HIGHLIGHTS

1. Enhancing Quality Improvement for Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCAH)

2. Reducing the Rate of Post-cesarean Surgical Site Infections

3. Patient Flow Analysis in a Public Hospital

4. Staff Satisfaction Levels in a Hospital

5. Factors Affecting Incident Reporting among Nurses

6. Prevalence and Factors Associated with Neonatal Mortality

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General Information

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CONTENT

Dear readers,

I am delighted to introduce this issue of the Rwanda Public Health Bulletin (RPHB), which features articles on the continuous and critical improvements in the quality of healthcare services in Rwanda.

Rwanda's healthcare system has been recognized globally for its innovative approaches and strong commitment to achieving Universal Health Coverage (UHC). However, as our healthcare system evolves, it is imperative that we focus on not just expanding access to care but also ensuring the highest standards of service delivery. This publication reflects our shared commitment to advancing quality across all health sectors and serves as a platform for sharing best practices, research, and innovations that will shape the future of healthcare in Rwanda.

This issue features key insights on vital areas such as reproductive, maternal, newborn, child, and adolescent health, surgical safety, patient flow efficiency, and the prevention of infections in healthcare settings. Each of these articles highlights the outstanding work being done by health professionals, researchers, and institutions in driving quality improvement. From analyzing patient satisfaction and enhancing post-surgical outcomes to optimizing hospital processes, these contributions are invaluable in our quest to provide world-class healthcare.

The path to a healthier nation is built on the foundation of quality healthcare services. This can only be achieved through robust systems, continuous education, innovation, and collaboration. The RPHB remains an essential resource for health professionals, offering a platform for disseminating the knowledge that informs our strategies and interventions.

I would like to commend all the contributors for their exceptional work and dedication, and the findings and recommendations in this publication will inspire even greater efforts toward excellence in healthcare service delivery. Let us continue to work together to ensure that every Rwandan has access to safe, effective, and high-quality healthcare services.

Prof. Claude Mambo Muvunyi, MD, PhD
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Enhancing Quality Improvement for Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCAH): Insight at Remera Rukoma Hospital

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ABSTRACT

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A comprehensive quality improvement (QI) training was conducted at Remera Rukoma District Hospital from March 11-15, 2024 targeting 21 key stakeholders, including hospital heads of departments and leaders from various high-risk service areas. Facilitated by national QI facilitators and a QI advisor in USAID Tubeho project, the program aimed to enhance healthcare quality by empowering professionals with knowledge and skills in QI methodologies. The training covered topics such as QI principles, patient safety, change management, and hospital accreditation, utilizing a participative approach with diverse teaching methods. The training resulted in significant improvements in participants' QI knowledge, with average test scores rising from 52.9% to 86.9%. Participants successfully identified quality gaps, developed aim statements, and designed QI projects for implementation. Hospital rounds revealed critical areas for improvement, particularly in maternity and neonatology departments. Key recommendations included fostering closer collaboration between USAID Tubeho staff and hospital personnel, reviewing and refining existing QI projects, and providing targeted support for new initiatives addressing identified gaps. This training represents a crucial step towards embedding a culture of continuous improvement in the healthcare system.

INTRODUCTION

Reproductive, maternal, newborn, child and adolescent health (RMNCAH) is an important measure of progress towards universal health coverage and a priority health area for African countries [1]. However, to accomplish this involvement, staff need to be knowledgeable and skilled to do so. Part of the knowledge and skills that health facilities staff need to acquire include continuous quality improvement techniques. Applying those knowledge and skills will help them better understand the process through which healthcare quality gaps are identified, analyzed to know their root causes, development and testing of changes to address root causes; implementing and sustaining successful changes [2].

The Quality Improvement Training for Hospital staff is vital to enhance the overall quality of healthcare services provided at the hospital. The training empowers healthcare professionals with the knowledge and skills required to identify, assess, and improve the quality of patient care. Traning hospital leadership helps improve standards of care at different levels of health system, regular evaluation of the quality of care and adherence to the set norms and standards and institutionalization of continuous quality improvement system for

all healthcare providers [3]. In this regard, the Ministry of health in collaboration with USAID Tubeho Project conducted a 4 day's training on quality Improvement for Remera Rukoma District Hospital heads of departments and other key leaders. Training topics included introduction to quality improvement, patient safety, quality improvement (QI) models, how to conduct rapid assessments on the quality of healthcare, concepts of change management, developing and implementing QI plans, monitoring and evaluating QI as well as the implementation of the hospital accreditation program, etc. The involvement of hospital heads of department and key leaders (clinical and non-clinical) is essential in the successful implementation of the quality improvement projects and other strategies aimed at improving RMNCAH indicators [4].

Training Goal: The purpose of the training was to build the capacity of the Hospital heads of department on QI principles, QI methodology, QI projects development, and data use for decision making to make a timely decision for improvement.

TRAINING METHODOLOGY

The training employed a comprehensive and engaging methodology designed to maximize participant learning and practical application. At its core was a participative approach, where facilitators actively incorporated participants' training needs, questions, reflections, and proposed strategies for change into the curriculum. This adaptive strategy ensured that the content remained relevant and immediately applicable to the participants' work contexts [5]. Each session concluded with a brainstorming activity, serving as both a summary and a platform for collaborative idea generation [6]. To foster deeper engagement and peer learning, participants were frequently organized into groups for various activities. The training utilized a diverse range of teaching methods to address different learning styles and reinforce key concepts [7]. These included facilitator-led presentations to introduce new concepts, brainstorming sessions to encourage creative problem-solving, and both small and large group activities and discussions to promote collaboration and knowledge sharing. Additionally, case studies and exercises were employed to provide practical, real-world applications of the concepts learned,

while ward rounds offered hands-on experience in identifying and addressing quality improvement opportunities in a healthcare setting [8]. This multi-faceted approach ensured a dynamic, interactive learning environment that effectively met the training objectives while preparing participants to implement quality improvement strategies in their respective roles [9].

Targeted Audience: The quality improvement training at Remera Rukoma Hospital, scheduled for March 11-15, 2024, targeted a diverse group of 21 key participants, including hospital heads of departments and leaders. This comprehensive audience comprised hospital leaders, risk areas focal persons, quality and safety committees' chairpersons, and representatives from high-risk service areas such as maternal and neonatal care, HIV services, and Malaria and Tuberculosis programs. The training was expertly facilitated by a team of three experienced professionals: two National Quality Improvement Facilitators from Byumba Level II teaching hospital and RSSB Nyanza, alongside a Q.I Advisor from the USAID Tubeho Project.

This carefully curated mix of participants and facilitators ensured a comprehensive and tailored approach to quality improvement, addressing the specific needs and challenges of Remera Rukoma Hospital while leveraging both national expertise and international development support.

Training Evaluation/Assessment: The training employed pre-test and post-test approach to assess participant's knowledge prior to the training and the level of knowledge after training. Moreover, there were questions and answers session after each training session. The average score in the pre-test was 52.9% and whereas in the average percentage in post-test was 86.9%, as shown in table one. Daily anonymous evaluation forms were distributed to the participants at the end of daily session to provide their observations/comments/ feedback about the taught subjects which the facilitators reviewed and responded accordingly [10].

TRAINING OUTCOMES

Following the completion of the quality improvement training, participants demonstrated remarkable progress in achieving the expected

Table 1: *Pre and post test scores*

Participants	Pretest	Post test
1	12 (60%)	18 (90%)
2	14 (70%)	18 (90%)
3	14 (70%)	18 (90%)
4	12 (60%)	18 (90%)
5	13 (65%)	14 (70%)
6	14 (70%)	18 (90%)
7	7 (35%)	18 (90%)
8	12 (60%)	18 (90%)
9	12 (60%)	18 (90%)
10	9 (45%)	17 (85%)
11	7 (35%)	18 (90%)
12	12 (60%)	16 (80%)
13	9 (45%)	18 (90%)
14	12 (60%)	16 (80%)
15	9 (45%)	17 (85%)
16	13 (65%)	18 (90%)
17	13 (65%)	16 (80%)
18	9 (45%)	18 (90%)
19	12 (60%)	18 (90%)
20	12 (60%)	18 (90%)
21	7 (35%)	17 (85%)

outcomes. They successfully identified several quality and performance gaps within their organization and crafted clear, actionable aim statements to address these issues. Participants showed enhanced analytical skills by thoroughly examining the root causes of these gaps using various tools and techniques learned during the training. They also exhibited creativity and initiative in developing innovative change ideas, which they systematically tested using Plan-Do-Study-Act (PDSA) cycles [11]. Furthermore, participants implemented effective measurement strategies to monitor their improvement efforts, utilizing appropriate metrics and data visualization techniques to track progress. This comprehensive application of learned skills not only validated the effectiveness of the training but also led to tangible improvements in various processes within the organization, showcasing the participants' newfound expertise in quality improvement methodologies [12].

Post Training Plan: During the training, hospital heads of department and trained key leaders met to identify priority areas for improvements in line with RMNCAH accreditation standards and the hospital quality and patient safety plan. Identified gaps were used during practical sessions to design QI projects that will be implemented in the departments. During QI projects implementation, teams will be primarily and regularly mentored and coached by the QI officer with regular support from USAID Tubeho teams. There will also be continuous evaluation of the QI projects to track

their progress by the Hospitals QI committees.

Observed gaps: During comprehensive rounds conducted in the maternity and neonatology departments, several critical gaps in patient care and safety were identified, highlighting areas requiring immediate attention and improvement. Foremost among these was an ineffective triage and follow-up system for high-risk pregnancies, potentially compromising the timely identification and management of complications. This gap poses significant risks to both maternal and fetal health outcomes. Additionally, the emergency preparedness was found to be suboptimal, with emergency trolleys in the maternity ward not properly maintained or stocked, and ambulances lacking proper cleanliness protocols, both of which could severely impede rapid response in critical situations [13]. Of particular concern was the insufficient implementation of infection prevention and control (IPC) measures across various hospital departments, starkly evidenced by an ongoing Klebsiella outbreak in the neonatology unit. This outbreak not only threatens the health of vulnerable newborns but also indicates broader systemic issues in hygiene and infection control practices [14]. Lastly, a significant gap was noted in the continuity of care for high-risk infant's post-discharge, with no structured follow-up mechanism in place. This lack of follow-up could lead to missed opportunities for early intervention in potential complications, potentially affecting long-term outcomes for these vulnerable patients [15]. These identified gaps collectively point to a pressing need for comprehensive quality improvement initiatives focusing on risk management, emergency preparedness, infection control, and continuity of care in both the maternity and neonatology departments. Nearly 20 years ago, Grol and Grimshaw asserted that evidence-based practice must be complemented by evidence-based implementation [2,16].

RECOMMENDATIONS

At the conclusion of each quality improvement (QI) training session, participants engaged in a reflective process to formulate key recommendations, demonstrating their commitment to applying newly acquired knowledge and skills in their respective healthcare settings. The first recommendation emphasized the importance of collaborative efforts, calling for USAID Tubeho staff to establish closer working relationships with hospital personnel, professional association mentors, and district-based mentors [17]. This collaborative approach aims to provide comprehensive support to healthcare facilities in designing, implementing, monitoring, and evaluating QI projects more effectively, ensuring that interventions are tailored to local needs and contexts. The second recommendation focused on enhancing the quality and consistency of existing QI initiatives by proposing a thorough review of ongoing projects. This review process would involve refining the documentation practices to align more closely with the QI methodologies learned during the training, thereby improving the rigor and reproducibility of these projects. Lastly, participants recommended that hospitals receive dedicated support in initiating and monitoring new QI projects specifically targeted at addressing the gaps identified during the training. This proactive approach underscores the importance of translating theoretical knowledge into practical applications, encouraging healthcare facilities to tackle their most pressing quality issues systematically [18]. Collectively, these recommendations reflect a holistic strategy for embedding QI principles and practices more deeply within the healthcare system, fostering a culture of continuous improvement and evidence-based decision-making.

CONCLUSION

This Quality Improvement Training improved healthcare quality and patient safety. The training empowered 21 key stakeholders, including hospital heads and leaders, with essential knowledge and skills in quality improvement methodologies. The comprehensive curriculum and participative teaching approach resulted in a significant increase in participants' understanding of QI principles, with test scores improving from 52.90% to 86.9%. Participants also demonstrated practical application by identifying critical gaps in patient care, particularly in maternity and neonatology departments, and developing actionable QI projects. The post-training plan, focusing on implementing QI projects and ongoing mentorship from USAID Tubeho teams, promises to drive sustainable improvements in healthcare delivery at Remera Rukoma Hospital, contributing to better health outcomes and progress towards universal health coverage in Rwanda.

