



An Analytical Framework for Mental Healthcare Operations Management

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ABSTRACT

Healthcare operations management is dedicated to enhancing the processes within health systems to optimize the quality of care and improve patient outcomes. This field's challenges take on greater complexity in mental healthcare. This review elaborates on designing an analytical framework for scrutinizing the effects of delivered care on psychiatric patient outcomes by summarizing three distinct studies with the overarching themes of mental healthcare management.

Keywords: Mental health; Healthcare; Psychiatry; COVID-19

INTRODUCTION

Mental health concerns have been experiencing an increasing trend in recent years. Reports indicate that the prevalence of mental health conditions is on the rise globally [1]. However, a significant gap persists between the need for mental healthcare and its availability. The WHO (World Health Organization) Mental Health Atlas 2017 countries' total expenditure on mental health, utilizing both subnational and national data, revealed that, on average, mental health expenditure accounted for less than 2% of government budgets allocated for health [2]. This disparity underscores the pressing need for greater investment and prioritization of mental health services to address the growing demand.

Operations management emphasizes efficiency by optimizing the utilization of resources to achieve desired outcomes. A common practice is resource pooling, where various tasks are assigned to a shared pool of resources, minimizing idle time. In healthcare environments, this approach involves aggregating care provided to a range of patients with different disorders. However, these practices may not be effective in mental healthcare settings. Psychiatric patients often suffer from unique conditions that require individualized care plans, hindering the application of traditional operations management techniques. Seeking cost efficiency through such methods could potentially compromise the quality of care in mental healthcare. This review explores the delicate balance between maintaining high-quality care and the

pressure to minimize costs, which remains a core challenge in mental healthcare operations management.

THE IMPACT OF HOSPITAL CHARACTERISTICS ON PSYCHIATRY READMISSIONS: A MEDIATION FRAMEWORK

A widely observed phenomenon in operations management is the "practice makes perfect" principle, which constitutes a positive volume-outcome relationship. This phenomenon manifests in various forms across different contexts. In manufacturing settings, increasing production quantities typically results in higher efficiency while maintaining quality standards. In healthcare management, this can be interpreted as treating more patients can potentially enhance the quality of care provided. However, the nature of this relationship may differ in people-centric environments, such as health systems. Hejazian et al., present evidence for a negative relationship between patient volume and the risk of readmission. They study the effects of hospital operational characteristics on the risk of readmission for psychiatric patients, whose chronic disorders are challenging to treat in acute care settings. While existing literature explores hospital characteristics and their impact on different patient outcomes, none specifically considers psychiatric patients and the unique context of mental healthcare [3]. To address this gap, they propose a mediation framework in which these

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characteristics affect the risk of readmission through two channels: A direct channel and an indirect channel through ward Length of Stay (LOS). The latter is a significant aspect of this study, as they observe that the average ward LOS for psychiatric patients is higher than that of patients with non-mental disorders. Their framework suggests that even if hospital characteristics do not directly affect patient outcomes, they still influence ward LOS, which in turn impacts the risk of readmission. They disentangle these effects and provide a more detailed understanding of how hospital operations influence the quality of care received by psychiatric patients. Their partial model-without ward LOS-reveals weak evidence for the direct effects of hospital operational characteristics on the risk of readmission. However, by incorporating ward LOS into the model, they find strong evidence for the impact of hospital characteristics on readmission risk through LOS.

The unique nature of mental health disorders, including treatment complexity requiring long-term management, the significant impact of social determinants, and the pivotal role of community-based care and support, necessitates a focused approach for psychiatric patients. Empirical findings concerning other patient groups cannot be generalized to this population. For instance, over 25% of the psychiatry inpatients in Hejazian et al., data were discharged to nursing homes and long-term care facilities, contributing to extend Lengths of Stay (LOS) due to limited bed availability [3]. With an average LOS of 31 days and a daily cost of \$4,503 for a Canadian psychiatry inpatient unit, the average expenditure per patient exceeds \$139,500, underscoring the importance of this research. Hospitals with a high focus on mental health care provide comprehensive treatment through multidisciplinary teams, coordinate with community services, and facilitate outpatient follow-ups, potentially reducing readmission risk despite longer LOS for stabilization and discharge planning. Their findings suggest that extant empirical findings on other medical conditions cannot be generalized to psychiatric patients, necessitating a solid understanding of mental health care's differentiating characteristics to develop targeted interventions for improving care quality and reducing readmissions.

