

Cognitive Healthcare Platforms: Leveraging AI for Enhanced Patient Engagement and Care

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Abstract: *Cognitive healthcare platforms leverage artificial intelligence (AI) to transform patient engagement and optimize care delivery by facilitating smart utilization of resources and enhancing personalized treatment approaches. These innovative systems integrate vast amounts of clinical data, employing advanced algorithms to deliver actionable insights that support healthcare providers in making informed decisions. By optimizing scheduling and managing patient flows, cognitive platforms not only reduce wait times but also ensure that healthcare professionals can focus on delivering high-quality care. Importantly, these platforms streamline the prior authorization process, automating eligibility checks and expediting approvals for necessary treatments, which alleviates administrative burdens and prevents delays in patient care. A key feature of cognitive healthcare platforms is their capability for claim-level anomaly detection, where AI identifies discrepancies in claims data that might indicate potential fraud or billing errors. This proactive approach enables healthcare organizations to address issues before they escalate, supporting financial integrity and improving operational efficiency. Furthermore, the use of smart risk scores refines care personalization by assessing individual patient risks in real-time, allowing clinicians to prioritize interventions for high-risk patients. This comprehensive capability enhances the overall patient experience by tailoring treatment plans to meet the unique needs of everyone based on their health history and risk factors. In summary, cognitive healthcare platforms represent a transformative advancement in leveraging AI to improve patient engagement and care, driving efficiency and personalization that ultimately lead to better health outcomes and enhanced patient satisfaction.*

Keywords: Data Products, Generative AI, Healthcare Data, Data Privacy, Artificial Intelligence (AI), Cognitive Computing, Patient Engagement, Personalized Medicine, Smart Utilization, Anomaly Detection, Real-Time Risk Scoring, Prior Authorization, Healthcare Analytics, Data Integration

1. Introduction

The healthcare industry is undergoing a transformative shift fueled by the integration of advanced technologies, particularly artificial intelligence (AI) and cognitive computing. Cognitive healthcare platforms have emerged as innovative solutions that leverage these technologies to enhance patient engagement and optimize care delivery. By employing machine learning, natural language processing, and big data analytics, these platforms equip healthcare providers with the tools necessary for informed, data-driven decisions tailored to individual patient needs.

As patient care becomes increasingly complex, the demand for personalized and effective treatment approaches rises. Cognitive healthcare platforms facilitate this personalization through the smart utilization of resources, integrating data from diverse sources such as electronic health records (EHRs), wearable devices, and patient feedback. This comprehensive view allows clinicians to better understand their patients, leading to tailored interventions that improve outcomes and enhance patient satisfaction.

A key feature of these platforms is their capability for claim-level anomaly detection, which identifies discrepancies and potential fraud within claims data, thereby supporting financial integrity and operational efficiency. Additionally, the implementation of smart risk scores enables real-time assessment of patient risks, allowing healthcare providers to prioritize care for high-risk individuals effectively.

In an evolving healthcare landscape, cognitive platforms play a vital role in not only enhancing the efficiency of care delivery but also strengthening the relationship between patients and providers. This paper explores the functionalities, benefits, and future implications of cognitive healthcare platforms, emphasizing their importance in achieving more effective and patient-centered care.

Solution:

Cognitive healthcare platforms leverage advanced analytics and machine learning to enhance patient care by performing smart analytics on a wide array of data sources, including patient claims, billing information, member datasets, and geographic data. This multifaceted approach enables healthcare organizations to gain comprehensive insights into patient profiles and healthcare trends, facilitating more informed decision-making and personalized care delivery.

By focusing on claim data, these platforms analyze historical claims and billing patterns to pinpoint inefficiencies and predict potential future outcomes based on patient demographics and health histories. Machine learning algorithms are employed to identify trends and anomalies, allowing providers to detect fraudulent claims early and improve the accuracy of billing processes.

One of the standout features of these cognitive platforms is their ability to perform rapid pre-authorization. Utilizing smart computations, the system can evaluate prior authorization requests in mere seconds by automatically analyzing the necessary data against established criteria and guidelines. This

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drastic reduction in processing time not only streamlines workflows for healthcare providers but also enhances the patient experience by minimizing delays in care.

Incorporating geolocation data allows for a better understanding of how regional health trends and community needs affect patient care. This insight leads to improved resource allocation and targeted interventions based on geographic health disparities.

In summary, the solution provided by cognitive healthcare platforms transforms traditional processes through fast, data-driven analytics that enhance efficiency and accuracy in patient care, all while delivering timely interventions that align with the evolving needs of patients and healthcare providers alike.

