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Opportunities and Barriers in the Planning of Hospital Bed Capacity in a Tertiary Care Hospital in Makkah, Saudi Arabia

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Keywords
Hospital capacity planning · Bed management · Bed occupancy · Timely discharge · Length of stay · Case manager

Abstract

Introduction: In alignment with Saudi Arabia's 2030 Vision to improve healthcare services, Saudi hospital policy-makers must have a clear understanding of the needs of their hospitals to make strategic decisions regarding hospital bed capacity planning. King Abdullah Medical City (KAMC) is a tertiary and quaternary healthcare facility that has four state-of-the-art excellence centers, of which the Cardiac and Oncology Centers are among the largest and the most advanced in the west of Saudi Arabia. ***Methods:*** This study used a mixed-methods approach. The study's quantitative component included a revision of retrospective data of KAMC's operational parameters, such as bed capacity, bed occupancy rate (BOR), and length of stay (LOS). For the study's qualitative component, researchers used semi-structured interviews. Personnel at different management levels were interviewed to explore factors that might influence an increase in the BOR and patients' LOS. ***Results:*** KAMC's key performance indicators showed an overall LOS of 9.9 days and an overall BOR of 88%. Analysis broken down by the department shows the General and the Neuroscience Intensive Care Units and the Hematology/Oncology departments to have the highest BOR, ranging between 95% and 97%. Qualitative analysis of semi-structured interviews suggested that the delays in the provision of consultation services among the hospital's inpatients were among the factors that have the biggest influence on bed occupancy; the presence of dedicated case managers in every department was among the top suggested solutions. ***Conclusion:*** A battery of interventions might help to reduce the LOS by supporting timely patient discharge. The presence of a dedicated case manager with a medical background in each department is one of the most practical interventions. Other vital opportunities include reinforcement of back-referral policies, revising policies, and having cluster-level referral policies and bed management strategies. Although such efforts are likely to have a positive effect, they are expected to only partially meet the existing gap, which probably requires increasing the number of available active beds.

Introduction

In alignment with the Kingdom of Saudi Arabia's (KSA) 2030 Vision to improve healthcare services, the Saudi Ministry of Health (MOH) adopted a transformational

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strategy [1]. Makkah Al Mukarramah, a holy city in the western region of the KSA, welcomes millions of visitors from inside and outside the Kingdom annually for Umrah and Hajj rituals [2]. This has contributed to Makkah becoming the focus for transformation of the provision of healthcare services. The Makkah Healthcare Cluster (MHC) was founded in 2017 to provide multidisciplinary services for all levels of care. Nine public hospitals, 82 public healthcare centers, and a medical city named King Abdullah Medical City (KAMC) are all included under the umbrella of MHC [1]. KAMC is a tertiary and quaternary healthcare facility with four state-of-the-art excellence centers: the Cardiac Center, the Oncology Center, the Neuroscience Center, and the Special Surgery Center. The Cardiac and Oncology Centers are two of the largest and the most advanced medical centers in the west of the KSA [3].

Hospital managers and policymakers need to have a clear understanding of the current and future needs of their hospitals to make strategic decisions about hospital bed capacity planning [4]. Such decisions may become even more crucial when the management of numerous health centers are placed under a common umbrella, as is the case with cluster-based management. Factors affecting the required number of hospital beds can be divided into demand, supply, and external factors. Demand factors are mainly related to "admission rates, population changes, seasonal effects, epidemiological changes such as diseases prevalence, and emergency cases" ([4], p. 10). Supply factors are mainly related to "average length of stay (LOS), current bed numbers, waiting time, bed occupancy rate (BOR), medical and technological advances, hospital efficiency, clinical and service performance, alternatives to hospital care, patient transfers to other providers" ([4], p. 10). External factors include "political pressures, policy changes, subregional access, inter-regional flows" ([4], p. 10).

Key terms related to bed capacity include available bed capacity, active bed capacity, daily beds, temporarily closed beds, and chronic bed users. Available bed capacity is those beds assigned to receive patients admitted for more than 24 h, regardless of bed readiness, such as beds in the internal medicine service and its subspecialties. This capacity includes isolation beds and others according to the hospital's scope of specialty services [5]. Active bed capacity is those beds that are ready for inpatients with complete equipment and human resources. Daily beds are those beds that are prepared for daily use (less than 24 h), such as the beds present in emergency departments (EDs), dialysis, and day surgery beds [5]. Temporarily closed beds are those beds that are closed temporarily for reasons such as maintenance, human resources, and sterilization. Chronic bed users are those patients who are admitted for more than 30 days regardless of being discharged medically [5].