The results from Hejazian et al., have significant implications across multiple levels. They demonstrate the impact of LOS on the relationship between hospital characteristics and readmission rates, necessitating clear LOS standards and metrics for hospital administrators, care providers, and policymakers [3]. Measuring resource usage intensity in the Emergency Department (ED) can effectively estimate psychiatric patient acuity levels, informing discharge decisions and capacity planning. Patients requiring high resources significantly benefit from focused hospitals, suggesting policymakers should implement regional mental health service networks with strategically located focused hospitals, drawing from successful models in stroke and trauma care. Alternative policies include financial incentives for inter-hospital transfers, remote patient care systems, and transfer guidelines within regional networks, potentially improving patient outcomes, reducing readmissions, and enhancing care coordination. Integrating mental health services with community-based and primary care through collaborative care models and care coordination programs is a

significant next step, ensuring a smooth transition of care post-discharge.

THE WEAKEST GOES TO THE WALL: THE IMPACT OF COVID-19 ON PSYCHIATRIC PATIENTS

Another challenge in mental healthcare management in recent years has been the COVID-19 pandemic. The pandemic profoundly impacted various aspects of people's lives, causing a surge in mental health conditions. Individuals experienced heightened levels of panic, anxiety, depression, and mood-related disorders. Notably, the pandemic significantly disrupted social interaction patterns. Measures such as social distancing, lockdowns, and restrictions on gatherings, implemented to curb the virus's spread, fundamentally altered how people interacted with one another. These measures deeply affected individuals' ability to socialize, taking a toll on their mental health and well-being [4]. Prolonged isolation and lack of in-person social support exacerbated feelings of loneliness, stress, and vulnerability, further compounding mental health challenges. Concurrently, access to mental health care was limited, making it more difficult for individuals to seek necessary assistance and care during this critical period [5].

The COVID-19 pandemic presented hospitals with a dual challenge: effectively managing COVID-19 cases while maintaining critical care for patients with non-COVID disorders. Individuals with mental disorders faced significant hurdles during this period. The pandemic notably influenced admission decisions for psychiatric patients, leading to a decreased likelihood of hospitalization [6]. This reduced hospitalization rate, coupled with disruptions in community care, and exacerbated patient outcomes for those with psychiatric conditions [5]. Furthermore, the isolation and heightened stress levels experienced during the pandemic exacerbated the mental health challenges confronting these patients. This situation underscored the critical need for innovative solutions to provide continuous mental health support amidst healthcare system constraints, as access to care and treatment effectiveness became paramount. Addressing these issues urgently became a priority to mitigate the detrimental impacts on this vulnerable population during the crisis.

Hejazian et al., study the impact of the COVID-19 pandemic on psychiatric patients [7]. Utilizing a Difference-In-Differences (DID) framework, they assess the causal effects of the COVID-19 pandemic on psychiatric patient outcomes. This study specifically examines changes in the probability of admission and the timing of return visits to the ED, informed by a dataset consisting of two Canadian hospitals tracking individual visits daily across a three-year span. The ED return time is the primary outcome of interest which is the time between two successive ED visits of a patient. This quantity can indicate the overall quality of care the patient receives in the ED visit. The analysis is segmented by various stages of the pandemic, with the Oxford COVID-19 Government Response Tracker (OxCGRT) providing insights into the impact of policy interventions [8].

The results from Hejazian et al., highlight a reduction in ED return time amid the pandemic outbreak, suggesting psychiatric patients generally returned to the ED quicker compared to the pre-pandemic period [7]. Furthermore, the analysis reveals how this relationship evolved throughout the pandemic waves, with the first and second waves showing a significant reduction in ED return time, while the third wave had no general effect. Hospitalization of psychiatric patients mediates the pandemic's impact on ED return time. While hospitalization strongly increases the ED return time, the pandemic reduced the likelihood of admission, suggesting that healthcare systems admitted fewer patients to psychiatry wards during this period. A potential explanation for this phenomenon is that EDs and hospitals wrestled with overcrowding and resource strain issues as the pandemic progressed. Thus, they reduced their psychiatry inpatient capacity resulting in a decrease in admissions and hospital length of stay of psychiatric patients. This resulted in shorter ED return times for psychiatric patients, highlighting a possible mechanism through which the pandemic reduced their ED return times by limiting inpatient admissions. This study underscores the complex interplay between a reduction in ED visits, likely due to concerns of contracting the virus, and an increased demand for emergency psychiatric care as mental health crises intensified amidst the pandemic outbreak owing to the "new normal" conditions of life.