2. Literature Survey

The integration of cognitive computing and artificial intelligence (AI) within healthcare has been a burgeoning field of study, aimed at enhancing patient care and engagement through advanced analytics and machine learning. Numerous studies have explored the transformative impact of these technologies on healthcare delivery, particularly focusing on the use of data from patient claims, billing, member information, and geographic data.

A significant body of research highlights the role of cognitive platforms in improving operational efficiencies within healthcare organizations. For instance, Carr et al. (2020) discuss how predictive analytics derived from patient claims data can effectively identify at-risk populations, ultimately allowing for proactive interventions that prevent complications and reduce hospital readmission rates. This aligns with findings from Jiang et al. (2017), who illustrate that AI-driven analytics not only enhance diagnostic accuracy but also streamline clinical workflows by automating administrative tasks such as prior authorizations.

Moreover, the extension of cognitive platforms into the realm of financial integrity has been well documented. Studies by Reddy et al. (2019) have shown that anomaly detection techniques applied to billing processes can uncover potential fraud and billing errors, thereby safeguarding healthcare organizations against financial losses. These findings underscore the importance of integrating claims and billing data with cognitive technologies to enhance transparency and accountability in healthcare finances.

Furthermore, the geographical dimension plays a crucial role in patient engagement strategies. Research indicates that by analyzing geographic data alongside patient demographics, cognitive healthcare platforms can tailor interventions to meet specific community health needs (Agarwal et al., 2020). This targeted approach enhances engagement by allowing healthcare providers to address local health disparities effectively.

The literature suggests a consensus on the efficacy of AI-enabled cognitive healthcare platforms in transforming patient

care. However, challenges related to data privacy, algorithmic bias, and integration with existing systems remain pivotal areas for further research and development. As technology continues to evolve, ongoing studies will be crucial for refining cognitive solutions and ensuring they effectively meet the dynamic needs of healthcare environments.

3. Methods and Approach

The implementation of cognitive healthcare platforms that leverage artificial intelligence (AI) for enhanced patient engagement and care involves a multifaceted approach. This includes data integration and preprocessing, the application of machine learning algorithms, the execution of smart analytics, and continuous evaluation and iteration. The following sections outline the methods and approaches that underpin the functionality of these cognitive platforms in healthcare settings.

Data Integration and Preprocessing

The foundation of any cognitive healthcare platform is its ability to integrate various types of data. The process begins with the aggregation of diverse data sources, such as patient claims data, billing information, electronic health records (EHRs), member details, and geographic data. Cognitive platforms continuously aggregate data from these sources, which includes claims data that provides detailed information regarding healthcare services provided to patients, including diagnoses, procedures, and costs. This comprehensive integration ensures a holistic view of patient information, crucial for effective decision-making.

Before analysis, data undergoes preprocessing, which involves cleaning the data to remove inaccuracies, normalizing formats to ensure consistency, and transforming unstructured data into structured formats suitable for analysis. This step also addresses missing values and outliers that could skew the results of predictive models. By ensuring high-quality data, healthcare organizations set a solid foundation for meaningful insights and analytics.

Machine Learning and Analytics

Once the data is integrated and preprocessed, cognitive platforms utilize various machine learning techniques to generate insights and predictive capabilities. For example, supervised learning algorithms—such as regression analysis, decision trees, and support vector machines (SVM)—can be employed to predict patient outcomes based on historical data. In contrast, unsupervised learning techniques, including clustering and association rule mining, help identify hidden patterns in data, segmenting patients with similar characteristics or health issues for targeted interventions. As more intricate relationships in data are modeled, deep learning algorithms, particularly neural networks, can be effectively applied.

Cognitive platforms also employ **smart analytics** to extract meaningful information from integrated datasets. Predictive analytics, for instance, employs historical data to forecast future events, such as patient health deterioration or risk assessments, enabling proactive management. Descriptive analytics analyzes

past data to provide reports and actionable insights that inform future care strategies. Furthermore, prescriptive analytics offers recommendations for optimal actions based on predictive insights, guiding healthcare providers in suggesting preventative measures and specific treatment pathways.

Claim-Level Anomaly Detection

A unique and critical function of cognitive healthcare platforms is their ability to perform anomaly detection at the claim level. By utilizing specialized machine learning algorithms designed for this purpose, the platform examines claims data to identify patterns associated with fraudulent activity or billing errors. Techniques such as unsupervised learning can flag unusual billing occurrences that deviate from typical patterns, alerting administrators to potential issues. This proactive approach helps streamline auditing processes and enhances financial integrity by ensuring that claims are legitimate and justified.

