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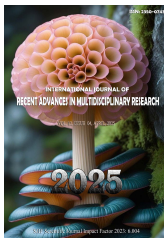

RESEARCH ARTICLE

ASSESSING THE CURRENT THEATRE SCHEDULING SYSTEM AT VIHIGA COUNTY REFERRAL HOSPITAL (VCRH) AND ITS ADAPTABILITY TO OPERATIONAL CHALLENGES

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ABSTRACT

The theatre scheduling system is the centerpiece of the operating theatre playing a pivotal role in ensuring seamless operation of the theatre while providing the highest quality of surgical services. An efficient system helps facilities utilize the available resources optimally and adapt to changes smoothly. This study assesses the current theatre scheduling system at Vihiga County Referral Hospital. A particular area of focus is its adaptability to various operational challenges such as equipment failures and machine breakdown, staff shortages resulting from sick leaves and study leaves, industrial actions like staff strikes, and external factors such as surgical camps utilizing the theatre. This study employed a mixed-methods research design incorporating quantitative data from theatre staff through structured questionnaires and qualitative data collected through key informant interviews. The target population of the 30 staff members who work in the theatre was sampled. The quantitative data were integrated and analyzed using Microsoft Excel to assess how the existing system responds to disruptions from operational challenges. Findings indicated that the current theatre scheduling system was moderately efficient, as rated by 76% of the respondents. It also identified several key operational challenges as major disruptors of the theatre operation; these challenges were, machine breakdown (52%), industrial action (32%), and staff shortage (16%). Emergency cases were also noted as a key disruptor of the theatre operation, as the facility lacked a dedicated operating room for emergency cases. While 68% of the staff believe the system prioritizes urgent cases effectively, 28% of the respondents reported occasional cancellations and delays due to poor resource allocation and emergency cases. Over-reliance on informal arrangements highlighted the need for standardized protocols. The current theatre scheduling system at Vihiga County Referral Hospital is moderately effective but faces significant operational challenges. Recommendations include investing in equipment maintenance, improving communication channels, developing formal protocols for system adaptation, and setting aside an operating room for emergency cases. These measures could enhance the system's resilience and efficiency, ultimately improving patient care and staff productivity.

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INTRODUCTION

The surgical operating theatre is a critical component of hospital operations, serving as a surgical care and resource allocation center. Chandra (2010) argues that the operating theatre is the most important and complex facility in the surgical department and requires delicate care and cooperation of the multidisciplinary team involved to improve efficiency. An efficient theatre scheduling system is necessary for planning both elective and emergency surgical cases effectively, optimizing resource utilization, and delivering the highest quality of patient care (Rothstein &Raval, 2018). In resource-limited settings such as Vihiga County Referral Hospital (VCRH), however, theatre scheduling systems often face significant operational challenges such as equipment failures, staff shortages, industrial actions, and emergency cases. Operational challenges refer to internal and external factors that interfere with the seamless functioning of the theatre as outlined in the scheduling system. These challenges

include equipment failures or machine breakdowns, staff shortages due to illness or leave, staff industrial actions such as strikes, a sudden increase in emergency surgeries following disasters such as road traffic accidents, or surgical camps that occupy the operating rooms for some time. These challenges necessitate immediate adjustment in scheduling and resource allocation affecting the overall efficiency of the theatre as well as the quality of patient care. Theatre scheduling systems can be classified into open, block, and modified block systems (Fei, Meskens & Chu 2006). The open systems operate on a first come first served basis while the block and modified block systems work by allocating each area of surgery a fixed time and date, with the modified block system being able to reallocate any free space that comes up (Fei, Meskens & Chu 2006). The modified block system aims to maximize efficiency while being adaptable to unforeseen disruptions. It tries to achieve efficiency by allowing for proper utilization of resources such as operating rooms and human resources by predicting potential spaces for urgent surgical cases, as well as ensuring adaptability so that postponed cases or emergency cases do not affect overall scheduling as well as patient management. Proper and timely communication is at the center stage in coordinating all activities that are happening as observed in a study done by Weldon et al (2013) who argued that efficient communication on theatre activities and changes reduces the chances of cancellation and delays as well as errors. Among other measures, studies have recommended improving theatre scheduling systems is the use of sophisticated technological advancements and algorithms, Bruni et al., (2015) argued the use of stochastic models and advanced algorithms and less advanced methods such as the use of graphs to visually monitor the utilization of operating rooms as suggested in a study done by Przasnyski (1986) that suggests blacking out times when the operating room is in use so that when the theatre room is not in use can be visualized and explanation of why it is not used can be sought and corrected to improve utilization of the resources within the surgical theatre.. The lack of these sophisticated predictive tools in resource-constrained settings such as VCRH necessitates low-cost manual contingency planning methods that are usually informal and vary from time to time. These informal methods usually have their shortcomings that when the operators are not on the lookout can cause delays, cancellations, and cases of neglecting patients. Studies suggest machine breakdown is a major operational challenge in facilities in resource-limited settings (Liang, 2010). The effects of these operational challenges can be minimized by developing scheduling systems that are resilient and adaptable as suggested by Blake and Carter (2002).