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Reducing the rate of post-cesarean surgical site infections at Remera Rukoma Hospital: a quality improvement analysis using PDSA and fishbone diagram

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ABSTRACT

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Surgical site infections (SSIs) following cesarean sections (CS) are a significant global health concern, with varying prevalence rates across regions. At Remera Rukoma Hospital in Rwanda, the CS infection rate was 2.025% from July to December 2023, prompting a quality improvement project to reduce it to 1% by June 2024. The hospital's target of a 1% surgical site infection rate for cesarean sections aligns with World Health Organization standards, positioning it as a potential regional leader in infection control while significantly improving patient safety and maternal health outcomes.

The project utilized a comprehensive approach, employing the Fishbone diagram to identify root causes across patient, surgical team, and hospital environment factors. Targeted interventions were implemented, including improved pre-operative cleaning, staff training on infection prevention, and enhanced environmental hygiene. Progress was monitored monthly using the Plan-Do-Study-Act cycle.

The project successfully reduced the average CS infection rate to 0.45% from January to June 2024, with four months achieving 0% infection rates. Key factors in this success included strengthened aseptic practices, optimized antibiotic prophylaxis, and improved teamwork. Continuous monitoring, regular staff education, and data-driven improvement cycles are recommended to sustain these positive outcomes.

INTRODUCTION

Surgical site infection (SSI) is one of the most common complications following cesarean section (CS) [1]. A recent World Health Organization (WHO) report highlighted that CS has become increasingly common in both developed and developing countries for a variety of reasons [1-4].

Cesarean section (CS) is the commonest obstetric surgical procedure, its global rates including both emergency and elective range from 5 to 20% and the rates continue to rise in both developed and developing countries [1,5].
Recent systematic reviews and meta-analyses have shown that the estimated global prevalence of post-caesarean surgical site infections is 5.63%

with the highest prevalence in sub-Saharan Africa (11.91%) and the lowest prevalence in North America (3.87%) [1,6]. C-section site is associated with high maternal morbidity and mortality rate of up to 3% [1]. According to the 2019–20 Rwanda Demographic and Health Survey, 15% of births in Rwanda are delivered by Caesarean section [7]. The Centers for Disease Control and Prevention defines surgical site infection (SSI) as an infection that develops in the surgical site within 30 days of the procedure [1,8].

Despite being one of the most preventable types of healthcare-associated infections, surgical site infections (SSIs) continue to pose a substantial economic challenge to healthcare systems worldwide [6]. Research from various countries demonstrates that SSIs not only lead to considerable financial strain on patients and their families but also significantly diminish the overall quality of life for those affected [6]. SSIs led to unnecessary fatalities and extended hospitalization periods, including ICU stays and hospital readmissions, consequently escalating antimicrobial resistance and long-term disability rates [9].

Adherence to fundamental practices like proper hand hygiene, skin preparation, appropriate antibiotic use, minimally invasive techniques, shorter surgeries, better hemostasis, and temperature regulation can potentially prevent half of all surgical site infections [6]. Women who did not receive prophylactic antibiotics (35.5%) developed SSI more often than those who did (P < 0.0001) [5]. These findings suggest that emergency C-sections and inappropriate antibiotic prophylaxis are risk factors for developing SSI [5]. The development of SSI is associated with many factors rather than one factor [1]. Additionally, infection occurring after delivery may lead to substantial physical and emotional burdens on the mother and to a significant financial burden on the health care system [10].

Remera Rukoma Hospital is a district hospital in Kamonyi district, Rwanda, serving a large population and performing a significant number of cesarean deliveries with an average of 12 deliveries and 5 C-sections per day. Despite advances in surgical techniques and infection control measures, the hospital continues to experience an alarmingly high rate of surgical site infections (SSIs) among women undergoing Cesarean sections at Remera Rukoma Hospital, in fiscal year 2022-2023 C-section infection rate was 1.7%, from July to December 2023 C-section infection rate was 2.025%, presents a critical healthcare challenge that demands immediate attention. This elevated rate not only poses a significant threat to patient safety and well-being, potentially leading to prolonged recovery times, increased pain, and life-threatening complications for mothers and newborns but also places a substantial burden on the hospital's limited healthcare resources. The increased need for extended hospital stays, additional treatments, and potential readmissions strains both medical supplies and staff capacity.

Furthermore, this high SSI rate negatively impacts the hospital's reputation within the community, potentially eroding trust in its maternity services. The situation also raises concerns about the overall quality of care, suggesting possible gaps in infection prevention protocols, surgical techniques, or post-operative care practices. Addressing this issue is crucial for improving immediate patient outcomes and mitigating long-term health consequences, reducing the socioeconomic impact on families, and upholding the hospital's commitment to providing high-quality maternal healthcare services. This project's target was to reduce the surgical site infection rate among the mothers who underwent C-sections at RRH from 2.025% in January to 1% on 30 June 2024. This target is particularly significant as it aligns with global health standards. The World Health Organization recommends that SSI rates following cesarean sections in low- and middle-income countries should be below 5%, with rates of 1-2% considered excellent benchmarks for quality care [11]. Achieving a 1% infection rate would not only enhance patient safety and reduce maternal morbidity at Remera Rukoma Hospital but also position it as a regional leader in infection control, potentially influencing healthcare practices across Rwanda and East Africa.

Comprehensive Problem Analysis

Reducing the C-section surgical site infection rates at Remera Rukoma Hospital utilizes a comprehensive approach, employing the Fishbone (Ishikawa) diagram method to identify root causes across three main categories [12]. Patient Factors, Surgical Team Factors, and Hospital Environment

Factors. Patient Factors contributing to the high SSI rate included inadequate pre-operative preparation, such as poor abdominal washing and insufficient vaginal cleaning for women in labor. Prior to intervention, patients were not consistently educated about proper hygiene practices, and there was no clear protocol to separate mothers with infected wounds from those scheduled for C-sections, leading to increased infection risks. During the "Do" phase of the PDSA cycle, educational sessions were introduced to improve patients' awareness of hygiene practices, and stricter pre-operative protocols were implemented, ensuring better abdominal and vaginal cleaning. Additionally, mothers with infections were isolated from those undergoing surgery, minimizing cross-contamination risks.

Surgical Team Factors reveal several critical issues, including non-adherence to guidelines for prophylactic antibiotic administration, inadequate decontamination procedures in the operating room, insufficient patient transfer equipment, and improper use of personal protective equipment (PPE). Prior to intervention, there was inconsistent compliance with antibiotic timing protocols and decontamination processes, and staff were not fully trained on proper PPE use or IPC (Infection Prevention and Control) practices. During the "Do" phase of the PDSA cycle, targeted interventions were implemented: surgical staff were retrained on IPC protocols, with specific focus on timely antibiotic administration and proper PPE usage. Decontamination procedures were standardized, and new patient transfer equipment was procured to ensure safe and sterile transfers. These changes aimed to bridge the knowledge gap and improve adherence to IPC practices across the surgical team.

Hospital Environment Factors contributing to elevated SSI rates include poor patient bed hygiene, inadequate cleaning of the operating room, the presence of antibiotic-resistant bacteria, and overcrowding. Before interventions, bed hygiene protocols were inconsistent, operating room cleaning lacked standardization, and overcrowding was common, making infection control difficult. In the "Do" phase of the PDSA cycle, several corrective actions were implemented: enhanced cleaning protocols for patient beds and operating rooms were introduced, focusing on high-touch

areas and using disinfectants effective against resistant bacteria. Additionally, bed spacing was adjusted to reduce overcrowding where possible, and hospital staff were retrained on the importance of maintaining these new standards to control the spread of infection. These steps were crucial in addressing the environmental root causes of SSIs.

METHODS

To address these root causes, the quality improvement analysis project involved a series of targeted interventions, applied systematically through the Plan-Do-Study-Act (PDSA) cycle. This process was enhanced by mentorship from the USAID-Tubeho team from JHPIEGO, who guided the hospital team on infection prevention and control (IPC) practices, gap identification, intervention design, and effectiveness monitoring. During the "Plan" phase, root causes of SSIs were identified using Fishbone diagram analysis, and specific interventions were designed for each category. Importantly, feedback mechanisms were established to gather insights from both internal (staff) and external (patients) stakeholders, ensuring a comprehensive understanding of the challenges and potential solutions.

Patient-focused actions included introducing thorough pre-operative cleaning protocols, with an emphasis on abdominal washing and vaginal cleaning for women in labor. Patients were also educated on proper hygiene practices, and infected mothers were separated from those scheduled for C-sections to reduce cross-contamination. A patient feedback system was implemented, including post-discharge surveys and follow-up calls, to gather insights on their experiences and identify areas for improvement in patient care and education.

For the surgical team, the project focused on reinforcing compliance with prophylactic antibiotic guidelines, improving operating room decontamination procedures, and addressing knowledge gaps through IPC training. Personal protective equipment (PPE) availability was improved, and staff were trained on its proper use. Regular staff meetings and anonymous suggestion boxes were introduced to encourage open communication and gather feedback on the implementation of new protocols and potential challenges faced by the team.

In the "Do" phase, these interventions were rolled out: enhanced operating room cleaning procedures were implemented, focusing on high-touch surfaces and disinfectants targeting antibiotic-resistant bacteria. Regular IPC training sessions were conducted for the surgical team to ensure adherence to updated protocols. The hospital environment was improved by standardizing patient bed hygiene and addressing overcrowding in the maternity wards by reorganizing patient flow. Bacterial cultures were performed to guide targeted treatment, and efforts to expand maternity facilities were initiated to reduce patient congestion.

Throughout this phase, continuous feedback was solicited from both staff and patients. Staff were encouraged to report any difficulties in implementing new procedures or suggestions for improvement through regular team huddles and a dedicated feedback channel. Patients were interviewed at various stages of their hospital stay to gather real-time feedback on their care experience and the effectiveness of the new hygiene protocols. Monthly monitoring and data collection followed to track progress, and adjustments were made as necessary to ensure continuous improvement. The data collected included not only infection rates but also staff compliance metrics and patient satisfaction scores, providing a holistic view of the project's impact.

The USAID-Tubeho team from JHPIEGO played a crucial role in this process, providing ongoing mentorship to the hospital team. They assisted in analyzing the feedback received, identifying additional gaps, and refining interventions based on both quantitative data and qualitative feedback from stakeholders. This collaborative approach ensured that the interventions remained responsive to the needs of both staff and patients, while aligning with best practices in IPC.

RESULTS

As illustrated in Figure 1, the increase in infection rates from January to February was likely influenced by several factors identified during the quality improvement analysis. In January, the hospital had just initiated interventions targeting the root causes of surgical site infections (SSIs). Factors such as inadequate pre-operative hygiene practices, gaps in adherence to prophylactic antibiotic administration, and poor operating room cleaning protocols were still being addressed. The high rate of 1.7% in January reflects the initial stages of implementation, where challenges such as staff adaptation to new protocols and procedural changes were still being optimized. However, by February, the interventions—such as stricter adherence to pre-operative cleaning, improved surgical protocols, and enhanced staff training—began to take effect, leading to a significant drop to 0%. This improvement reflects the successful execution of the "Do" phase of the PDSA cycle, where corrective actions were put into place and had a notable impact on infection control.
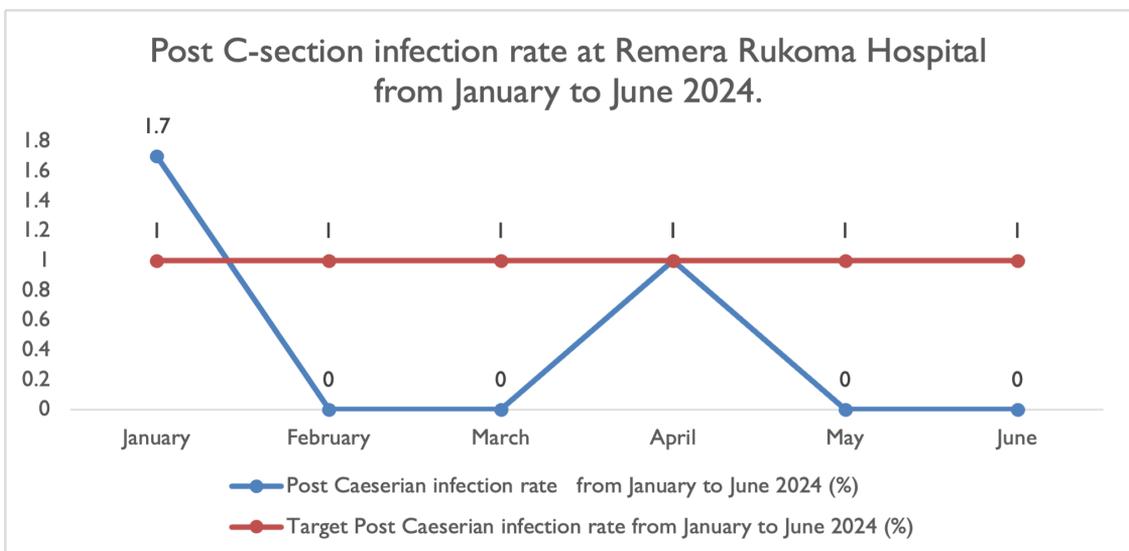

Figure 1: *Trends in C-section infections from January to June 2024*

LESSONS LEARNED

The project to reduce C-section surgical site infections at Remera Rukoma Hospital from 2.025% to 1% between January and June 2024 presented a valuable learning opportunity. The average infection rate from January to June 2024 was found to be 0.45%. While the overall goal was to achieve a 1% infection rate, the initial high of 1.7% in January served as a wake-up call, prompting the need for immediate and focused interventions. The success that followed, with 0% infection rates in February and March, strongly suggests the effectiveness of these implemented changes. These interventions likely centred around three key areas.