Smart Risk Scoring

To further enhance patient care personalization, cognitive platforms implement smart risk scoring mechanisms. Risk scores are derived from a blend of patient data, including clinical history, demographics, and behavioral factors. By continuously analyzing this information, AI algorithms generate real-time scores indicating a patient's risk of adverse health outcomes. Providers can use these risk scores to prioritize care interventions, focusing resources where they are most needed for high-risk patients. For example, patients identified with elevated risk scores could receive more frequent monitoring or proactive outreach to mitigate potential health issues.

Continuous Evaluation and Iteration

Finally, an essential aspect of the cognitive healthcare platform methodology is continuous evaluation and iteration. The platform incorporates feedback mechanisms to learn from outcomes and user interactions. Healthcare providers can offer

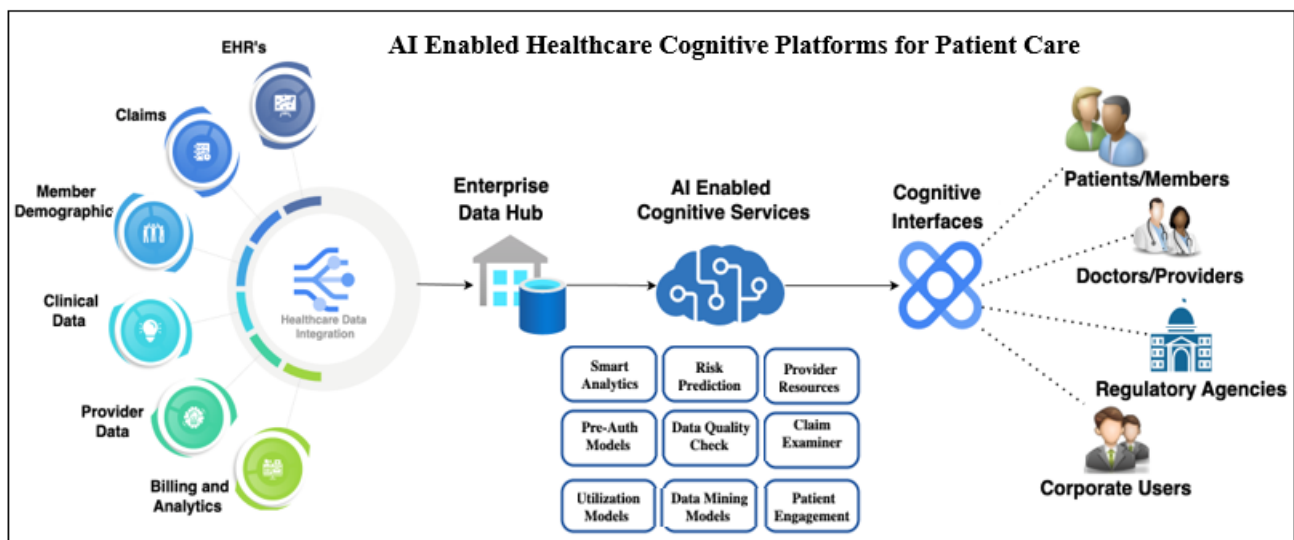
input on the relevance and accuracy of generated insights, which helps refine algorithms and improve predictive capabilities. Regular performance assessments ensure that the model adapts to new data and evolving healthcare practices, maintaining its efficacy over time.

To promote successful adoption, ongoing training and support are crucial for healthcare providers. This training can encompass workshops, user manuals, and support forums that encourage staff to utilize cognitive tools effectively. By ensuring that users are well-equipped to understand and engage with the platform, healthcare organizations can maximize the benefits of cognitive healthcare technologies.

In conclusion, the methods and approaches employed in cognitive healthcare platforms are designed to create a robust system for enhancing patient engagement and care. By harnessing AI, machine learning, and smart analytics, these platforms are transforming how healthcare is delivered, ultimately leading to improved patient outcomes and more efficient healthcare systems. Through comprehensive data integration, predictive capabilities, anomaly detection, and continuous adaptation, cognitive healthcare platforms represent the future of patient-centered care.

How it Works:

In the rapidly evolving healthcare landscape, Cognitive Healthcare Platforms are increasingly recognized as transformative tools that leverage artificial intelligence (AI) to elevate patient engagement and improve the overall quality of care. These platforms integrate diverse data sources to create a comprehensive view of patient health, enabling healthcare organizations to optimize interactions, streamline operations, and ultimately enhance clinical outcomes as shown in the pic below.