The imbalance between hospital bed supply and demand is a worldwide problem, mainly affecting highly specialized centers. Increasing the supply of beds may not always be the optimum solution because, in addition to being economically infeasible in many cases, it also increases the burden on the healthcare team if it is not accompanied by parallel support in all healthcare resources. Therefore, improving bed utilization seems vital [6]. The hospital BOR is a very commonly used measure of hospital bed utilization. It is generally calculated by dividing the LOS by the length of time all hospital beds are available for patient stay, and it is expressed as a percentage [7].

The BOR is affected by the number of hospital admissions as well as by the LOS. Depending on the level of care, each hospital and department must have clear criteria to ensure that they admit patients eligible for the appropriate type of care provided. This inevitably involves the prioritization of cases for the optimization of the use of resources [4]. Hospital LOS, another determinant of the BOR, is, in turn, determined by the factors that influence the discharge process [4]. Setting benchmarks for the LOS is tricky because it differs depending on the level of care and each patient's case. Some policies require the treating physician to suggest an expected discharge date for each patient at admission. Although often thought of as a routine process, patient discharge may take longer than expected. It may be subject to delay due to factors unrelated to the patient's medical condition [8].

The BOR can help plan the allocation of hospital beds among specialties to signal the need for facility/bed expansion. A BOR exceeding 75% is generally used to justify bed expansion, but other solutions should also be exhausted [7]. Critical care units are usually the most important hospital units needing bed expansion to meet the high demand for intensive healthcare services. This is because most of the patients admitted to the Intensive Care Unit (ICU) are critical with multiple morbidities and are expected to have a prolonged LOS in the hospital [9].

Strategies for better utilization of hospital beds include setting clinical pathways for the better flow of patients, discharge planning, case management, multidisciplinary care, the expansion of health home care and promotion services, and performance accountability [10, 11]. Chang et al. [11] state that a functioning ED serves as a reflection of the hospital's status of operation and the quality of patients' care. Clinical pathways can be established through the standardization of patients' admission orders and clinical guidelines with early implementation of management plans starting from the ED [10, 12].

Discharge planning interventions involve establishing an early discharge plan from the time the patient arrives at the ED and regularly reviewing, monitoring, and updating the plan. Regular assessment of the inpatient's suitability for discharge and following up on the health status of the patient post-discharge is essential. This is to reduce the possibility of patient relapse and readmission. It is essential to ensure the continuity of healthcare services post-discharge [10].

Case management is another effective modality in reducing the BOR and LOS. It is usually led by a nurse or nurse manager who is responsible for reviewing the patient's admission plan regularly to ensure it is being smoothly implemented so that LOS expectations can be reasonably met [10]. Case managers should facilitate patients' access to multidisciplinary care and follow-up on the status of consulted healthcare services. This usually involves utilizing effective communication and coordination strategies to regulate the healthcare services of different specialties involved in patient care [10]. Case managers should be empowered to demand justification from the caring team for any delay in providing the requested services. They should be supported in taking all necessary steps to speed the patient's recovery and discharge, reporting directly to management any issues that could impede patient discharge [11].

Leaders of highly performing hospitals continuously monitor the hospital performance parameters regarding the timely admission and discharge of patients and the timely delivery of healthcare services. The immediate investigation of any performance issues encountered and ensuring the high quality of provided services is essential [11].

Innovative solutions for hospital bed management include the use of smart applications that are integrated into hospital information systems. Tools used by such systems may include flagging charts of patients ready for discharge or those with excess LOS or implementing admission orders ahead of time to decrease patients' LOS [13].

By investigating bed utilization issues in the real-world setting of KAMC, this study explores strategies that could be applied to solve those issues. The study aimed to support hospital managers and policymakers in making strategic decisions for hospital bed capacity planning by taking KAMC as a tertiary/quaternary care center example.