Strengthened Aseptic Practices: This might have involved improvements in hand hygiene protocols for healthcare staff. This could include more frequent handwashing with soap and water or alcohol-based hand rub, especially before and after glove changes and patient contact. Additionally, meticulous surgical site preparation procedures may have been implemented, ensuring proper skin antisepsis before incision. Furthermore, the project might have emphasized the proper use of sterile equipment throughout C-section procedures to minimize the risk of contamination.

Antibiotic Prophylaxis Optimization: Another area of focus may have been reviewing and potentially revising the guidelines for antibiotic prophylaxis given to C-section patients. This could have involved ensuring appropriate antibiotic selection based on the specific risk factors of each patient, optimizing the timing of administration (often given shortly before the incision), and adhering to proper dosage recommendations. Streamlining these practices likely contributed to a reduction in infections.

Teamwork and Communication: The project's success likely hinged on effective communication and collaboration among surgeons, nurses, and all other healthcare personnel involved in C-section procedures. Regular discussions, clear protocols, and ongoing training on infection control measures would have ensured everyone was on the same page, consistently adhering to best practices to minimize surgical site infections.

Though the project yielded significant learnings and demonstrably positive outcomes, the initial high infection rate of 1.7% in January underscored the critical need for immediate and targeted interventions. The subsequent success in achieving 0% infection rates in February and March strongly suggests the effectiveness of the implemented changes. These improvements likely centered on reinforcing aseptic practices, optimizing antibiotic prophylaxis protocols, and fostering effective teamwork and communication among healthcare staff. However, the slight rise in infection rate to 1% in April highlights the importance of acknowledging that maintaining a perfect record is an ongoing challenge but also a possible seasonal effect.

WAY FORWARD

While achieving zero C-section surgical site infections in May and June 2024 was a remarkable accomplishment for Remera Rukoma Hospital, it's crucial to recognize the ongoing challenge of maintaining such a perfect patient record. The slight rise to a 1% infection rate in April serves as a reminder that fluctuations can occur. To build upon this success and ensure long-term sustainability, the hospital can implement several key strategies. Continuous monitoring by establishing a system for ongoing surveillance of C-section infection rates is essential. This allows for early detection of any potential increases, enabling prompt investigation and corrective action. Regular monitoring can involve tracking infection rates by month, department, surgeon, or any other relevant factor to identify areas where additional focus might be needed.

Regular Staff Education and Training: Healthcare personnel involved in C-section procedures require ongoing education and training to reinforce aseptic practices and proper antibiotic use. This can involve regular training sessions focusing on best practices for hand hygiene, meticulous surgical site preparation, and proper sterile equipment handling. Additionally, incorporating refresher courses on antibiotic prophylaxis guidelines can ensure consistent and appropriate antibiotic selection and administration for C-section patients. By prioritizing continuous learning, the hospital can maintain staff vigilance in adhering to infection control protocols.

Data Analysis and Quality Improvement Cycles:
Regularly analyzing data on C-section procedures and infection rates is a powerful tool for identifying areas for further improvement. This data can reveal trends, highlight potential weaknesses in protocols, or even suggest opportunities for further optimization. By establishing quality improvement cycles, the hospital can use these insights to refine existing protocols and practices. This might involve implementing changes based on data analysis, monitoring their effectiveness, and then making further adjustments as needed. This cyclical approach allows for continuous improvement and adaptation, ensuring the long-term effectiveness of infection control measures.

To address the reviewer's comment using the Plan-Do-Study-Act (PDSA) method, the project at Remera Rukoma Hospital aimed to reduce C-section surgical site infections (SSIs) to 1% or lower by implementing specific interventions. What are we trying to accomplish? The hospital's goal was to minimize SSIs by addressing issues such as poor hygiene practices, inadequate antibiotic use, and environmental factors like overcrowding. How will we know that a change is an improvement? Success was measured by tracking monthly infection rates, aiming for a sustained reduction to 1% or lower, with regular data collection and analysis to evaluate the effectiveness of each intervention. What changes can we make that will result in an improvement? Key changes included improving pre-operative hygiene procedures for patients, enforcing adherence to antibiotic prophylaxis guidelines, enhancing operating room sterilization, and offering continuous staff training on infection prevention protocols. These steps were implemented systematically, with ongoing monitoring and adjustments based on infection rate data, leading to the hospital's ability to meet or exceed its targets in most months.

CONCLUSION

The Remera Rukoma Hospital's project to reduce C-section surgical site infections (SSIs) demonstrates a successful implementation of the PDSA cycle. In the Planning phase, the team identified the need to reduce SSI rates and designed interventions focusing on aseptic practices and antibiotic prophylaxis. The Do phase involved implementing these interventions, resulting in a 0% infection rate in February and

March. The Study phase revealed these positive outcomes but also highlighted a slight increase in April, prompting further analysis. In the Act phase, the team is now refining protocols based on these findings, emphasizing the need for ongoing vigilance and continuous improvement.

This project showcases the power of multidisciplinary collaboration between medical doctors, nurses, anesthesiologists, infection control practitioners, quality improvements officer, cleaning personnels, laboratory technicians, and hospital administrators. Their collective efforts focused on standardizing pre-operative preparation, optimizing antibiotic timing, enhancing intra-operative sterile techniques, and improving post-operative wound care. This collaboration extended to creating and implementing new protocols, conducting training sessions, and establishing a culture of open communication for reporting and addressing potential infection risks. By working together, the team was able to leverage diverse expertise, ensuring a comprehensive approach to SSI prevention.

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Patient Flow Analysis in a Public Hospital: A Case of Outpatient Services at Remera Rukoma District Hospital

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ABSTRACT

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INTRODUCTION: Wait times in outpatient services are a major challenge for hospitals. This study at Remera Rukoma District Hospital aimed to analyze patient flow and waiting times in the outpatient department to improve service quality and resource utilization.

METHODS: A cross-sectional study was conducted from November 2023 to January 2024, involving 300 patients. Data was collected by observing patient flow and recording time spent at each touchpoint, then analyzed using SPSS version 25.

RESULTS: The average age of participants was 36.23 years, with a majority being female (55%) and referred patients (82%). Most visits (72.7%) were first-time consultations. Average wait times ranged from 19 minutes at reception to 104 minutes at the pharmacy, with the longest waits observed at the pharmacy.

CONCLUSION: The study highlighted the need for interventions to reduce delays, particularly at the cashier and pharmacy. Recommendations include process improvement, staff training, and regular monitoring of patient flow data to enhance patient satisfaction and healthcare service quality.

INTRODUCTION

Patient flow analysis (PFA), a simple quality improvement tool to identify patient flow patterns, can be used in resource-limited settings to inform service delivery improvements [1]. Inefficient patient flow affects the quality and timeliness of care and patient satisfaction [2]. The shortage of resources and staff in lower and middle-income countries (LMICs) emergency rooms makes the overcrowding problem even worse than in developed countries [1]. As a result, LMIC emergency rooms struggle with too many patients and limited resources, compounding the challenge of providing timely care [1].

PFA pinpoints inefficiencies in how patients move through facilities, leading to better care experiences and outcomes and it identifies opportunities to streamline healthcare delivery, enhancing efficiency and patient satisfaction [3-7]. It also reflects how quick and efficient hospitals are in providing healthcare services, shows possible bottlenecks, and is an evidence-based tool for managing patient flow [8]. The use of patient flow analysis and the creation of patient care teams proved useful in identifying areas for improvement, targeting, and measuring the effectiveness of interventions [5]. Previous research has demonstrated that measurement of patient flow in emergency department might

be a valuable tool to analyse the influence of internal factors on overcrowding [7]. Time-flow studies can be useful instruments for academic ambulatory practices to identify and ameliorate practice inefficiencies without sacrificing quality of teaching or patient care [3].

Although PFA is regularly used in developed countries to help evaluate wait times and improve efficiency and patient care, it has been applied minimally in healthcare facilities of LMICs despite the opportunity for improving care systems in those environments [1]. PFA is an effective technique to identify inefficiencies in patient visits and efficiently collect patient flow data [4], and once inefficiencies are identified they can be improved through brief interventions [4]. The duration of patient waiting time and the amount of contact time with providers varies from one facility to another and depends on some of the following factors: quantity and quality of medical equipment, capacity of human resources, speed of registration process, the physical layout of facilities and policies regarding payment for services [9].

In Rwanda, the Ministry of Health has committed to providing universal access to health services and improving the quality of care [10]. An important factor that impacts quality and access to care is the amount of time patients wait to see providers at health facilities [10]. There is evidence of the application of PFA in healthcare facilities, using patient flow data for estimating wait time and visit time, identifying bottlenecks in service-providing processes, optimizing schedules, and planning for future reorganization and resource allocation [8]. Public hospitals in Rwanda, particularly district hospitals like Remera Rukoma, play a crucial role in providing accessible healthcare services to rural communities. However, these facilities often face challenges with managing patient flow effectively, leading to long waiting times, inefficient resource utilization, and compromised patient satisfaction. Patients often report that they avoid coming to the health centres due to long wait times even though such delays could have serious consequences for their health [9]. Optimizing patient flow becomes even more critical in resource-constrained settings like Remera Rukoma, where every minute and resource count.

Wait times for outpatients and the time management remain major challenges to providing outpatient services, especially in overcrowded hospitals [8]. As part of Rwanda's "people-centered" approach

to services, the patient's experience of care is paramount to its success [9], and consequently, the Ministry of Health has prioritized the reduction of wait times in the national strategic plan [9] [11]. In this regard, this study assessed the PFA at the outpatient department of Remera Rukoma District Hospital to determine the average waiting times of patients at each of the treatment stations and identify areas for improvement in patient care delivery within the existing system.

METHODS

Study design and setting
A cross-sectional study employing a mixed approach method was conducted at Remera Rukoma Hospital. Remera Rukoma Hospital is a district hospital located in Kamonyi District, Southern Province, Rwanda. It is located 9km from the main road of Kigali-Muhanga, and provides a range of services including both inpatient and outpatient in all age groups.

Study participants
The participants from this study were the patients who consulted the outpatient department at Remera Rukoma Hospital during the period of data collection. The inclusion criteria comprised consent to participate in the study and receive outpatient services at the hospital clinics.

Sampling
The sample size was primarily determined using the Fisher formula

$$n = Z^2pq/d^2$$

Where Z is the standard normal deviation at a 95% confidence level equivalent to 1.96; p is the prevalence of the factor under study, which was 84% from a previous study; q is a complementary factor for q = 1 − p; d is the precision/tolerable margin of error equivalent to 0.05.

This calculation gave a sample size of 207 participants, which was later corrected for a finite population (less than 10,000) giving the minimum finite sample size of 122 participants.

Non-probability, proportionate quota sampling method was employed. This method was performed in different stations of the service delivery process. Samples were selected independently from different service stations (Table 1) on different

Table 1: *The sample of the participants followed in each service or department*

Services	A sample size of the following client in each service
Reception	122
Admission/triage	122
Consultation	122
Cashier	122
Laboratory	122
Radiology	122
Pharmacy	122
Dental	122
Ophthalmology	122
NCDs	122
Maternity	122

days of the week. Sampling was continued until the sample size was completed.

Data collection
A checklist made by the researchers, who considered the study aim and outpatient workflow at the setting, was used to record patient entrance and exit times at each station. Observation of patient flow through the outpatient department (OPD), recording time spent at each touchpoint from 15 November 2023 to 30th January 2024 by 2 trained quality improvement officers and one customer care officer. They were familiar with the hospital and its workflow.

Data analysis
Data was analyzed using statistical methods (SPSS version 25) to identify patterns in wait times and determine the impact of various factors on patient flow efficiency. Descriptive analysis was used to estimate central and dispersion indices. The results were reported in tables and graphs.

