PUSAT PERUBATAN UNIVERSITI MALAYA

Identification of Outliers from Case-mix Analysis in a Teaching Hospital in Malaysia

PRESENTER:DR. MOHAMAD HELMI BIN MOHAMAD YASIM

PROF. MAZNAH DAHLUI, DR.AMIRAH AZZERI,DR.HAFIZ JAAFAR,DR.SALLEH YAHYA, PROF.NAZIRAH HASNAN

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Malaysia is located in Southeast Asia. It consists of two main regions separated by the South China Sea. Malaysia is a vibrant country known for its diverse culture, tropical climate, and bustling cities. As of 2023, Malaysia has a total population of 33.4 million people with a population growth rate of 2.1%.

Universiti Malaya Medical Centre (UMMC) is a leading teaching hospital located in Kuala Lumpur, Malaysia, affiliated with the University of Malaya. It is renowned for its exceptional healthcare services, medical education, and research activities.

UMMC uses case-mix analysis as an integral tool to evaluate patient populations, resource utilization, and healthcare outcomes. By analyzing case mix, UMMC can effectively allocate resources, identify areas for quality improvement, and optimize patient care delivery.

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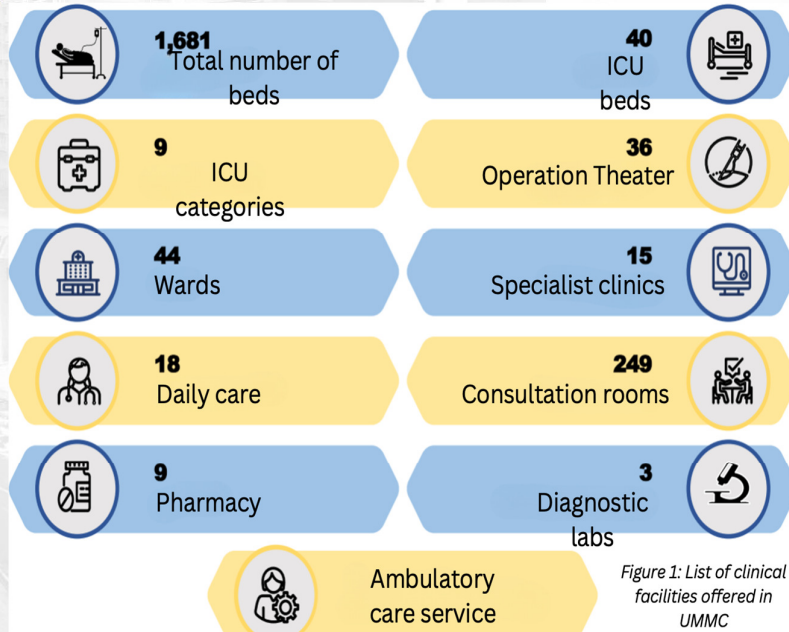*'Peneraju Pengajaran Perubatan'*

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Clinical facilities in UMMC

1,681	Total number of beds	40	ICU beds
9	ICU categories	36	Operation Theater
44	Wards	15	Specialist clinics
18	Daily care	249	Consultation rooms
9	Pharmacy	3	Diagnostic labs
	Ambulatory care service		