Methodology

Setting

KAMC is a tertiary/quaternary healthcare facility with four state-of-the-art excellence centers: the Cardiac Center, the Oncology Center, the Neuroscience Center, and the Special Surgery Center. The Cardiac and Oncology Centers are two of the largest and most advanced medical centers in the west of the KSA [3]. The KAMC Cardiac Center has two departments, Cardiology and Cardiac Surgery, and they receive the most complex cases from all over the Kingdom. The Cardiac Center provides interventional cardiac procedures and surgeries for all common and rare cardiac diseases. The Oncology Center at KAMC was one of the first specialized cancer centers in the western region of the KSA. The Oncology Center has four main divisions: Medical Oncology, Haemato-oncology, Radiation Oncology, and Palliative Care [3].

Primary field research using a mixed-methods approach of quantitative and qualitative data analysis was conducted to provide recommendations to facilitate patient flow in the hospital and provide solutions to bed management issues. The quantitative component included the revision of retrospective data of the hospital's operational parameters from the hospital's records and monthly reports from January to April 2022. The relations between various occupancy parameters were explored by plotting the data provided by the Strategy and Statistics Departments on clustered line graphs that show the relation between parameters among different departments. The qualitative component of the current study followed the grounded theory tradition, in which the admission and discharge processes were explored [14].

For data collection, researchers performed semi-structured interviews to provide a more flexible approach to collecting data. Personnel at different management levels at KAMC were interviewed to determine the hospital management's view and to elucidate factors related to communication with other hospitals at the MOH level. After researchers obtained ethical approval from the KAMC Institutional Review Board, the participants were invited to take part in the interviews, which were conducted in a venue at KAMC that conferred good privacy. Four interviews were conducted in total. The interviews started by explaining the study and asking for a voluntary signature to show the participant had given informed consent. The interviews were audio-recorded for research purposes only and transcribed for analysis while maintaining the privacy and confidentiality of participants.

All participants were asked the following questions:

1. Can beds at KAMC be better utilized?
2. Is there a problem with admission, discharge, or any other process related to hospital bed utilization?
3. Do you think patients stay longer than they should, and how does each of the following affect their length of stay?
   a. discharge planning at admission
   b. acceptance of patients who should not be admitted
   c. policies are not clear
   d. transfer process from KAMC
   e. services delay: pharmacy, radiology, others
   f. patients themselves
   g. coordination between healthcare teams
   h. logistics within KAMC
4. What solutions do you suggest to improve the capacity planning of beds at KAMC?
   a. more KAMC policies
   b. higher level policies
   c. monitoring of policy implementation
   d. innovative solutions such as applications and electronic tools

Questions functioned as introductory tools to help start the conversation, and the participants were given ample time and

opportunity to express their thoughts. Only when the participant was finished with a particular line of thought would the interviewer suggest a new aspect to discuss or pose a new open question. So, the interviewer asked broad questions and then was guided by the participants' answers to ask more probing questions that could be linked to emergent concepts to reach theoretical saturation. Glaser and Strauss's grounded theory constant comparison analysis method was used [15]. Coding was used to conceptualize data into patterns, helping researchers to discover the fundamental problems with which participants contended. Three levels of codes were created. Level 1 codes were derived directly from participants' words. The latter were grouped into second- and third-level codes along with constant comparison, "a method that involves comparing elements present in one data source (e.g., in one interview) with those in another. The process continued until the content of all sources has been compared so that commonalities are identified" ([16], p. 402).

Coding was done independently by the authors. It was done manually using transcriptions of the interviews. To develop a coding scheme, the two researchers who did the coding first read the data to identify the emerging concepts. First-level coding identified concepts from participants' actual words, attempting to classify codes that fit into two broad categories: barriers and suggestions for improvement (third-level coding). Subcategories of barriers and suggestions were also independently sought (second-level coding). After a coding scheme was developed, the data were re-read and coded for correspondence to the categories and subcategories.

After each stage of coding, the two researchers sat together to agree on a common scheme by consensus. When new categories emerged, the researchers re-read previously coded data. Because coding was done manually, conceptual files were used, so there was a physical file for each category. When a single paragraph or text passage belonged to more than one category, it had to be copied into each of the categories where it belonged. In the final analysis stage, researchers tried to weave the codes together into an integrated whole or an overall structure.

Results

Quantitative Results

KAMC's operational bed capacity for the year 2021 shows the total operational capacity of KAMC to be 710 beds, 210 of which are for daily use and do not count toward the "available" bed capacity. These include beds in the ER, day care, operation, and chemotherapy. Thus, the total available bed capacity of KAMC should be 500 beds. However, almost a quarter of this available capacity is inactive (117/500 = 23.4%). A significant portion of these unavailable beds (93 beds) is licensed for KAMC but not present. The remaining 24 are constantly unavailable beds. Thus, the maximum number of available active beds in KAMC was 383 beds (Table 1). Still, it is unclear to what extent these beds are available around the year since Table 1, which shows KAMC's operational bed capacity, does not account for other reasons for those beds that are closed temporarily (e.g., for maintenance, human resources, sterilization, etc.).

