Report]

Hruza, G. J. (2020). Unintended consequences of prior authorization. *Missouri Medicine*, *117*(6), 505–506. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7721422

Jeong, C. (2023). Generative AI service implementation using LLM application architecture: based on RAG model and LangChain framework. *Journal of Intelligence and Information Systems, 29*(4), 129–164. https://doi.org/https://doi.org/10.13088/JIIS.2023.29.4.129

Joseph, S. (2023, September 29). *AI and standards aren't enough: Fixing prior authorization will require something else entirely*. Forbes. https://www.forbes.com/sites/sethjoseph/2023/09/27/ai-and-standards-arent-enough-fixing-prior-authorization-will-require-something-else-entirely [Magazine]

Kyle, M. A., & Song, Z. (2023). The consequences and future of prior-authorization reform. *New England Journal of Medicine*, *389*(4), 291–293. https://doi.org/10.1056/nejmp2304447

Lenert, L. A., Lane, S., & Wehbe, R. (2023). Could an artificial intelligence approach to prior authorization be more human? *Journal of the American Medical Informatics Association*, *30*(5), 989–994. https://doi.org/10.1093/jamia/ocad016

Nigam, A. (2023, October 31). *5 considerations for health plan leaders using AI-enabled prior authorization and Utilization Management*. Forbes. https://www.forbes.com/sites/forbesbusinesscouncil/2023/10/30/5-considerations-for-health-plan-leaders-using-ai-enabled-prior-authorization-and-utilization-management/?sh=445727196f9e [Magazine]

Spear, J., Ehrenfeld, J. M., & Miller, B. J. (2023). Applications of artificial intelligence in health care delivery. *Journal of Medical Systems*, *47*(1). https://doi.org/10.1007/s10916-023-02018-y

United States Government Accountability Office. (2018, April 20). *Medicare: CMS should take actions to continue prior authorization efforts to reduce spending*. https://www.gao.gov/assets/gao-18-341.pdf [Government Report]