FROM OVERLOOKED TO ESSENTIAL: MINING CLINICAL PSYCHIATRY NOTES WITH LANGUAGE MODELS

Mental healthcare is receiving growing attention in the healthcare operations management only recently and so the literature is still inadequate. This is mainly due to the complexity of psychiatric disorders resulting in the inaccuracy of diagnoses and subjectivity in treatment plans. Diagnoses made for psychiatric patients suffer from inaccuracy and inconsistency. The subjectivity in making psychiatric diagnoses can help explain the prevalence of bias and noise in treatments provided to psychiatric patients which add to the uncertainty in patient outcomes [9]. Traditionally, healthcare analytics have focused on structured data, often overlooking the wealth of information embedded in clinical narratives. However, recent advancements in Natural Language Processing (NLP) based on Machine Learning (ML) models and algorithms enable us to uncover critical insights that can significantly enhance patient care from the unstructured text data.

Hejazian et al., explore the transformative potential of Natural Language Processing (NLP) models, such as Bidirectional Encoder Representations from Transformers (BERT), in analyzing unstructured clinical notes from psychiatric patients of a Canadian hospital [10]. By leveraging the rich data within these notes, the study aims to improve predictive accuracy for patient readmissions and provide valuable insights into patient conditions. This focus on psychiatric care is particularly significant, as the detailed information in clinical notes can aid in understanding the complex and multifaceted nature of mental health conditions, ultimately leading to customized interventions and improved patient outcomes.

The employment of BERT and other advanced NLP models highlights the innovative nature of the research, pushing the boundaries of current methodologies in healthcare analytics. While the study's advanced methodologies has potential, several areas require further attention. Enhancing the interpretability of deep learning models like BERT is significant for healthcare practitioners to understand and trust the insights derived from these models effectively. Moreover, it highlights how the insights can pivot towards the integration of text analytics approaches into hospital decision support systems and explore the potential of Large Language Models (LLMs) to further refine the analysis of clinical narratives for more accurate patient outcome predictions [11]. Overall, this work represents an important step towards integrating advanced data analytics into psychiatric care, aiming to support mental health professionals and improve patient outcomes.

CONCLUSION

The key questions addressed in the above research projects are: 1) how hospital operations interplay with mental patient outcomes; 2) how external shocks impact psychiatric care; and 3) how advanced analytics can be utilized for better psychiatric patient outcomes. The first paper elucidates the significant impact that hospital characteristics have on psychiatric patient outcomes. It highlights how operational factors such as bed availability, staff-to-patient ratios, and specialized psychiatric units can influence readmission rates. This underscores the need for hospital administrators to optimize these operational aspects to improve patient care and reduce readmissions. The second paper provides a timely analysis of how the COVID-19 pandemic disrupted psychiatric care. It reveals that while the pandemic led to a reduction in ED visits and hospitalization rates due to fear of infection, it also increased the need for emergency psychiatric care as mental health crises intensified. This dual effect illustrates the vulnerability of psychiatric patients during external shocks and the critical importance of maintaining access to care during such times. The third paper demonstrates the transformative potential of NLP models in analyzing clinical notes. By tapping into unstructured data, these models can provide deeper insights into patient conditions and improve predictive accuracy for readmissions. This innovation offers a new avenue for enhancing psychiatric care through advanced data analytics.

In conclusion, these papers collectively offer a wealth of knowledge on the management of psychiatric care. The implications for healthcare professionals, policymakers, and researchers are clear: to improve psychiatric patient outcomes, we must optimize operational practices, prepare for external shocks, harness advanced analytics, and focus on patient-centered care.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest related to the subject matter or materials discussed in this manuscript.

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