The cardiac ward in KAMC has a total of 49 functioning inpatient beds out of 50 beds. While Cardiac Surgery has a bed capacity of 40 beds, only 30 beds are functioning. The ICU, Cardiac Care Unit, Cardiac Surgery ICU, Neuroscience ICU, and Surgical ICU have 25, 18, 9, 13, and 7 functioning inpatient beds, respectively. The Medical Oncology ward has 47 active inpatient oncology beds out of a 49-bed capacity, and Haemato-oncology has 20 functioning beds (Table 1).

A look into KAMC's key performance indicators shows an overall LOS of 9.9 days and an overall BOR of 88%. KAMC policies set the two benchmarks/goals as 5.5–6.5 days and 75–80%, respectively [17]. Analysis broken down by department shows that the General and the Neuroscience ICUs and the Hematology/Oncology departments have the highest BOR, which ranges between 95% and 97% (Table 2).

Figure 1a shows a more or less reciprocal relation between the number of active beds and the BOR, where departments with the lowest number of beds tend to show the highest BOR. Because the LOS and the number of admissions are the two major determinants of the BOR, we can refer to Figure 1b to contemplate the association between the two parameters. It is to be noted that the general ICU, NICU, and Hematology departments show the highest total LOS. This probably reflects a slow turnover with relatively low admissions. Figure 1c, d shows departments with a low rate of admissions but a high BOR due to a long average LOS and a slow turnover. Those departments will need to improve the efficiency of the discharge process by lowering the LOS. Other departments with a high rate of admissions, short average LOS, high rate of turnover, and BOR still high reflect high demand from the community. Those departments will benefit from the hospital's bed expansion.

Qualitative Results

For the reader to gain access to parts of the qualitative data without having to read the data set in its entirety repeatedly, Figure 2 was developed to depict the emerging concepts. At the final analysis stage, the thematic pieces were woven together to provide an overall structure to the data.

Bed expansion to meet service demand: Participant 1 stated that the main issue causing a high occupancy rate at KAMC is the increased demand for KAMC's specialized services without any expansion in the hospital's bed capacity. They added that capacity expansion would

Table 1. KAMC operational bed capacity, 2021

Ward/unit	Operational capacity	Bed capacity	Active inpatient beds	Inactive inpatient beds
ICU	26	26	25	1
CCU	18	18	18	–
CSICU	9	9	9	–
NSICU	13	13	13	–
SICU	7	7	7	–
Cardiac ward	50	49	49	–
Cardiac surgery	40	40	30	10
Medical oncology	51	49	47	2
Hemato-oncology	20	20	20	–
Neuroscience unit	43	41	41	–
Specialized surgical unit 1	52	50	50	–
Specialized surgical unit 2	26	25	25	–
Specialized internal medicine	26	25	25	–
Epilepsy monitoring unit	5	5	5	–
Sleep lab	1	1	1	–
Inpatient short stay	5	5	5	–
Royal suite	1	1	1	–
Medical oncology, Jeddah	15	15	12	3
Chemotherapy	24	–	–	–
Chemotherapy, Jeddah	11	–	–	–
Day care unit	14	–	–	–
Ophthalmology day care	6			
DIC	11	–	–	–
ED	24	–	–	–
Recovery	30	–	–	–
Holding beds	6	–	–	–
Operation rooms	17	–	–	–
Cath lab	3	–	–	–
Dialysis	6	–	–	–
Main hospital	7	–	–	–
OPD procedures beds	42	–	–	–
BMT	8	8	–	8
Licensed beds	93	93	–	93
Total	710	500	383	117

ICU, Intensive Care Unit; CCU, Cardiac Care Unit; CSICU, Cardiac Surgery Intensive Care Unit; NSICU, Neuroscience Intensive Care Unit; SICU, Surgical Intensive Care Unit; DIC, disseminated intravascular coagulation (after endoscopic injection); BMT, bone marrow transplant.

be the solution. Participant 3 mentioned the issue of blocked beds in decreasing the availability of hospital beds. KAMC has only 12 isolation rooms, and when isolation cases exceed the bed capacity, regular rooms are used for isolation. Each regular room contains two beds, but when the room is used for isolation, only one bed is used and the other is blocked (not used).