The justification of this study is the fact that the adaptability of a scheduling system plays a critical role in ensuring smooth operation, especially in dynamic environments such as operating theaters. Unforeseeable operational challenges in the hospital theatre, such as staff industrial actions, and emergency surgeries, especially in disasters where there are mass casualty events, staff leaves, machine breakdown, and the presence of surgical camps occupying the operating theatre can significantly disrupt theatre operations. These disruptions not only affect the quality of service patients receive but also staff morale and productivity. By assessing how the current system at VCRH functions and how it adjusts to the changes brought about by the operational challenges faced by the system, the findings of this study will contribute to making this theatre scheduling system more resilient and flexible by reducing disruptions, reducing surgery cancellations and ultimately improving patient morale, productivity, better utilization of resources and patient outcome. The study aimed to assess the efficiency of the current theatre scheduling system at VCRH, identify the common operational challenges it faces, and its adaptability in the face of these challenges.The findings of this study provide valuable insights for improving theatre scheduling practices in resource-limited settings.

METHODS

Study design: A cross-sectional study design was employed utilizing a mixed-methods research design combining both quantitative and qualitative approaches to adequately study the theatre scheduling system. The study was conducted at VCRH from September 30th to November 8th, 2024.

Study population and sampling: The target population was composed of the 30-theatre staff involved in theatre operations at Vihiga County Referral Hospital such as surgeons, anesthetists, nurses, and medical officers. Purposive sampling was used to select participants directly involved in the theatre operations.

Data collection: Quantitative data were collected using a structured questionnaire, which assessed the current theatre scheduling system, its efficiency, operational challenges, and the adaptability of the scheduling system to changes resulting from the operational challenges. The qualitative data were obtained through key informant interviews with the nurse in charge of the theatre.

Data analysis: The quantitative data were analyzed using Microsoft Excel, presented and summarized using descriptive statistics, while the qualitative data were analyzed under thematic analysis using the interview transcript.

Ethical consideration: Approval to conduct the study at VCRH's surgical theatre was obtained from the hospital's medical superintendent. Informed consent was secured from all participants before taking part in the study, and confidentiality was maintained throughout the study and its presentation.

Limitations: While the findings of this study provide valuable insights into operating theatre scheduling systems, it has several limitations. First, the data is self-reported which may introduce response bias as respondents may overestimate the system's efficiency or its adaptability. Second, the study was focused on a single facility, limiting its generalizability. Future studies could address these limitations by incorporating objective measures of efficiency and conducting multi-site studies to compare scheduling systems across different settings.

RESULTS

Demographics: The study included 25 respondents (83% response rate), with 52% male and 48% female participants. Nurses constituted the largest group of respondents and theatre

staff (44%), followed by surgeons (24%), anesthetists (20%), and medical officers (12%) composed of the least number. Most respondents had 1-5 years of experience (52%) and interacted with the scheduling system daily (68%).

Efficiency of the scheduling system

- Communication: 44% of the respondents rated the efficiency of the communication channels of the current theatre scheduling system as average while 40% rated it as good.
- Collaboration: 52% felt that the scheduling team collaborated and moderated well with another department that is involved in the theatre operation. Prioritization of urgent cases: 68% of the participants strongly agreed that the system effectively prioritizes urgent cases.
- Cancellations: 64% of the respondents reported that cancellations due to operational challenges rarely occurred due to poor resource allocation.
- Overall efficiency: 76% of the respondents rated the system as moderately efficient.

Operational challenges: The most frequent challenges were machine breakdowns (52%), industrial actions (32%), and staff shortages (16%). These disruptions led to delays, rescheduling, and overcrowding in the theatre.

Adaptability of the system

- Responsiveness: 52% of the participants believed that the system was somewhat responsive to operational challenges, while 44% rated it as very responsive.
- Speed of adaptation: 80% of the respondents reported that the system adapted quickly to unforeseen challenges.
- Modification of scheduling: 52% of the respondents indicated that the system allowed for modifications quite often.

The study also found that the lack of a dedicated emergency operating room was a major disruptor of theatre operations and the scheduling system as emergency cases forced scheduled surgeries to be pushed to another date or delayed.