Ethical Consideration
Before data collection, the aim and process of the study were explained to the patients. Only those patients who agreed to participate and gave informed consent were included in the study. The study was approved by the Ethics committee of Remera Rukoma Hospital.

RESULTS

Socio-demographic data of the participants
This study evaluated 300 samples from the outpatient department, cash station, and follow-up appointments. The patient flow of outpatients (Figure 1) was analyzed and the primary reason for the visit was predominantly general OPD. The mean age of the participants was 36.23 years, and the majority (55%) were female. Most patients (82%) were referred, and the majority of participants (72.7%) were of first visit. Regarding occupation, unemployment was most common (69.3%). The most prevalent insurance type was CBHI (64%), followed by those uninsured (21.7%). Education status varied, with no formal education attended being the most frequent (39.7%). Most individuals (72%) were married, followed by those divorced (17.3%) (Table 2).

Average waiting time per service/department
An analysis of patient flow at Remera Rukoma Hospital revealed varying wait times across different departments (Figure 2). The average wait time ranged from 19 minutes at reception to 104 minutes at the pharmacy. The longest wait times were observed in the Pharmacy (104 minutes), Cashier (81 minutes), and Consultation (61 minutes). Relatively shorter wait times were in Laboratory (36 minutes), Radiology (33 minutes), Dental (23 minutes), Ophthalmology (26 minutes), NCDs (29 minutes), Maternity service points (31
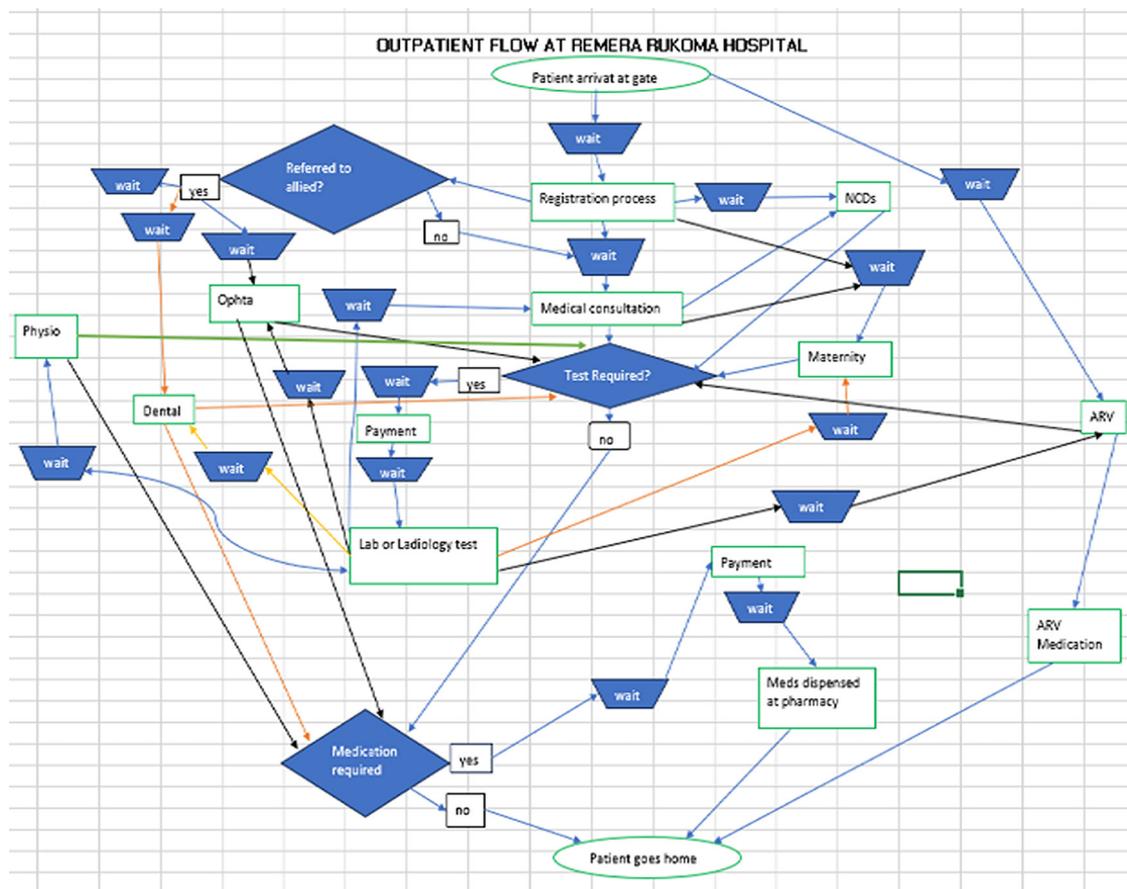
Figure 1: *Patient flow chart at Remera Rukoma Hospital*
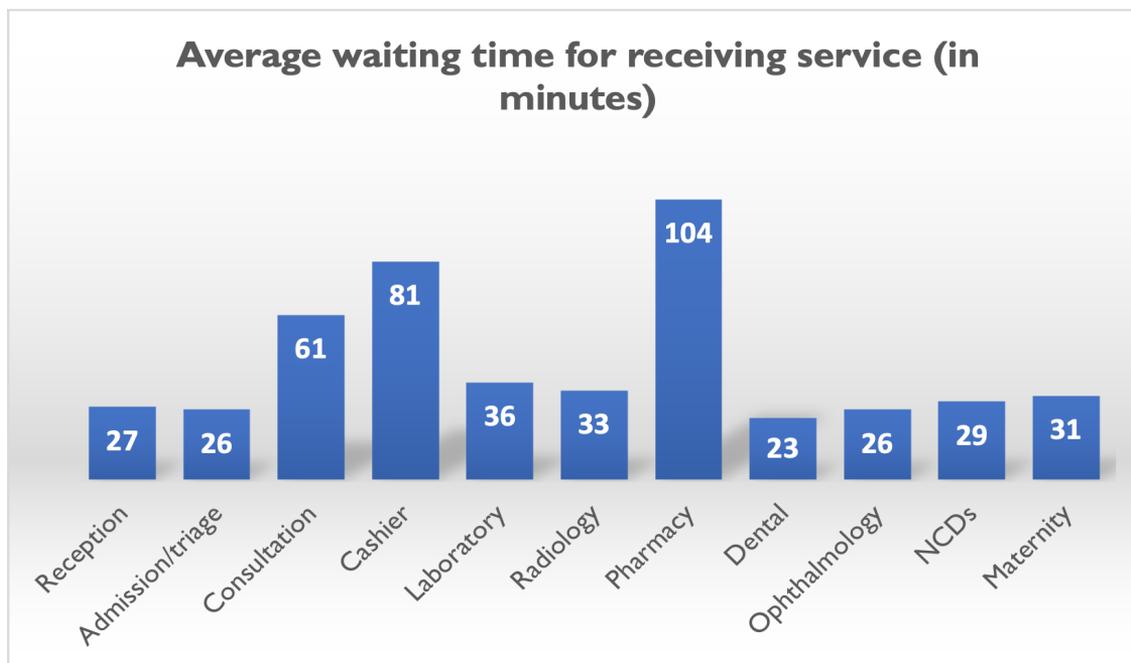
Figure 2: *Outpatient waiting time at different services in Remera Rukoma Hospital*

Table 2: *Socio-demographic characteristics of the participants*

Variables		Frequency (n)	Percent (%)
Gender	male	55	45
	female	67	55
Referred	yes	22	18
	no	100	82
Visit type	First visit	89	72.7
	Follow-up visit	33	27.3
Occupation	student	9	6.7
	Full time	7	6
	Employed	22	18
	Not Employed	84	69.3
Type of Insurance	CBHI	78	64
	RAMA	14	11.7
	Others	4	2.7
	Not insured	26	21.7
Education status	Tertiary	34	28
	Secondary	20	16.3
	Primary	19	16
	No formal education	48	39.7
Marital status	Married	88	72
	Single	13	10.7
	Divorced/separated	21	17.3
The primary reason for the visit	OPD General	83	68.3
	Obstetrics & Gynecology	18	14.3
	Surgery	8	6.7
	Others	13	10.7

CBHI: Community Based Health Insurance; RAMA: Rwanda Medical Insurance Scheme; OPD: Outpatient department

minutes). Reception wait time was 19 minutes.

DISCUSSION

Wait times for outpatients and the management thereof is a major challenge to providing outpatient services, especially in large centres and hospitals [8]. The provided data on average waiting times per service/department at Remera Rukoma Hospital reveals some interesting insights into patient flow efficiency. Overall, the average waiting times across most departments seem relatively long, exceeding 30 minutes in most cases. This consistent with the findings of a study which was conducted in the Kingdom of Saudi Arabia from Primary Health Centers, which founds that the

wait time to see the physician ranged between 21 and 30 minutes [12]. This could indicate potential bottlenecks or inefficiencies in service delivery, leading to patient dissatisfaction and impacting the overall healthcare experience [13].

The findings show that pharmacy with an average wait time of 104 minutes, the pharmacy stands out as a critical area needing urgent intervention. These findings are different to a study which was conducted in Medical City that is located in Riyadh, Saudi Arabia, waiting time to receive service at pharmacy was 120 minutes [14]. Such long wait times can be extremely frustrating for patients and negatively impact their perception of the hospital's efficiency. Moreover, it was found that the client spends 81 minutes at the cashiers

on average. This highlights that the cashier department requires significant improvement. Streamlining payment processes and potentially implementing alternative payment methods could significantly reduce wait times and improve patient convenience. Digitalization has been shown to enhance streamlined health processes, and integration of artificial intelligence (AI) can assist in claims processing, billing, and medical coding, further reducing the waiting time [15].

Furthermore, while consultation wait times (61 minutes) are longer than ideal, they fall within a more manageable range compared to pharmacy and cashier. The Institute of Medicine (now National Academy of Medicine) recommends that patients should be able to schedule an appointment within 2 weeks of their request and wait no more than 30 minutes past their scheduled appointment time [16]. The waiting time is consistent with as study which was conducted in primary health care clinic, in Gombak District, Malysia with waiting time of 60 minutes for being consulted by doctor [17]. In contrast, other studies from Australia have shown that the average consultation time in a primary care setting ranges between 10 to 15 minutes [16], [17], indicating that patients spend 4 times more time at Remera Rukoma Hospital. Laboratory and Radiology waiting times were 36 and 33 minutes, respectively, which are relatively good, suggesting efficient processes in these places. The 36-minute laboratory waiting time at this facility can be considered relatively good when compared to some benchmarks, but there's room for improvement. According to a study by Goswami et al., the median laboratory turnaround time (TAT) for outpatient settings was 57 minutes, with a range of 29-80 minutes [20]. In this context, 36 minutes falls within the better-performing range. A 28-minute wait time for admission/triage is acceptable but could be further optimized for smoother patient onboarding. The Emergency Nurses Association (ENA) recommends that the triage process should be completed within 10 minutes of a patient's arrival [21].

In the current study, the use of PFA provided a good picture of the whole system. The study highlighted the importance of tailored interventions within the outpatient department, potentially focusing on accountability by reducing delays, among the staff and investigating the factors associated with this delay, especially at cashier and pharmacy.

The extended wait times in the pharmacy and cashier departments at Remera Rukoma Hospital require immediate attention to improve patient experience and satisfaction. To address this issue, several interventions should be established. These include investigating the root causes of delays, such as staffing limitations, operational inefficiencies, or high patient volume, which have been shown to influence the waiting time [22], [23]. Implementing interventions like process improvement, staff training, or alternative payment methods, including digital processes, could significantly reduce wait times [23]. Additionally, regularly monitoring and analyzing patient flow data will help identify and address emerging issues proactively [24]. Overall, optimizing patient flow across all departments, particularly those with longer wait times, is essential for enhancing patient satisfaction and the overall quality of healthcare delivery at the hospital.

The study provided valuable insights that can inform measures for improving clinic efficiency, reducing wait times, and enhancing resource utilization. This study can serve as a model for other public hospitals, contributing to broader healthcare system advancements to enhance better patient experience and system efficiency expected to have positive impacts on the local healthcare landscape.

While this study provides valuable insights into current waiting times and potential areas for improvement, it has several limitations. Primarily, we did not assess the impact of implementing the suggested interventions on system performance. This lack of post-intervention data prevents us from drawing direct conclusions about the effectiveness of our proposed changes in improving patient flow and service quality. Furthermore, our assumptions about the potential benefits of improving patient flow are based on related studies rather than direct evidence from our specific healthcare setting. While these studies provide valuable context, they may not fully account for the unique characteristics of our facility. Future studies should address these limitations by implementing a pre-post intervention design, allowing for direct measurement of the impact of patient flow improvements on waiting times and patient satisfaction in our specific context.