Figure 1: List of clinical facilities offered in UMMC

Statistics on patients visits

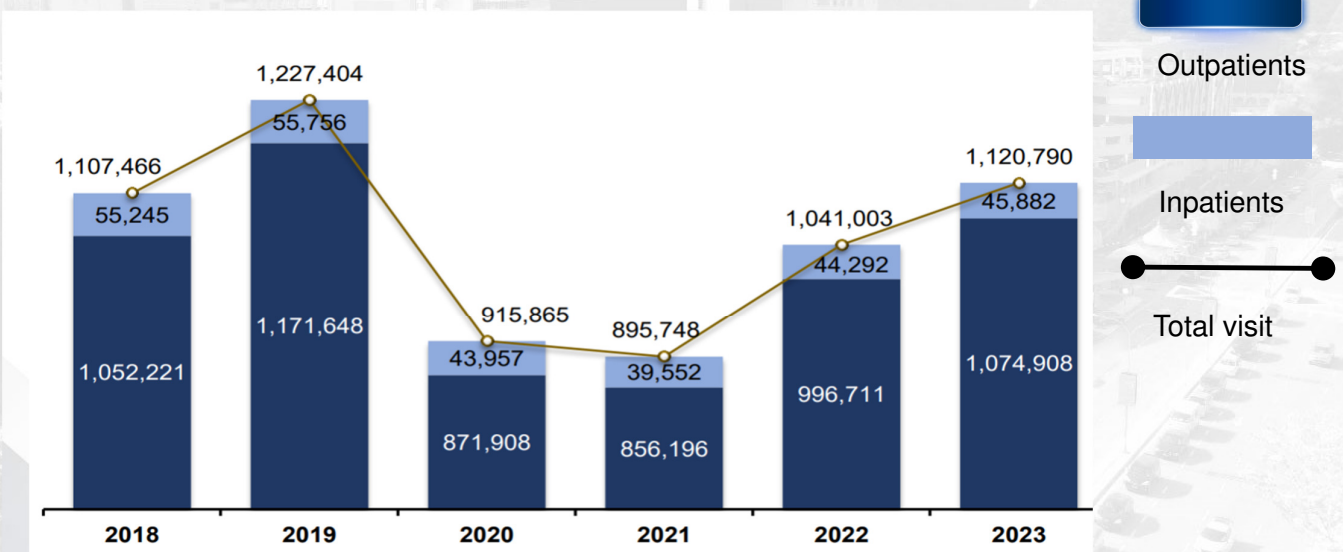Outpatients

Inpatients

Total visit

Figure 2: Statistics of patients visits at UMMC from year of 2018-2023

Problem Statement

Outliers can significantly affect hospital operations by causing disruptions in workflow, resource allocation challenges, and inefficiencies. Financial implications include potential revenue loss, and reimbursement challenges.

Rationale

Outlier identification serves as a catalyst for quality improvement initiatives by highlighting areas for enhancement in patient care, clinical processes, and operational efficiency.Addressing outliers can lead to improved patient outcomes, enhanced patient satisfaction, and compliance with quality standards and regulations.

Introduction

Outliers represent deviations from typical patterns in patient data, indicating potential areas of concern or opportunity.
Identification allows for targeted interventions and resource allocation to address specific issues and optimize performance.

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Objectives

The primary objective of our study is to identify and analyze these outliers within the case-mix data of UMMC. By doing so, we aim to improve the accuracy of our case-mix analysis, ensuring that the hospital can better allocate resources and provide optimal care to all patients

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Methodology

We engages in the collection of comprehensive inpatient episode data, which encompasses patient demographics, diagnoses, procedures, length of stay (LOS), and outcomes. This data is collected through a variety of sources, including electronic medical records (EMRs), administrative databases, and clinical documentation systems in the year of 2022. To effectively identify outliers in length of stay (LOS), the formula used is Quartile 3 + 2 * Interquartile Range (IQR). This formula allows for the identification of both long-stay and short-stay outliers.Long-stay outliers are defined as LOS that exceed the upper range of usual LOS by 2 times the IQR. Conversely, short-stay outliers are defined as admissions with LOS of only one day.