DISCUSSION

The findings of this study provide invaluable insights into the current theatre scheduling system at VCRH, its efficiency, operational challenges, and adaptability. The findings indicate that the current theatre scheduling system at VCRH is moderately efficient but faces significant operational challenges such as machine breakdowns, and staff shortages. While the system effectively prioritizes urgent cases, frequent disruptions interfere with its overall performance. These findings align with and expand upon existing literature on theatre scheduling, particularly in resource-limited facilities.

Current theatre scheduling system at Vihiga County Referral Hospital (VCRH): VCRH uses a modified block system where different specialty of surgery are allocated specific days to perform their elective procedures; on Mondays, ENT (Ear, Nose and Throat) surgeries are done, on Tuesdays and Thursdays general surgery elective surgeries are done, on Tuesdays and Fridays orthopedic surgeries are done, and on Wednesdays obstetrics and gynecology elective surgeries are performed. This system allows for surgical procedures of specialty that were not scheduled to perform surgeries that day to be accommodated in case of available theatre spaces as well as emergency procedures. This system allows for the prioritization of emergency and urgent cases while sharing the theatre resources equitably among all specialties. These findings are consistent with studies that were done on different types of theatre scheduling systems (Fei, Meskens & Chu 2006).

Efficiency of the current theatre scheduling system: The current scheduling system at VCRH was rated as moderately efficient by 76% of the study participants, indicating that the system is achieving its operational target adequately. However, there is room for improvement in areas such as communication channels and lack of standardized protocol, which may contribute to its inefficiencies. 44% of the respondents for example rated communication on scheduling as average, indicating that communication is not always timely or effective. This aligns with Weldon et al. (2013), who emphasizes that effective communication is critical for reducing errors, cancellations, and delays in theatre operations. 52% of the respondents rated the system's efficiency in terms of coordination and collaboration among staff in the department and other related department as moderately well, this is a very important metric in determining the overall efficiency of the system as Chandra (2010) argues that without these collaborations the operating theatre cannot function to deliver its life-saving role efficiently.

Operational challenges: The study identified machine breakdowns, industrial actions, staff shortages, and emergency cases as the most frequent operational challenges disrupting theatre schedules. 52% of the respondents reported machine breakdown as the most common operational challenge highlighting the need for regular equipment maintenance and investment in new technology. This finding is consistent with studies that identified equipment failure as a major barrier to efficient theatre operations in resource-limited settings (Liang, 2010). These operational challenges not only disrupt the scheduling system but also have broader implications for patient care and staff morale. For example, delays and cancellations can lead to patient dissatisfaction and increased waiting times, while overburdening staff may experience burnout and reduced productivity. This is as argued by Blake and Carter (2002).

Adaptability of the system: The study found that the current theatre scheduling system at VCRH demonstrates a reasonable level of adaptability, with 80% of respondents reporting that the system adapts quickly to unforeseen challenges. However, the study also found that these adaptabilities heavily rely on informal and manual adjustments that are not sustainable in the long term and may lead to inconsistencies in how disruptions are managed. The reliance on informal arrangements contrasts with the structured protocols recommended in the literature. For instance, Bruni et al. (2015) advocate for the use of stochastic models and advanced algorithms to optimize theatre scheduling and improve adaptability. While such sophisticated tools are not feasible in resource-constrained facilities such as VCRH, the development of formal, low-cost, standard protocol is imperative to make the system resilient.

CONCLUSION AND RECOMMENDATIONS

The theatre scheduling system at VCRH is moderately effective, despite this, there is a clear need of improvement to address operational challenges. These proposed provisions would increase efficiency, reduce disruptions to hospital care for patients and the work operations and ultimately improve the quality of environment for staff by improving communication protocols, purchasing more equipment, instituting formal scheduling guidelines around the new operating room and designating an emergency operating room.

Key recommendations include

1. **Improve communication protocols:** To streamline intra and interdepartmental communication on scheduling changes, VCRH should consider implementing standardized communication protocols and channels. This could include automated notifications, regular meetings, or updates to ensure all team members are promptly informed of the changes.
2. **Increase investments in equipment maintenance and acquisition:** Given the frequency of machine breakdowns, regular maintenance and investment in new equipment should be prioritized to reduce delays and eliminate cancellations caused by equipment failures.
3. **Development of formal protocols for changing the scheduling system:** These protocols will help ensure a more systematic approach to adapting the system during operational challenges
4. **Designate an operating room for emergency cases only:** Setting aside an operating room for emergency cases will enable the system to handle emergency cases without disrupting elective surgeries and causing rescheduling and overcrowding of the theatre list.

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