Multidisciplinary team round and case managers: KAMC policy ACC-008 [17] states that a case manager's responsibilities involve discussing patients' clinical condition, investigating the issues causing the lengthy stay of patients, and discussing this with the attending physicians and the heads of departments. They are also responsible for continuously monitoring patients' discharge plans and the daily collection of the list of patients with longer lengths of stay. They are required to notify physicians about the necessity to discharge patients who have had an extended stay and coordinate with other departments to facilitate the conduction of delayed procedures to speed up the discharge process for the better utilization of beds. Participant 4 emphasized the need to have a multidisciplinary team that consists of a physician from the specialty the patient needs, a clinical pharmacist, a social worker, a clinical dietician, and a nurse. This

Table 2. KAMC BOR and LOS per department

Department	BOC	LOS	BOR, %
ICU	2,701	873	95
CCU	2,018	231	95
CSICU	862	230	94
EMU	532	550	69
NSICU	1,474	478	97
SICU	739	277	90
Subtotal ICUs	7,926	3,230	95
Cardiac ward	4,707	572	88
Cardiac surgery	3,055	395	81
Medical-oncology 1	4,008	567	93
Hemato-oncology	1,546	980	96
Neuroscience new	3,337	691	87
Specialized surgical unit (1)	3,789	446	85
Specialized surgical unit (2) (COVID-19 isolation)	1,189	366	69
Specialized internal medicine	1,670	73	80
EMU (1–22 days) only Jan	3	1	3
Sleep lab (1–22 days) only Jan	0	0	0
Inpatient short stay	260	14	44
Royal suite	0	9	0
Medical Oncology, Jeddah	1,229	136	34
BMT	0	451	–
Licensed beds	0	1,888	–
EMU (22–28 days) only Feb Hemato-oncology extension ward (21–28) only Feb	252	114	92
Subtotal	26,142	6,747	81
Total	34,068	9,977	88

ICU, Intensive Care Unit; CCU, Cardiac Care Unit; CSICU, Cardiac Surgery Intensive Care Unit; EMU, Epilepsy Monitoring Unit; NSICU, Neuroscience Intensive Care Unit; SICU, Surgical Intensive Care Unit; DIC, disseminated intravascular coagulation (after endoscopic injection); BMT, bone marrow transplant.

team will visit patients upon admission to facilitate patients' access to the recommended services. Almost all participants recommended that there should be case managers in every department to facilitate patient access to services, asking to justify the LOS stay exceeding the predetermined expected LOS and taking all the necessary steps to lessen the patient's hospitalization period. Participant 4, in particular, emphasized the need to empower the case managers to demand that the treating physicians discharge patients and that the consulting service be carried out immediately. They further stated that the case manager should have a strong personality and "not be easily manipulated."

Performance accountability: Participant 4 also raised the issue of the main responsible physician (MRP) policy at KAMC. According to that policy, the MRP in any given department is changed every 2 weeks. So, an admitting MRP implements the treatment plan and estimates the LOS but often does not complete the whole treatment plan of the patient. This almost invariably results in a protracted LOS and may have a negative impact on patient management. The situation becomes even more complicated without clear hospital guidelines and clinical pathways adopted by healthcare teams. Participant 2 suggested fixing the MRP for the total length of hospital stay of a given patient to avoid changing the management plan.

Clinical pathway and referral system: Participant 1 mentioned that in a tertiary/quaternary care setting, patients should be accepted according to priority for specialized care like surgery, oncology, and cardiology. The "first come, first served" method should not be used

Fig. 1. The relation between pairs of bed occupancy parameters in the period from January to April 2022.

to prioritize patients. Participant 4 mentioned that most of the patients' presenting for admission at KAMC came from a referral system from other MOH hospitals. Routine investigations for such patients should not be repeated, especially if the patient is stable. However, this should not be applied to emergency patients or patients with complications. Patients should do the requested advanced radio imaging like computerized tomography, magnetic resonance imaging, or echocardiography as part of pre-admission preparation to decrease the LOS waiting for these investigations.

Participant 1 mentioned that patients who have already received tertiary care should be transferred back to their refereeing hospital. Participant 3 agreed that hospitals within MHC should not refuse to accept patients referred back to them for providing secondary care.