CONCLUSION

The study on patient flow analysis at Remera Rukoma Hospital reveals critical inefficiencies

in the outpatient department, particularly in the pharmacy and cashier departments, where extended wait times significantly impact patient satisfaction and the quality of care. These findings underscore the need for targeted interventions to streamline operations, such as optimizing staffing, enhancing process efficiency, and introducing alternative payment methods. Additionally, consistent monitoring of patient flow metrics will be crucial in sustaining improvements. To ensure the delivery of timely and quality care, it is recommended that the hospital management prioritize these interventions and adopt a patient-centered approach to service delivery.

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Evaluating Staff Satisfaction Levels at Remera Rukoma Hospital in Rwanda: A 2023 Survey

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INTRODUCTION: Job satisfaction, defined as the positive emotional state resulting from job appraisal, significantly impacts healthcare systems' performance. Staff satisfaction influences patient care quality, staff retention, and overall hospital reputation. At Remera Rukoma Hospital, the current level of staff satisfaction is unknown, necessitating a survey to assess and improve it.

METHODS: A cross-sectional study was conducted from August 5th to September 5th, 2023, at Remera Rukoma Hospital in Kamonyi District, Rwanda. Using non-purposive sampling, 123 participants were selected from a total staff population of 180. Data was collected via self-administered questionnaires distributed through a WhatsApp group link, ensuring anonymity and encouraging honest responses. Satisfaction levels were categorized as: Not at all Satisfied, Satisfied, or Highly Satisfied.

RESULTS: All 123 participants responded the question asked. The survey revealed varied satisfaction levels among staff. While 40.7% of respondents reported being "Satisfied" and 22% "Highly Satisfied," a significant 37.4% indicated dissatisfaction. High satisfaction was noted in areas like understanding the hospital's vision (82.9%), pride in work (61.8%), and colleague respect (85.4%). However, dissatisfaction was prominent regarding salary (74.8%), benefits (78%), and staffing levels (59.3%) at 96% CI and p value of 5%.

CONCLUSION: The survey identified critical areas needing improvement, including compensation, workload, and professional development opportunities. Addressing these issues is essential for enhancing staff morale and retention, ultimately leading to improved patient care and hospital reputation. Targeted interventions, such as adjusting salaries, increasing staffing, and providing equitable training opportunities, are recommended to create a more positive and productive work environment at Remera Rukoma Hospital.

INTRODUCTION

Job satisfaction is "the positive emotional state resulting from the appraisal of one's job or job experiences," or "the extent to which people like or dislike their job [1]. In a constantly challenging

environment, healthcare systems are expected to achieve the often competing aims of improving public health, while simultaneously avoiding increases in health spending [2]. Employee job satisfaction is the fulfilment, gratification, and enjoyment that come from work. It's not just the money or the fringe benefits, but the feelings employees receive from the work itself [3].

Several studies have shown that managers' approach and leadership styles may influence both staff performance and healthcare system performance metrics [4]. According to a review by Buffer et al. [5], work☐related well☐being is a comprehensive concept, which includes (besides occupational health and health behaviour), social and economic well☐being and well☐being connected to professional development, as well as both psychological and physical health [6]. Interactions with some doctors and nurses have shown that monetary incentives primarily drive the current rate of emigration of health workers to other countries such as the United Kingdom, Canada, and the Middle East to seek greener pastures [7]. It is believed that health workers in such climes are better remunerated and have better working conditions [7]. Poor remuneration was the most common reason for job dissatisfaction among nurses in a government teaching hospital in Ethiopia [8].

There is a definite link between employee attitudes and patient satisfaction, if employees are unhappy or dissatisfied, despite their best efforts, it is difficult for them to conceal this factor when interacting with patients and other staff members [9]. One of the primary reasons for evaluating employee satisfaction is to identify problems and try to resolve them before they impact on patient care and treatment [9].

By conducting regular satisfaction surveys, leaders and managers can get vital data on how employees perceive company culture [10]. Also, these surveys help Human resource professionals understand which issues have a deeper impact on employee engagement and productivity [10]. In addition to improved patient satisfaction, other benefits of measuring and improving employee satisfaction include: improved employee engagement, reduced turnover, associated reductions in training costs, reduced absenteeism, strengthening supervision, assessing training needs, Improved Employee's performance and attitude, Evaluate employee's understanding of, and agreement with, the

facility's mission [9]. The staff satisfaction survey is an important tool for improving the quality of care at Remera Rukoma Hospital. However, the level of staff satisfaction at Remera Rukoma hospital is unknown. Therefore, the study was conducted to assess overall staff's satisfaction, and identify strategies to enhance staff satisfaction and retention at the Hospital.

The findings of the survey will be used to develop strategies to enhance staff satisfaction and retention. This should contribute to improved patient care, reduced staff turnover, and a stronger hospital reputation at Remera Rukoma Hospital.

Remera Rukoma Hospital is a major healthcare provider in Kamonyi District, Rwanda, serving a large and diverse population. The hospital is committed to providing high-quality care and maintaining a positive and productive work environment for its staff. However, there is limited data available on the current level of staff satisfaction at the hospital. To address this gap, we propose conducting a staff satisfaction survey at Remera Rukoma Hospital. The purpose of the survey is to assess the overall level of staff satisfaction, identify areas where the hospital can improve, and develop strategies to enhance staff satisfaction and retention. We conducted this study to assess overall staff satisfaction, and develop strategies to enhance staff satisfaction and retention at Remera Rukoma Hospital.

METHODS

Design and settings: This study employed a comprehensive and systematic approach. A cross-sectional design was utilized, with data collection occurring from August 5th to September 5th, 2023. The study setting was Remera Rukoma Hospital, a district hospital in Kamonyi District, Southern Province, Rwanda, which provides a range of inpatient and outpatient services.

Participants: The sample size of 123 participants was determined using Fisher et al.'s 1998 formula [11], ensuring statistical significance with a 95% confidence level and 5% margin of error. Non-purposive sampling was employed to select 123 participants from the total staff population of 180.

Data collection: Data collection was primarily conducted through self-administered questionnaires, distributed via a hospital's staff

WhatsApp group link to ensure wide accessibility. The survey instrument was pretested and refined before full deployment to enhance validity and reliability. To maintain confidentiality and encourage honest responses, the survey was anonymous.

Data Analyisis: Data analysis was performed using SPSS version 25 and Microsoft Excel, employing descriptive statistics. Satisfaction levels were categorized into three groups: Not at all Satisfied (score below 50%), Satisfied (score from 50.1% to 74.9%), and Highly Satisfied (score above 75%) [12], providing a nuanced understanding of staff contentment across various aspects of their work environment. This rigorous methodology ensured a comprehensive and statistically sound assessment of staff satisfaction at Remera Rukoma Hospital.

This study was approved by the ethical committee

Table 1: *Characteristics of the participants*

Characteristics		n(%)
Age group of the participants (in years)	15-30	46(37%)
	31-45	68(55.3%)
	>=46	9(7.3%)
Gender of the participants	Male	57(46.7%)
	Female	66 (53.7%)
Marital status	Single	32 (26%)
	Married	86 (69.9%)
Job title of the part	Nurse	67(54.5%)
	Midwife	13(10.6%)
	Doctor	16(13%)
	Others	23(18.7%)
	Prefer not to say	2(1.6%)
Duration participants worked at Hospital	Less than 6 months	1(0.8%)
	1-3 years	4(3.3%)
	3-10 years	100(81.3%)
	More than 10 years	18(14.6%)
Department of the participants	Allied health	23(18.7%)
	Clinical	10(8.1%)
	Administration	23(18.7%)
	Out datient department (OPD)	4(3.3%)
	antiretroviral (ARV) therapy service	5(4.1%)
	Neonatology	11(8.9%)
	Surgery	9(7.3%)
	Maternity	14(11.4%)
	Internal Medicine	4(3.3%)
	Pediatry	3(2.4%)
	Emergency	11(8.9%)
	Pharmacy	6(4.9%)

and hospital leadership of Remera Rukoma Hospital, and the informed written consent was obtained before participating in this study.

RESULTS

Background information of the participant at Remera Rukoma Hospital

The study participants exhibited diverse demographic characteristics. As shown in Table 1, the majority (55.3%) were aged 31-45 years, with a slight predominance of females (53.7%). Most respondents were married (69.9%) and had worked at the hospital for 3-10 years (81.3%). Nurses constituted the largest professional group (54.5%), followed by doctors (13%) and midwives (10.6%). Participants were distributed across various departments, with allied health and administration each representing 18.7% of the sample. This demographic profile provides a comprehensive representation of the hospital staff, ensuring a well-rounded perspective on satisfaction levels across different age groups, genders, professions, and departments.

Satisfaction with the care process, care environment, education, and technical support among the participants

This survey reveals a mixed picture of staff satisfaction at Remera Rukoma Hospital. There are several areas of high satisfaction, including understanding of the hospital's vision and mission (82.9% agree), pride in working for the hospital (61.8% agree), and feeling respected by colleagues (85.4% agree). Moreover, staff generally like the type of work they do (84.6% agree) and feel part of a team (76.4% agree). However, significant dissatisfaction is evident in areas such as salary (74.8% disagree with being satisfied), overall benefits and compensation (78% disagree), and equal opportunities for training (44.7% disagree). Workload and staffing issues are also apparent, with 59.3% disagreeing that there are enough staff available and 56.9% dissatisfied with current working hours. While communication from management is generally viewed positively (68.3% agree), there's room for improvement in areas like staff involvement in decision-making and recognition of good performance. These results highlight areas of strength in team spirit and job satisfaction, but also point to critical areas for improvement, particularly in compensation,

workload management, and equal opportunities for professional development.

Overall staff satisfaction level among the participants

The results of the staff satisfaction survey at Remera Rukoma Hospital reveal a diverse range of satisfaction levels among employees. The largest group, comprising 40.7% of respondents (50 individuals), reported being "Satisfied" with their overall work experience. However, a substantial portion of the staff, 37.4%, (46 individuals), indicated they were "Not satisfied," suggesting considerable room for improvement in various aspects of the work environment. On the positive side, 22% of the participants (27 individuals) expressed being "Highly satisfied," representing a core group of content employees. This distribution highlights that while there is a moderate level of satisfaction among staff, there are also substantial challenges to address, as over a third of employees report dissatisfaction. These findings underscore the need for targeted interventions to improve overall staff satisfaction and address the concerns of the dissatisfied group.

DISCUSSION

This study showed that 40.7%and 22% of the participants were satisfied and highly satisfied respectively, which is consistent with the findings of the study that was conducted in Canada on Job satisfaction among Canadian orthodontists[13]. Also, this finding is consistent with the study conducted in four referral hospital in Rwanda [14], Ethiopia [15], and Alexandria [16] as well as in Yemen [17], and Nigeria [18]. However, 37.4 % of the participants were not satisfied, this was consistent with the study which was conducted in Nigeria that showed a low level of satisfaction among healthcare professionals in tertiary Hospital [7].