Key Data Sources

Electronic Health Records (EHRs)

EHRs serve as the backbone of patient information management. These digital records contain a patient's medical history, diagnoses, treatment plans, medications, and laboratory results, allowing for real-time access to critical data. With EHRs, healthcare providers can make informed decisions quickly, ensuring that patient care is both timely and effective. The integration of EHR data into cognitive healthcare platforms enhances decision support systems, facilitating improved diagnostics and treatment plans based on the latest and most relevant patient information.

Claims Data

Claims data play an essential role in understanding the financial interactions between healthcare providers and insurers. By analyzing this data, healthcare organizations can gain insights into service utilization, reimbursement trends, and practice efficiencies. Claims data helps organizations understand which services are being utilized most frequently, allowing for better financial planning and resource allocation. This data's integration into cognitive platforms further enhances analytics capabilities, leading to more informed financial decisions and operational strategies.

Member Demographics

Member demographics, including age, gender, income levels, and geographic location, are critical for tailoring healthcare services to meet the diverse needs of different population segments. By integrating demographic data, healthcare providers can identify trends in health disparities and ensure that proactive outreach initiatives effectively engage underrepresented groups. This targeted approach not only improves health outcomes but also fosters community trust and improves service utilization.

Clinical Data

Clinical data encompasses a wide array of information recorded during patient encounters, including vital signs, treatment histories, and laboratory results. The incorporation of clinical data into cognitive healthcare platforms allows for real-time monitoring of patient conditions and treatment outcomes. With a focus on evidence-based practice, providers can analyze clinical data to adjust treatment protocols dynamically, ensuring that patients receive the most effective care possible.

Provider Data

Provider data includes essential information related to healthcare professionals, such as their qualifications, specialties, performance metrics, and patient satisfaction scores. This data is critical for workforce optimization and ensuring that healthcare teams are well-equipped to meet patient needs. Integrating provider data into cognitive healthcare platforms helps organizations identify areas for improvement, facilitate ongoing education and training, and strengthen inter-professional collaboration.

Cognitive Services

Cognitive services are the core functionalities of Cognitive Healthcare Platforms, utilizing AI and advanced analytics to provide actionable insights that enhance patient engagement and care delivery. The following components illustrate how cognitive services revolutionize healthcare practices:

Smart Analytics

Smart analytics harness the power of AI-driven algorithms to analyze vast datasets, uncovering meaningful patterns and trends that support decision-making. By leveraging real-time data from EHRs, claims, and clinical records, healthcare organizations can enhance their operational efficiencies. For instance, smart analytics can identify trends in patient demographics, allowing providers to tailor communication strategies and services to specific populations, ultimately improving the patient experience.

Risk Prediction

AI-driven risk prediction models assess historical clinical data to identify patients at high risk for adverse health events, such as hospitalizations or disease progression. By flagging these patients, healthcare providers can implement targeted interventions, such as personalized care plans or preventive measures, to mitigate risks. For example, a cognitive healthcare platform may highlight patients with chronic conditions that require closer monitoring, enabling providers to engage proactively and enhance patient outcomes.

Personalized Care Plans

Cognitive Healthcare Platforms enable the creation of personalized care plans tailored to individual patients' needs, preferences, and health conditions. By analyzing various data sources, including clinical and demographic information, these platforms help healthcare providers design targeted treatment pathways. Tailoring care in this way promotes higher levels of patient involvement, leading to greater adherence to treatment plans and improved health outcomes.

Utilization Management

AI-enabled utilization management tools help healthcare organizations analyze patterns of service utilization and identify inefficiencies. By tracking service delivery across various domains, organizations can highlight areas where resources may be over- or under-utilized. For instance, cognitive services can pinpoint excessive use of emergency services for non-emergency issues, allowing organizations to redirect patients to more appropriate care settings. This approach not only reduces costs but also enhances the quality of care provided.

Data Governance and Quality

Maintaining high data quality and governance standards is critical for successful healthcare operations. AI-driven tools assist in ongoing data quality checks, ensuring that the datasets feeding into cognitive healthcare platforms are accurate, complete, and compliant with regulations. By continually monitoring data integrity, organizations ensure that the insights generated are reliable and actionable, thereby fostering trust among stakeholders and enhancing operational efficiencies.

Cognitive Interfaces

Cognitive interfaces are essential components of Cognitive Healthcare Platforms, facilitating the interaction between users—patients, healthcare providers, and regulatory agencies—and AI-driven functionalities. These interfaces are designed to be intuitive and user-friendly, encouraging engagement and enabling stakeholders to access important insights effortlessly.