Discussion and Recommendations for Policymakers

Factors contributing to high BORs may be external, such as difficulties in referring patients from KAMC to other hospitals, or internal. Despite having a very elaborate set of policies that govern admission to and discharge from KAMC, the discharge process may be complicated by problems that include but are not limited to delays in the provision of some services, such as radiological services or pharmaceutical services, and patient-related factors, such as refusal to leave or inadequate home care services.

KAMC has a very elaborate set of policies [18–20] that address the admission criteria of major departments, including the Outpatient Department (OPD), the critical care areas, the Cardiac Care Unit, the neurology facility, and the oncology services. There is also a good set of policies addressing the discharge process, the transfer process, and the admission of transferred patients. KAMC has more than one policy that addresses discharge, including one that provides a multidisciplinary guide to the discharge process. That later policy is called the Discharge Planning Checklist Form. It helps physicians and nurses monitor and anticipate factors that might affect the discharge process. However, neither the policy nor the discharge guide mandates the admitting physician suggest an expected LOS for the patient at admission.

Clear clinical pathways for ED and OPD patients: The ED and OPD need to be supported with efficient staff from multidisciplinary teams to review and decide on the actual needs of the patients for admission to the hospital. This is to prevent unnecessary admissions and the costs of

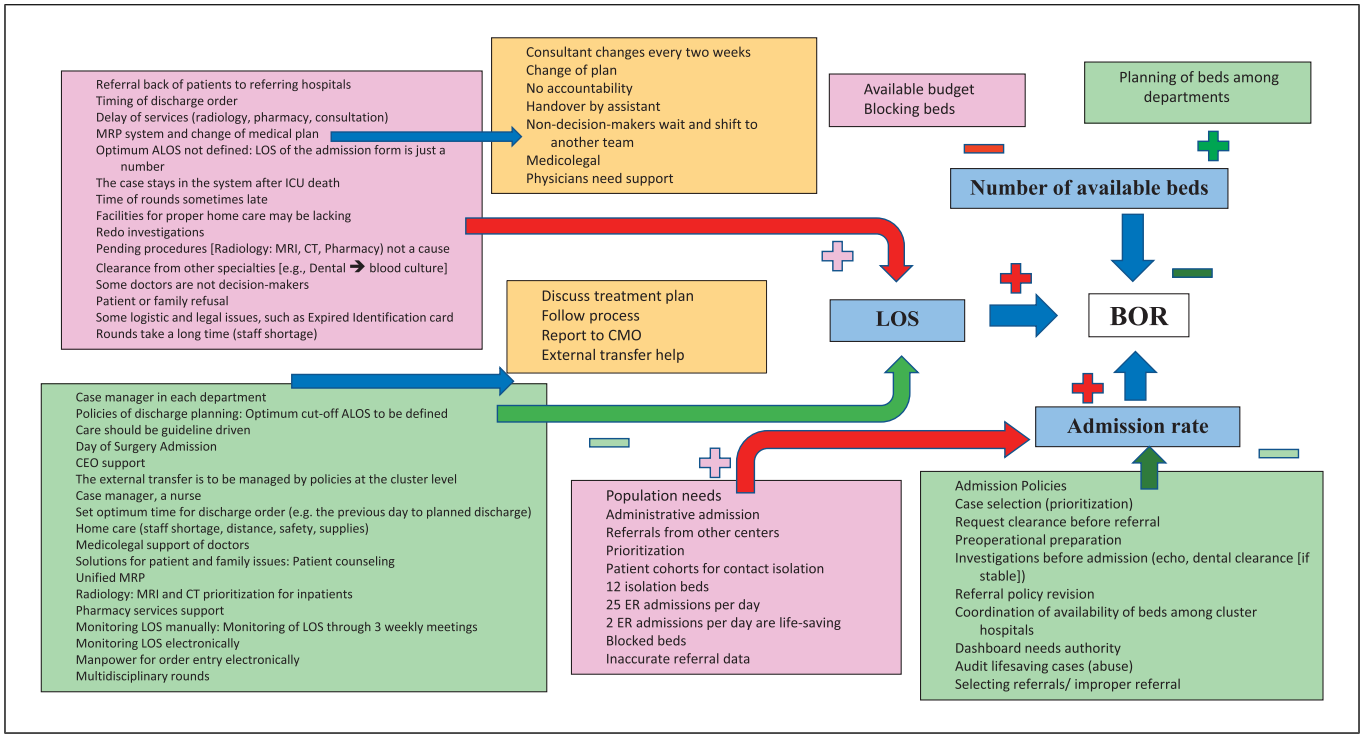

Fig. 2. Results of qualitative analysis.

healthcare services. Moreover, ED and OPD need to be supported with advanced diagnostic equipment and fast laboratory investigations. This is to decrease the need for hospital admissions waiting for a diagnostic procedure or laboratory results and to ensure the timely delivery of services during hospitalization.