Most of the participants have a clear understanding of the vision and mission of Remera Rukoma Hospital, which should be linked to their commitment, contribution and dedication to the hospital. This study showed that 44.7% of the staff are satisfied with how the hospital offers a good working environment and flexible working conditions, this is not far from other research that was conducted in Finland, found that nurses believe that nurse managers are able to change the

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Table 2: *Satisfaction with the care process, care environment, education, and technical support*

Variables	Agree	Disagree	Neutral
	N (%)	N (%)	N (%)
I have a clear understanding of the vision and mission of Remera Rukoma Hospital	102 (82.9%)	8(6.5%)	13(10.6%)
I am proud to work for the hospital and I would not hesitate to recommend this hospital to a friend	76 (61.8%)	20(16.3%)	27(22%)
My supervisor involves me in decision-making processes that affect my department	66 (53.7%)	34(27.6%)	23(18.7%)
The hospital offers a good working environment and flexible working conditions	55 (33%)	33(26.8%)	35(28.6%)
I contribute enough to decision making	51 (41.5%)	46(37.4%)	26(21.1%)
I am satisfied with how the management recognizes my good work performance	62 (50.4%)	40(32.5%)	21(17.1%)
Quality is a top priority at Remera Rukoma District Hospital	71 (57.7%)	26(21.1%)	26(21.1%)
I am satisfied with how the hospital conducts training sessions as frequently as possible	50 (40.7%)	42(34.1%)	31(25.2%)
Communications from the management team keep me updated about the hospital's activities	84 (68.3%)	24(19.5%)	15(12.2%)
The hospital provides sufficient tools and support to accomplish my tasks	62 (50.5%)	34(27.6%)	27(22%)
I am satisfied with how my supervisor helps me to identify job-related issues and finds ways to resolve them	84 (68.3%)	22(17.9%)	17(13.8%)
I like the type of work that I do	104 (84.6%)	10(8.1%)	9(7.3%)
The responsibilities and objectives related to my work are clearly defined and well-understood by both myself and my immediate supervisor	85 (69.1%)	23(18.7%)	15(12.2%)
I feel like I am part of a team that is working towards common goals	4 (76.1%)	9(9.3%)	20(16.3%)
I feel valued at Remera Rukoma District Hospital	83(67.5%)	21(17.1%)	19(15.4%)
At Remera Rukoma District Hospital I am treated with respect by the leaders	79(64.2%)	0(16.3%)	24(19.5%)
My colleague treats me in a respectful manner	105 (85.4%)	10(8.1%)	8(6.5%)
I am satisfied with the salary I earn compared to the tasks I perform	14 (11.4%)	92(74.8%)	17(13.8%)
Internal training provided by Remera Rukoma Hospital has been helpful	81 (65.9%)	27(22%)	15(12.2%)
I am satisfied with the overall benefits (PBF) and other overall compensations	13 (10.9%)	96(78%)	14(11.4%)
I am satisfied that everyone has an equal opportunity to participate in a training program	41 (33.3%)	55(44.7%)	27(22%)
I am satisfied with the general hygiene of the working environment and the availability hygiene facilities and materials	53 (43.1%)	37(30.1%)	33(26.8%)
I am satisfied with the working premises	41 (33.3%)	60(48.8%)	22(17.9%)
I am satisfied with the current maintenance of the biomedical equipment	69 (56.1%)	31(25.2%)	23(18.7%)
I am satisfied with the number of staff available (in my service) for performing work tasks	35 (28.5%)	73(59.3%)	15(12.2%)
I am satisfied with the current fixed working hours	34 (27.6%)	70(56.9%)	19(15.4%)
I am satisfied with the workload pressure in general	35 (28.5%)	60(48.8%)	28(22.8%)

Table 3: *The overall satisfaction level of the participants at Remera Rukoma Hospital.*

Satisfaction Category	Frequency (n)	Percentage (%)
Not satisfied	46	37.4
Satisfied	50	40.7
Highly satisfied	27	22

work systems and equipment to promote nurse safety [19].

Furthermore, this study showed that 59.3% of the staff were dissatisfied with the number of staff available (in my service) for performing work tasks, this calls for hospital management to increase the number of staff for quality service delivery. In addition, 78% were dissatisfied with the overall benefits (performance-based financing) and other overall compensations. This finding is consistent with the study that was conducted in Nigeria which showed that the average staff of the hospital is dissatisfied with the financial remuneration [7]. Moreover, 74.8% of the staff were dissatisfied with the salary they earn compared to the tasks they perform. Another study showed that good wages ranked first among employees' viewpoints of motivational factors for quality healthcare service delivery at Iran University Medical Sciences, Tehran [20]. This implies that dissatisfaction with one's salary will automatically adversely affect the person's motivation to put in his best at the workplace, for quality healthcare service delivery [7]. Yami et al. in his study identified human resources as a vital component in health services delivery [7]. This study showed that 48.8% of the staff were dissatisfied with the workload pressure in general. However, Barnes recognized the need to address the issue of realistic workload concerning salary, to increase the satisfaction of health professionals on their job, thereby improving healthcare provision [21].

This study found that 50.5% of the staff were satisfied with the hospital's provision of necessary tools and resources to accomplish their tasks. This finding contrasts with a previous study conducted in Nigeria, which reported that 34.1% of staff disagreed with the hospital's frequency of training sessions[7]. Research has emphasized that training and retraining are essential components of modern healthcare, and a lack of support from hospital management for these activities can be discouraging for staff [7]. Additionally, prior studies in 2016 at Ethiopia have identified motivation and job satisfaction as key factors in encouraging further

training among nurses, while time constraints and employer discouragement were critical barriers to nurses' continued education [22].

This study had several limitations worth noting. As a cross-sectional study, it captured staff satisfaction at a single point in time, potentially missing seasonal or temporal variations in satisfaction levels. The self-reported nature of the survey may have introduced response bias, with participants possibly over- or under-reporting their satisfaction levels. Additionally, the study was confined to a single institution, limiting its generalizability to other healthcare settings. Lastly, while the survey measured satisfaction, it may not have fully captured the complex factors influencing employee contentment or the long-term impact of satisfaction on hospital performance and patient care quality.

CONCLUSION

The staff satisfaction survey conducted at Remera Rukoma Hospital reveals a clear need for improvement in several key areas, including the current Performance-Based Funding (PBF) system, inadequate salaries, demanding work hours, and insufficient staffing. These factors have impact on staff morale, motivation, and potentially patient care, and must be addressed as a priority. Increasing transparency and refining the metrics for the PBF system, advocating for salary increases with the Ministry of Health to match the cost of living and provide clear career progression opportunities, reviewing workload and implementing flexible work arrangements to alleviate the burden of long hours and understaffing, developing targeted training programs with equal participation opportunities, and improving overall working conditions are all crucial recommendations. Promoting open communication, recognizing staff contributions, and fostering a culture of continuous improvement will also be essential in enhancing staff satisfaction, boosting productivity, and ultimately improving the quality of healthcare

provided to the community. By investing in these areas, Remera Rukoma Hospital can create a more positive and productive work environment, leading to increased staff retention and a more resilient healthcare system. Additionally, conducting a similar study in a comparable setting and assessing the factors associated with satisfaction and dissatisfaction would provide valuable insights for further improvement, underscoring the importance of staff satisfaction in the hospital's long-term success and effectiveness.

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Assessment of factors affecting incident reporting among nurses working at a tertiary hospital in Rwanda

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ABSTRACT

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INTRODUCTION: Optimal reporting of incidents occurring in healthcare is important for improving patients', visitors' and workers' safety. There are unsatisfactory rates of incident reporting worldwide, with some institutional and provider-related barriers. The aim of this study was to assess factors affecting incident reporting among nurses working at the largest teaching hospital in Rwanda.

METHODS: This is a cross-sectional descriptive study conducted among 166 nurses working in main 5 departments of the University Teaching Hospital of Kigali (CHUK) in 2019, using self-administered questionnaire. Data were compiled and analyzed through SPSS 27.0; statistical tests run through GraphPad Prism 9.5.

RESULTS: Most respondents (58.3%) were middle aged, female (83.1%), advanced-diploma holders (72.3%), and with a 3–4-year working experience. Institutional-related barriers to incident reporting were predominated by the complexity of work (64.6%), shortage of staff (55.8%), and inadequacy of incident reporting system (43.3%). Fear of being punished (77.5%) and lack of knowledge on what should be reported (67.2%) were the most frequent professional-associated barriers. There was statistically significant association of lower level of education versus complexity of work (P=0.0474, OR=2.056, 95% CI=1.017 – 4.148), younger age versus lack of knowledge on what to report (P=0.0390), lower level of education versus the fear of being punished (P=0.0030, OR=3.417, 95% CI=1.566 – 7.493), lower level of education versus lack of knowledge on what to report (P<0.0001, OR=4.271, 95% CI=2.066 – 8.608), and shorter professional's working experience versus lack of knowledge on what to report (P=0.016).

CONCLUSION: Identified barriers should be addressed according to their levels, to optimize incident reporting and thus safety in healthcare facility. User-friendly incident reporting system should be designed, and efficient human resource management ensured. Moreover, principles of incident reporting should be incorporated in the induction, orientation and continuing professional development programs of healthcare staff.

INTRODUCTION

Developing a patient safety culture in a healthcare facility is among the priority recommendations by the international health community, and incident reporting has been considered as a cornerstone for improving patient safety [1]. In fact, it has been reported that the existence of non-punitive approach for incident reporting were among the major predictors of positive patient safety culture in health organizations [2]. The World Health Organization (WHO) estimates that a serious adverse event or critical incident occur in up to 40% of patients in primary and outpatient health care, 80% of which are preventable, and that 15% of all health care spending is wasted due to poor quality care [3].

Incident reporting is a mechanism which enables health professionals to disclose unintended injury and near misses caused by a healthcare system or a health professional [1]. An inclusive and systematic approach to incident reporting would help learning from errors and adverse events within the same setup [4]. It is in this context that incident reporting form is used in healthcare facilities to enable the documentation, root-cause analysis, mitigation, and future prevention or recurrence of such incidents.

Despite the significant contribution of incident reporting to patient safety, the magnitude of underreporting remains high in different countries across the globe. For instance, incident underreporting occurs at a rate of >50% in the United States of America (USA), and among >40% of consultants and registrars in the United Kingdom (UK) [4]. Factors to incident reporting are either organization-associated, or healthcare professional-related [5].

Several factors were found to be associated with non-reporting or underreporting of incidents. Participants of a qualitative study in Korea suggested ninety-six barriers to incident reporting in their hospitals [5]. Some of the most frequently reported barriers include poorly designed incident reporting systems, and lack of adequate patient safety leadership [5]. A similar study among Iranian nurses revealed that fear of legal action and job threats, fear of economic losses, and fear of dignity were barriers associated with nurses' perceptions on incident reporting [6]. Healthcare professionals' awareness on incident reporting system seems to vary across reports. Accordingly, a report from the USA showed that 41% were not familiar with the safety process at their institution, with only 33% knowing how to report an adverse event or a near miss [7]. Also, a survey performed in Denmark showed that barriers to incident reporting included triviality of the case, lack of knowledge on what to report, existing culture on incident reporting, and high workload [8]. Other studies also reported a high likelihood to report incidence by nurses versus doctors [5]. A recent report showed that barriers to report incident among government pharmacists working in Malaysia included non-precision on who to report an incident to (45.5% of respondents) and lack of time to make the report (44.7% of respondents) [9]. Also, it was recently reported that organizational trust and perceived benefit (rather than perceived risk) affect professionals' willingness to report their own incidents [10].

Among the interventions so far implemented to improve incident reporting are training on incident reporting, reducing fear of reporting, reducing reporting burden, and improving feedback system [5]. According to the Ethiopian hospital reform implementation guideline, an incident officer should be assigned to each hospital to receive and investigate all incident reports [5]. A recent report from India highlighted the belief that nurses are key professionals to participate in incident reporting and showed that nurses need training to get confidence to do so [11].

Although quite a several reports are available regarding incident reporting in the Western Countries, very limited information exists in Africa. A previous report, which investigated the reporting on only occupational hazards in two teaching hospitals in Rwanda, indicated a poor knowledge of occupational hazards in nearly 51% of respondents, while only 29% of respondents assumed to have ever reported occupational hazards in their professional carrier [12]. To the best of our knowledge, there is no published report on the trend of incident reporting in Rwandan healthcare facilities. Therefore, this study aimed at assessing incident reporting behaviors and associated factors among nurses working at the largest public teaching hospital in Rwanda, to contribute to the design of appropriate incident reporting mechanism.

METHODS

Study Design

This is a descriptive cross-sectional study carried out on factors affecting incident reporting among nurses at the University Teaching Hospital of Kigali (CHUK) in 2019. The target population as determined by the office of human resource management at CHUK in 2019 was 285 nurses (50 from internal medicine, 91 nurses from surgical ward, 71 from pediatric ward, 30 from intensive care unit, and 43 from accidents and emergency medicine). Nurses were chosen as a target group as they constitute the largest homogeneous professional group at CHUK. The sample size was computed using OpenEpi 3.01 online software (West Hollywood, CA 90069-4109, USA) [13], considering the target population of 285, assuming anticipated frequency of 50%, confidence limits as ±5% and design effect of 1.0 for random sample. Accordingly, the calculated sample size n=164 individuals. The stratified sampling technique was used to obtain the sample size in each department.

Data Collection, Management and Analysis

Data were collected using pre-tested self-administered questionnaire. The questionnaire comprised of close-ended questions, and included variables grouped socio-demographic characteristics, organizational factors influencing incident reporting among nurses, and nurses' factors influencing incident reporting among nurses working in CHUK. Potential participants were approached after morning staff meeting for introduction of the study and explanation of the purpose of the study. Those who agreed to participate were taken through the informed consent process. A questionnaire was administered face to face in English; respondents were given one day to return the questionnaire. Data entry was done using Microsoft Excel sheets; thereafter, data were exported to and analyzed using Statistical Product and Service Solutions (SPSS) version 27.0 (IBM Corporation, New York 10504-1722, USA). Statistical test values such as P values, odds ratio (OR) and its 95% confidence interval (IC) where computed on Fisher's exact test and Chi-square test for the trend, as appropriate, using GraphPad Prism software version 9.5 (GraphPad Software, Inc., CA 92037 USA). For all analyses, a P value <0.05 was considered statistically significant.