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Results

An in-depth analysis of 48,248 hospital admissions in the year 2022 has uncovered a notable presence of outliers, constituting 13% of the overall sample. Among the 6,272 admissions that were classified as outliers, a majority of 52% were long-stay outliers, wherein patients spent an extended time in medical facilities due to complicated medical conditions, sophisticated diagnostic procedures, or difficulties in transferring patient care. The remaining 48% were short-stay outliers, where patients required only a brief period of hospitalization due to rapid recovery.
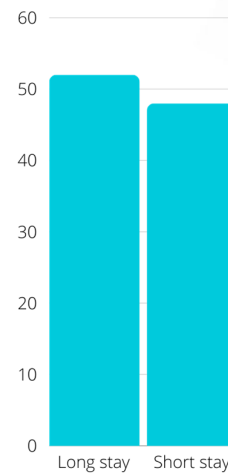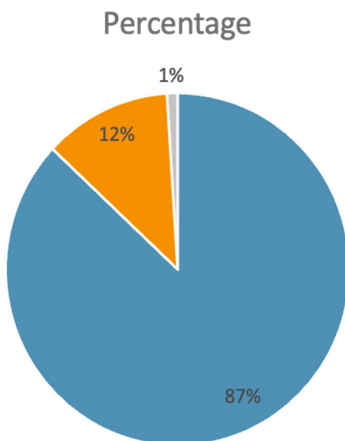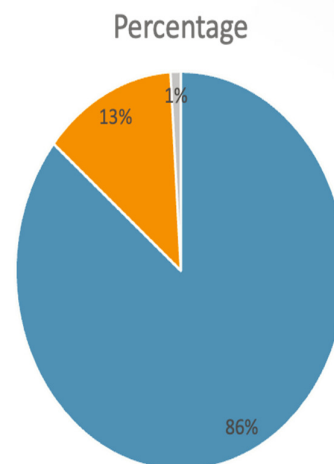
Figure 3: Bar graph showing the percentage of inliers and outliers in the year of 2022

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- Further investigation revealed that most of these cases were patients admitted for elective surgery that was cancelled due to various reasons, and cases that were not seen for discharge by the respective discipline's specialist at the emergency department.

- In 2022, UMMC's total expenditure amounted to a significant 146,391,637.51 USD (RM698,574,275.47)

- Approximately 19,032,984.97 USD (RM90,814,655.81) allocated for managing outliers. This allocation, representing nearly 13% of the expenditure.

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Percentage (left): 87% Inliers, 12% Outliers, 1% Intermediate

Percentage (right): 86% Inliers, 13% Outliers, 1% Intermediate

Legend: Inliers, Outliers, Intermediate

Figure 4: Pie chart on the percentage of inliers and outliers in the year of 2020 and 2022

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Data analysis

➢ The analysis comparing 2020 and 2022 shows that the amount of work in UMMC healthcare system stayed pretty much

consistent.

➢ This indicates that resources, including staff, were managed well to handle the workload effectively.

➢ Even with external challenges like the COVID-19 pandemic,

UMMC system remained adaptable and maintained a steady level of service.

Discussions

Outliers exhibit extended durations of hospitalization which arises from a combination of various variables, such as complex medical ailments, delayed diagnosis processes, and inadequacies in the management of care transitions.

Determining the outliers is one of the many benefits of implementing the case-mix system for inpatient episodes. Knowing the short-stay and long-stay outliers could guide in developing a near-accurate clinical pathway for standardised and efficient management of cases.

It helps to ensure appropriate use of resources and ultimately enhances efficiency in hospital management.

The implementation of this comprehensive strategy not only guarantees the proper utilisation of resources but also acts as a driving force in enhancing the overall effectiveness and excellence of healthcare administration in the modern context.

References:Freitas, A., Silva-Costa, T., Lopes, F. et al. Factors influencing hospital high length of stay outliers. BMC Health Serv Res 12, 265 (2012). https://doi.org/10.1186/1472-6963-12-265

Conclusion

The adoption of a comprehensive strategy that includes the implementation of a case-mix system not only promotes the utilization of resources but also drives excellence in healthcare administration. By using data-driven insights to identify and address outliers in hospitalization durations, hospitals can enhance their ability to provide high-quality care while simultaneously improving operational efficiency. This approach represents a significant step forward in modern healthcare management, aligning with the overarching goal of delivering patient-centered, cost-effective, and sustainable healthcare services.

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Acknowldegement

1. Health Economics And Case-mix Unit, Universiti Malaya Medical Centre

2. Research, Development And Innovation Department, Universiti Malaya Medical Centre

3. Malaysia's National Statistics Organisation

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Contact us

EMAIL ADDRESS

helmi.yasim@ummc.edu.my

Medical Officer

PHONE NUMBER
(+60)123527919

LOCATION
Research, Development and Innovation ,Universiti

Malaya Medical Centre, Lembah Pantai, 59100

Kuala Lumpur

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