The admitting physician should be mandated to determine an expected LOS for the patient's hospitalization based on the recommendations of the multidisciplinary team. The MRP in the inpatient ward should review the management and the expected LOS once the patient is admitted. The MRP should justify any changes related to the LOS or the management plan. The MRP should remain unchanged throughout the patient's hospitalization to avoid unnecessary changes in the management plan and extended LOS.

Reinforce the external referral system: Stable patients referred to KAMC from other tertiary and secondary hospitals within MHC for an advanced interventional modality should have their primary investigation and radiology, among other essential diagnostic modalities, ready before admission. Once the advanced intervention is done at KAMC and the patient's condition becomes stable, they should be transferred back to their refereeing hospital. Thus, the referring hospital should continue monitoring the patient in their facility once the advanced care at KAMC ends. This is necessary to make space for other patients who need to access the advanced services that can only be provided by KAMC.

The empowering and supporting of case managers: There is a need for case managers with a medical background in every department, and they must be supported with adequate resources. The case managers should facilitate the patients' journey from inpatient to outpatient services, discussing the patients' conditions with the MRP, the care team, and the consulting departments. The case manager should also facilitate patients' timely access to the required diagnostic and therapeutic services, contact the patient's family and arrange for discharge ahead of time, and facilitate the patient's access to social and home services post-discharge.

The use of systems and technological advances for better utilization of hospital beds: Patients with higher LOS and departments with reduced performance that are causing a delay in the delivery of healthcare services should be flagged.

Home services: Patients should be provided with home services to monitor patient's condition post-discharge and to provide basic healthcare needs like nebulization, intravenous fluids, antibiotics, wound care, and vaccinations, among other preventive and health promotion care. Thus, home care management needs to be supported with trained staff, medication, and equipment, among other essential resources.

Bed expansion to meet the increasing demand: At some stage, increasing the hospital bed capacity will be the ultimate solution.

Limitation

The limitation of this approach is that the quantitative part in this article included a revision of retrospective data of the hospital's operational parameters, BOC, LOS, and BOR from the hospital's records and monthly reports provided by KAMC's Strategy and the Statistics Department. The relations between various occupancy parameters were only explored by plotting the data provided on clustered line graphs to show the variation of occupancy parameters among different departments.

Conclusion

The BOR at KAMC exceeds the critical value of 75% in most of its departments. Some departments have a BOR as high as 97%. Values of BOR determinants differ among hospital departments, where some have a very high admission rate (e.g., Cardiology and Cardiac Surgery). In contrast, others suffer long average LOS (e.g., ICUs and Hematology/Oncology). Manipulating admissions can take the form of reinforcing strict case selection and referral policies, yet this will probably improve access to care for some complicated cases in the community rather than decreasing the rate of admission because of the expected pressure posed by the needs of the expanding population. A battery of interventions might help to reduce the LOS by supporting timely patient discharge. The presence of a dedicated case manager with a medical background in each department would perhaps be one of the most valuable interventions. Reinforcement of back-referral policies, revising the MRP policy, and having cluster-level referral policies and bed management strategies are other vital opportunities. Although such efforts are likely to have a positive effect, they are expected to only partially meet the existing gap, which probably requires increasing the number of available active beds.

Statement of Ethics

Participants have given their written informed consent, and the study protocol was reviewed and approved by King Abdullah Medical City's Institutional Review Board (study reference number #22-918). Written informed consent was obtained from participants to participate in the study.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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The authors declare that no funds were received from any source.

Author Contributions

Manal Z. AlFahmi and Soha A. Elmorsy designed the study, coded and analyzed the data, and wrote the manuscript. Raghad M. Aburuzaizah and Wedian O. Almowallad consented participants, and conducted interviews. All the authors approved the final manuscript and the resultant recommendations.

Data Availability Statement

All data generated or analyzed during this study are included in this article. Further inquiries can be directed to the corresponding author.

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