Ethical Considerations

Ethical approval for this study was obtained from the CHUK Research Ethics Committee (reference n° EC/CHUK/661/2019) prior to collecting the data. The questionnaire was administered to study participants who voluntarily gave a written consent; the questionnaire exhibits a unique and anonymous identifier number for each participant. Confidentiality was kept throughout the study and results dissemination. This study was conducted in accordance with the Declaration of Helsinki.

RESULTS

Socio-demographic characteristics of the respondents

A total number of 166 nurses working at CHUK consented to participate in this study. All the 166 nurses returned the questionnaires duly filled in, yielding a response rate of 100%. Most respondents (58.3%) were aged 36 – 50 years, were female (83.1%), had an advanced diploma (72.3%), and had a working experience of 3 – 4 years (71.6%), as shown in Table 1.

Table 1: *Socio-demographic characteristics of study participants*

Characteristics	Frequency	%
	(n=166)	
Age (years)		
21 – 35	62	37.5
36 – 50	97	58.3
51 – 65	7	4.2
>65	0	0.0
Sex		
M	28	16.9
F	138	83.1
Educational level		
Advanced Diploma	120	72.3
Bachelors' Degree	46	27.7
Masters' Degree	0	0.0
Working experience (years)		
1 – 2	35	21.2
3 – 4	119	71.6
5 – 6	11	6.4
>6	1	0.5

Institutional factors affecting incident reporting
In the present study, the identified organization-related barriers to incident reporting at CHUK are the complexity of work (reported by 64.6% of respondents), shortage of staff (55.8%), inadequacy of incident reporting system (43.3%), lack of documented procedures on reporting medical errors (13.2%) and lack of time to fill in the incident reporting form (10.6%), as shown in Table 2.

Table 2: *Institutional barriers affecting incident reporting at CHUK*

Barriers	Frequency (n=166)	(%)
Complexity of work	107	64.6
Shortage of staff	93	55.8
Inadequacy of incident reporting system	72	43.3
Lack of procedures on reporting medical errors	22	13.2
Lack of time to fill in the incident reporting form	18	10.6

Nurses' factors affecting incident reporting
This study revealed that fear of being punished and lack of knowledge on what should be reported are the most frequent professional-associated barriers to report incidents at CHUK, documented in 77.5% and 67.2% of respondents, respectively (Table 3).

Table 3: *Nurses' barriers affecting incident reporting at CHUK*

Factor	Frequency (n=166)	%
Fear of being punished	129	77.5
Lack of knowledge on what to report	112	67.2
Fear of being blamed	49	29.7
Difficulty in filling the form	30	17.8
Reporting errors is not anonymous	12	7.5
Reporting errors is not my responsibilities	1	0.4
Reporting errors is not a priority	0	0.0

Comparison of respondents' socio-demographic characteristics versus barriers to incident reporting
Among the institutional barriers to incident reporting, only the complexity of work was significantly associated with a sociodemographic characteristic (level of education), whereby those with lower qualification tend to claim that the complexity of work hinders them to report incidents (P=0.0474, OR=2.056, 95% CI=1.017 – 4.148), as shown in Table 4. On the other hand, individual professional's barriers to report incidents correlated with individual age, whereby younger age was significantly associated with lack of knowledge on what to report (P=0.0390), level of education, whereby lower qualification was significantly correlated with fear of being punished (P=0.0030, OR=3.417, 95% CI=1.566 – 7.493) and with lack of knowledge on what to report (P<0.0001, OR=4.271, 95% CI=2.066 – 8.608). Also, shorter professional's working experience significantly correlated with lack of knowledge on what to report (P=0.0158). There was no statistically significant association of respondent's sex with any of the barriers to incident reporting.

DISCUSSION

In this study, we have outlined institutional and individual healthcare nurse's barriers to report incidents at CHUK. All the 166 nurses who consented to fill the questionnaires returned did so, implying a response rate of 100%. According to Baruch [14], a response rate of 100% is considered excellent to draw conclusions.

Most respondents (58.3%) were middle aged (36 – 50 years), which would also imply a relatively longer working experience in healthcare system. Accordingly, it was seen in this study that a higher age and a higher working experience were somehow associated with barriers to report incidences. This may be explained by the time it takes to have long working experienced and advanced qualifications, which make nurses qualify to be employed in a teaching hospital. However, a study conducted on incident reporting behaviors and associated factors among nurses in Northwest Ethiopian university hospital showed that the most represented age group was 20 – 29 years (48.1% of cases) [15], younger than in CHUK. In our study, female nurses comprised the majority (83.1%) of the respondents, which reflects the general high female representation among nurses working at CHUK.

In the present study, most respondents (72.3%) had advanced diploma in nursing, which is the

Table 4: *Comparison of respondents' socio-demographic characteristics versus barriers to incident reporting at CHUK*

Characteristics	Frequency (n=166)	Institutional factors									Individual professional's factors					
		Complexity of work (n=107)			Shortage of staff (n=93)			Inadequacy of incident reporting system (n=72)			Fear of being punished (n=129)			Lack of knowledge on what to report (n=112)		
		Yes	No	P value	Yes	No	P value	Yes	No	P value	Yes	No	P value	Yes	No	P value
Age (years)[a]																
21 – 35	62	44	18	0.9424	38	24	0.3676	25	37	0.4188	51	11	0.2718	49	13	**0.0390**
36 – 50	97	68	29		51	46		43	54		73	24		58	39	
> 50	7	5	2		4	3		4	3		5	2		5	2	
Sex[b]																
M	28	18	10	>0.999	16	12	>0.999	12	16	>0.999	20	8	0.4548	19	9	>0.999
F	138	89	49		77	61		60	78		109	29		93	45	
Educational level[b]																
Advanced Diploma	120	83	37	**0.0474**	69	51	>0.999	56	64	0.2206	101	19	**0.0030**	92	28	**<0.0001**
Bachelors' Degree	46	24	22		26	20		16	30		28	18		20	26	
Working experience (years)[a]																
1 – 2	35	26	9	0.3432	23	12	0.1024	18	17	0.3566	29	6		27	8	**0.0158**
3 – 4	119	75	44		63	56		49	70		94	25	0.0628	81	38	
≥ 5	12	6	6		7	5		5	7		6	6		4	8	

[a]Chi-square test for the trend was used to compute the P values

[b]Fisher's exact test was used to compute the P values and odds ratio with its 95% confidence interval (the latter two statistics are not shown in the table but described in the texts when significant.

basic qualification required for a nurse working in a teaching hospital in Rwanda. This is lower than 53.6% of advanced diploma holders observed in a study on barriers of reporting errors among nurses in a tertiary hospital in Saudi Arabia [16], which might be attributed to different hiring policies. Furthermore, most respondents (71.6%) had a 3–4-year working experience at CHUK. We found that a longer working experience was associated with less incident-reporting barrier such as lack of knowledge on what to report. The trend of the working experience in our study is in line with the study carried out on barriers to reporting medication administration errors among nurses in Saudi Arabia, where most nurses (57.7%) had a working experience of more than 3 years [17].

Our study showed that the most frequently mentioned institutional barriers to incident reporting are the complexity of work (64.6%), shortage of staff (55.8%) and inadequacy of incident reporting system (43.3%). These barriers are somewhat similar to those reported in previous studies done on health professionals' experiences of medication errors in Saudi Arabia which revealed that work overload as results of shortage of staff was among the major barriers to effective incident reporting [18, 19]. Moreover, inadequacy of incident reporting system was reported by respondents in previous studies on factors affecting incident reporting by registered nurses [19, 20]. The difficulty in filling the incident reporting form was also reported by 58.2% of nurses in South Australian hospitals [21], and the relative lower rate of this barrier (17.8%) in our study may reflect the fact that a big proportion of our respondents have never filled in the incident report form.

Concerning individual professional's barriers to incident reporting, most participants reported fear of being punished as barrier to incident reporting while fear of being blamed was reported by almost a third of respondents. Similarly, a study conducted on barriers to reporting medication administration errors among nurses in Saudi Arabia showed that most nurses (61.7%) fear consequences from reporting medication errors [22]. Previous research showed that fear of being punished was a major barrier of reporting incidents not only among nurses, but also others. This might be explained by other studies showing that junior staff were blamed most of the time for incidents [23], leading to a fear of being blamed for reported incidents previously highlighted as a major barrier

by different healthcare providers [24-27].

Most participants (67.2%) reported lack of knowledge on what should be reported as a barrier to effective incident reporting. This finding is similar to a previous report, which indicated that a lack of understanding what constitutes a patient safety incident is a major barrier to incident reporting [7]. In our study, being less experienced, younger and of lower qualification were associated with this barrier. This sparks the necessity of continual professional development program, with inclusion of incident reporting in the training offered from the induction and orientation of the new staff and trainees at the hospital.

This study had some limitations. The convenience sampling was adopted in each stratum (department), and the population representation of nurses working in the study site was limited to the respondents in this study. Also, there is a possibility of recall bias in this study, since the participants self-reported their experience with incident reporting in the past. To mitigate these limitations, future studies should consider expanding the sampling method to include random or stratified random sampling to represent the entire nursing staff at CHUK. A larger, diverse sample will provide a more comprehensive understanding of incident reporting factors and reduce bias. Researchers should also reduce recall bias by using objective measures like actual incident reports and real-time data collection, along with interviews with nurse supervisors. Triangulating data collection methods, including interviews, focus group discussions, and direct observations, can offer a more accurate picture of incident reporting behavior.

CONCLUSION

The current study on factors affecting incident reporting among nurses at CHUK showed that the most predominant institutional related factors were staff shortage and complexity of work. The most reported nurses' factors affecting incident reporting were lack of knowledge on what should be reported and fear of being punished. CHUK in collaboration with partners should develop a user-friendly incident reporting system for healthcare facilities, which should be accessible on mobile devices and computers. CHUK leadership is recommended to enhance regular education and training programs for healthcare staff, emphasizing the importance of reporting for

patient safety. Addressing the fear of punishment by implementing a non-punitive culture, promoting open, blame-free reporting could also help optimize incidence reporting practices. In addition, strengthening human resource management to optimize staffing levels and manage workloads effectively is also recommended. We also recommed CHUK leadership to introduce continuous quality improvement initiatives to address incident reporting barriers, followed by periodic assessments to evaluate their impact on care quality and patient safety standards, as well as regular performance appraisals of the incident reporting process, using key indicators like incident reporting numbers, response times, and actions taken.

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Prevalence and factors associated with neonatal mortality at masaka district hospital, Rwanda: a cross-sectional study

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ABASTRACT

INTRODUCTION: Neonatal mortality remains a pressing global concern, with millions of infants losing their lives each year. However, there was a lack of specific information regarding the prevalence of neonatal mortality and associated factors at Masaka District Hospital (DH). This study aimed to determine neonatal mortality prevalence and associated factors at Masaka DH.

METHODS: A cross-sectional study among 385 neonates using structured observational checklist for data collection. A multivariable logistic regression analysis was used to assess the independent factors associated with neonatal mortality.

RESULTS: Of 385 (54% male and 46% female) neonates, 41 (10.6%) died. The major causes of admission were prematurity 28.5% followed by infection 19.9% and perinatal asphyxia 17.6%. Major causes of death were prematurity accounting for 43.9% and perinatal asphyxia at 29.3%. After adjustment, Apgar Score at 5- and 10-minutes (AOR: 16.37, 95% CI: 5.90-45.40, p-value<0.001), (AOR: 3.55, 95% CI: 0.98-12.79, p-value = 0.032) respectively, gestational age AOR: 0.08, 95% CI: 0.02-0.26), p-value <0.001), Birth weight (AOR:127.01, 95% CI:27.93-577.46), p-value<0.001) were significantly associated with neonatal mortality. Maternal conditions did not show a significant association after adjusting for other variables AOR:2.04 ,95% CI:0.55-7.49, p-value 0.282. Neonates born to mothers who attended antenatal care had significantly lower odds of mortality compared to those whose mothers did not attend (AOR: 0.35, CI: 95% CI: 0.13-0.90, p-value =0. 030).

CONCLUSION: Low birth weight, low Apgar scores, prematurity, lack of antenatal care visit were significantly associated with neonatal mortality at Masaka DH.

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INTRODUCTION

Neonatal mortality remains a pressing global concern, with 2.6 millions of infants losing their lives each year [1]. Tragically, a significant portion of these deaths occurs within the first day of life, contributing to the alarming statistics. Despite progress in reducing mortality rates for older children, neonatal deaths persist at an alarming rate of 7,000 per day [2,3]. These deaths are primarily due to complications like prematurity, perinatal asphyxia, and various infections. To address this ongoing crisis, a comprehensive and systematic approach is required, as single interventions often

fall short [2].