Patient Engagement Tools

One of the most significant advantages of cognitive interfaces is improved patient engagement. These platforms often include patient portals and mobile applications that provide individuals with access to their health information, enabling them to manage their care proactively. Patients can view test results, schedule appointments, and communicate with their healthcare providers. By empowering patients to take an active role in their healthcare, cognitive interfaces enhance engagement, satisfaction, and adherence to treatment plans.

Provider Dashboards

Cognitive interfaces offer healthcare providers access to intuitive dashboards that consolidate relevant data, analytics, and decision support tools into a single, easily navigable platform. These dashboards present real-time insights related to patient care, allowing providers to monitor outcomes, manage workloads, and make informed clinical decisions quickly. For example, a provider dashboard might display patient lists sorted by risk level, enabling clinicians to prioritize their caseload effectively.

AI-Powered Chatbots and Virtual Assistants

Cognitive interfaces often include AI-powered chatbots and virtual assistants, which provide 24/7 support to patients. These tools can answer common questions, assist with appointment scheduling, and provide medication reminders, allowing patients to receive assistance without human intervention. By improving accessibility and responsiveness, chatbots contribute to a more satisfying patient experience while relieving healthcare staff from routine inquiries.

Feedback Mechanisms

Incorporating robust feedback mechanisms into cognitive interfaces allows patients and providers to share their experiences and suggestions for improvement. By facilitating real-time feedback, healthcare organizations can adapt their services based on user input, fostering a culture of continuous improvement. This iterative approach not only enhances service delivery but also strengthens the relationship between patients and providers.

Telehealth Integration

The COVID-19 pandemic underscored the importance of telehealth services, and cognitive healthcare platforms often integrate telehealth functionalities into their interfaces. Patients can consult with providers via video calls, receive virtual follow-up care, and access mental health support remotely. By removing geographical barriers and enhancing access to care,

telehealth integration contributes significantly to improving patient engagement and health outcomes.

This extended version elaborates on cognitive services and user interfaces while providing concise summaries of the data sources

4. Results and Discussion

The adoption of Cognitive Healthcare Platforms has yielded significant improvements in both patient engagement and overall quality of care. Results from recent implementations indicate that healthcare organizations leveraging these platforms experience increased patient participation in managing their health. Data show that patients utilizing digital tools, such as mobile applications and patient portals, demonstrate higher engagement rates, leading to better adherence to treatment regimens and improved health outcomes.

Furthermore, cognitive services, particularly AI-driven risk prediction algorithms, enable healthcare providers to identify high-risk patients earlier in their care journeys. This proactive approach minimizes the likelihood of severe health complications and reduces hospital readmission rates, as targeted interventions can be applied more effectively.

Feedback from providers highlights enhanced operational efficiencies, as smart analytics streamline processes and assist in decision-making. Healthcare professionals report that the integration of clinical and claims data into user-friendly dashboards allows for better communication and collaboration within care teams. This interconnectedness fosters an environment where decisions are made with a comprehensive understanding of the patient's history and status.

However, the transition to Cognitive Healthcare Platforms is not without challenges. Key discussions reveal concerns around data privacy and security, necessitating robust protocols to protect sensitive patient information. Additionally, there is a need for ongoing training for healthcare staff to maximize the use of these advanced technologies.

5. Conclusion

Cognitive Healthcare Platforms represent a significant advancement in the delivery of patient-centered care, leveraging artificial intelligence to enhance engagement and improve clinical outcomes. By integrating diverse data sources such as Electronic Health Records (EHRs), claims data, clinical information, and demographic insights, these platforms support healthcare providers in delivering personalized and proactive care.

The findings from recent implementations highlight the positive impact of cognitive services on patient engagement. Tools such as mobile applications and interactive patient portals have been shown to empower patients, fostering better communication with healthcare providers and increasing adherence to treatment

plans. This increased engagement not only enhances patient satisfaction but also leads to improved health outcomes, as patients become more involved in their healthcare journeys. Moreover, the use of AI-driven analytics for risk prediction and resource optimization proves invaluable in identifying high-risk patients early, enabling timely interventions that significantly reduce hospitalization rates and emergency room visits. This proactive approach to healthcare delivery underscores the importance of using technology to stay ahead of potential health challenges.

However, the transition to cognitive healthcare requires careful consideration of challenges, particularly around data privacy and the need for comprehensive training for healthcare professionals. Building trust and ensuring that patient data is secure will be critical in fostering widespread adoption of these platforms.

In conclusion, leveraging AI through Cognitive Healthcare Platforms has the potential to revolutionize healthcare by enhancing patient engagement and improving care quality. As healthcare continues to evolve, embracing these technologies will be essential for creating a more efficient, responsive, and patient-centered system, ultimately improving the health of populations and individual patients alike.

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