The postnatal period widely recognized as the most critical in a person's life when it comes to disease. However, many of these diseases are preventable with proper measures, such as immunization, hygiene, and proper nutrition [4]. During the initial day of life, a newborn faces a significantly higher risk of mortality compared to the rest of the neonatal period. Around half of all neonatal deaths occur within this critical 24-hour timeframe, and a staggering 75% of deaths happen within the first week. Moreover, infants born into economically disadvantaged households are more than 1.4 times susceptible to mortality within the first 28 days compared to those born into wealthier families [5]. Rwanda has achieved significant progress in reducing child mortality rates in the last decades. Specifically, the country has reduced neonatal deaths from 37 to 20 per 1000 births and under-5 deaths from 152 to 50/1000 live births between 2005 and 2015 [4] .Despite attempts to reduce child mortality in Rwanda, the rates still differ greatly across the country, much like in other areas of Sub-Saharan Africa that lack resources [5]. In Rwanda, the mortality rate for children is largely linked to poverty, with 84 out of every 1000 live births in the poorest wealth quintile compared to 40 out of every 1000 in the wealthiest quintile. Additionally, maternal education plays a role with 89 out of every 1000 children born to mothers without an education passing away compared to 43 out of every 1000 children born to women with secondary education or higher. Lastly, residence also plays a factor with rural areas having a mortality rates of 70 out of every 1000 live births compared to 51 out every 1000 live birth in urban areas [6].

The disease patterns and outcomes in neonates are crucial indicators for planning appropriate healthcare to improve nursing and medical care [7]. The rates of neonatal morbidity and mortality are useful indicators of the efficiency and effectiveness of the healthcare delivery system. Therefore, this study aimed to determine neonatal mortality prevalence and associated factors at Masaka District Hospital (DH).

METHODS

Research design
This study used a cross-sectional research design which involved collecting data at a specific point in time to all neonates admitted at Masaka DH from 1st January to 31st December 2021.

Setting
The study was carried out at Masaka District Hospital, situated in the Masaka neighborhood within Kigali, the capital and largest city of Rwanda. Positioned approximately 17 kilometers (11 miles) to the East of Kigali's Central Business District, the hospital serves as a crucial healthcare facility in this urban setting.

Population, sample size and sampling techniques
The target population consisted of 1318 neonates who were admitted to Neonatal Ward during from 1st January 2021 to 31st December 2021. The sample size for this study was 385 neonates. The desired sample size was determined by using Cochran's formula [8].

$$n = z^2 pq / d^2$$

Where: n: is the required sample size, z: The Z score, which corresponds to the desired level of confidence (95% confidence corresponds to a Z-score of approximately 1.96), p: the estimated proportion of the population that has the attribute for studying (0.5 can be used for a conservative estimate, assuming a 50-50 split) ,q: the complement of p, which is equal to 1-p and d: the desired margin of error, which represents how much willing to allow the estimate to vary (0.05 for a 5% margin of error).

$$n = (1.96^2 * 0.5 * 0.5) / (0.05^2) = 384.16$$

Therefore, rounding up to the nearest whole number, the estimated sample size using the Cochran's formula was approximately 385.

A systematic random sampling technique was employed to select neonates from the study population of 1318, ensuring each participant had an equal opportunity for inclusion. The sampling interval, calculated by dividing the total population (1318) by the sample size (385), was approximately 3.43. To initiate the sampling process, a random start point was chosen by selecting a neonate at random from the first three neonates.

Data collection instruments and procedures
An observational structured checklist was employed as the primary data collection instrument. It consisted of predefined categories,

variables, and items that the observers assessed and recorded during their observations. The checklist covered essential factors related to neonatal mortality, including birth weight, gestational age, mode of delivery, place of delivery, diagnosis to admission time, congenital abnormality, Apgar scores, maternal age, antenatal care visits, gravida, maternal health conditions and neonatal death(yes/no). A representative sample of neonates was randomly selected from the hospital's records, ensuring equal chances of inclusion for all neonates. A team of trained observers made direct observations of the selected neonates, systematically recording relevant information using the observational structured checklist. The observers received comprehensive training on the checklist tool, ethical considerations, and data collection techniques. Their followed a standardized protocol and maintained ongoing communication with the researcher to address any challenges and ensure adherence to the study guidelines. The collected data was carefully recorded and subjected to quality control measures to ensure accuracy and consistency.

Data analysis
The data, were first entered in Excel where they were coded and cleaned. Then, the data were exported and analyzed in SPSS Statistics software version 22 and presented in tables. Frequencies and percentages as well as chi-square test ($p<0.05$) were used to determine the association between neonatal mortality and the independent variables. Multivariable logistic regression was performed to adjust for confounding variables and to determine independent variables. All variables with $p<0.05$ in bivariate analysis were treated together in multiple logistic regression analysis. The strength of association was determined using adjusted odds ratio and 95% confidence intervals (CI).

Ethical considerations
Ethical clearance with reference number 780/MSK/DH/2023, was received for this study from Masaka Ethical Review Board. Throughout the study, strict measures were implemented to ensure the confidentiality and privacy of all participants. Data were securely stored and accessible only to authorized personnel. Additionally, strict protocols were in place to maintain the anonymity of participants, with all data anonymized to protect the identities of individuals involved.

RESULTS

Socio-demographic characteristics
In a study of 385 neonates, key findings include a slightly higher percentage of males (54%) compared to females (46%). The majority of neonates were full-term (64.4%), with 35.6% being preterm. Normal birth weight was predominant (58.2%), while 41.8% had low birth weight. Apgar scores indicated good neonatal vitality, with scores of 80% at 1 minute, 84.7% at 5 minutes, and 94.3% at 10 minutes. Congenital abnormalities were rare, affecting only 1.8% of neonates. Most deliveries occurred in hospitals (71.7%), with 41% delivered by Cesarean Section and 59% via spontaneous vaginal delivery. Maternal characteristics showed that 69.1% of mothers were aged 14-29 years, 66.2% were married, and 65.7% had primary education. Details on these findings are further elaborated in Table 1.

Causes of admission
As shown in Table 2, Prematurity emerges as the leading cause, constituting 28.5% of admissions, followed closely by perinatal asphyxia, accounting for 17.6%. Neonatal jaundice is another significant contributor, representing 17.4% of case. Infections, contributing to 19.9% of admissions. Congenital malformations are relatively infrequent, comprising 2.1% of admissions. Hyperthermia, hypoglycemia, and respiratory distress syndrome collectively contribute to the diverse array of factors leading to neonatal admissions (2.6%, 3.4%, and 8.3% respectively) (Table 2)

Causes of neonatal mortality
The result revealed that the primary causes of neonatal mortality in the analyzed population were dominated by prematurity, accounting for 43.9% of deaths, followed by perinatal asphyxia at 29.3%. Infections contribute significantly to mortality at 19.5%, while congenital malformations and respiratory distress syndrome play comparatively smaller roles at 4.9% and 2.4%, respectively (Table 2).

Prevalence of neonatal mortality
The study at Masaka District Hospital in 2021 found that the overall prevalence of neonatal mortality among 385 neonates was 10.6%, indicating that approximately 1 in 10 neonates did not survive. Key findings highlighted that maternal education, prenatal care, and neonatal factors like

Table 1: *Demographic and Clinical Characteristics of neonates admitted in Masaka DH*

Variables		Frequency	Percentage
Neonatal Gender	Male	208	54.0
	Female	177	46.0
Gestational Age	Preterm (>=37 weeks)	137	35.6
	Full-term	248	64.4
Birth weight	Low birth weight	161	41.8
	Normal	224	58.2
Apgar Score (1 min)	Good Vitality (>=7)	307	80.0
	Poor Vitality (<7)	78	20.0
Apgar Score (5 min)	Good Vitality (>=7)	326	84.7
	Poor Vitality (<7)	59	15.3
Apgar Score (10 min)	Good Vitality (>=7)	363	94.3
	Poor Vitality (<7)	22	5.7
Congenital abnormalities	Yes	7	1.8
	No	378	98.2
Place of delivery	Health center	109	28.3
	Hospital	276	71.3
Mode of delivery	Caesarian Section	158	41.0
	Spontaneous Vaginal delivery	227	59.0
Maternal age	14-29	266	69.1
	30-45	119	30.9
Mother's marital status	Single	130	33.8
	Married	255	66.2
Educational Level	Primary	253	65.7
	Secondary and above	132	34.3
Occupation Status	Unemployed	134	34.8
	Employed	251	65.2
Insured	Yes	376	97.7
	No	9	2.3
Residence	Urban	297	77.1
	Rural	88	22.9
Antenatal Visit	Yes	313	81.3
	No	72	18.7
Maternal Conditions	Abnormal	26	6.8
	Normal	359	93.2
Gravidity	First	167	43.4
	Multi	218	56.6

Table 2: *Causes of Admissions to the Neonatal Ward*

Causes of Admission		Percentage
Perinatal asphyxia	68	17.6
Prematurity		28.5
Congenital malformation	8	2.1
Jaundice	67	17.4
Infection	77	19.9
Hyperthermia	10	2.6
Hypoglycemia	13	3.4
Respiratory distress syndrome	32	8.3
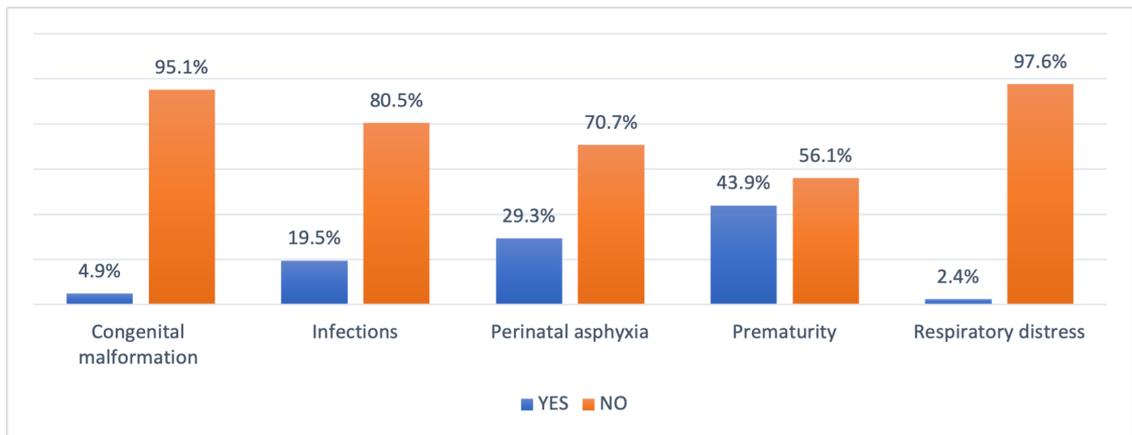
Figures 1: *Causes of neonatal mortality*
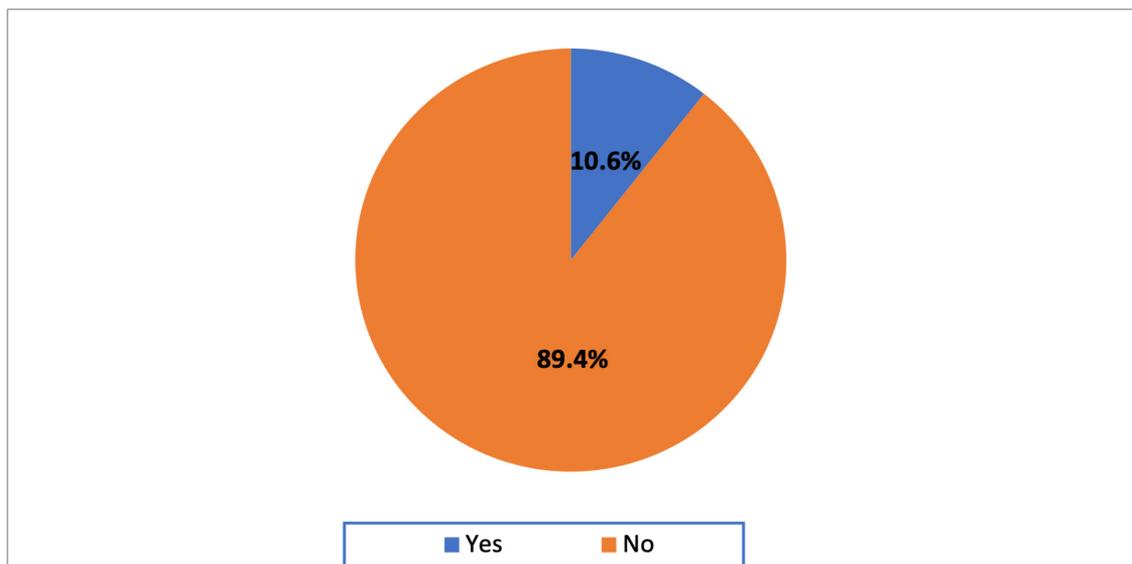
Figures 2: *Prevalence of the mortality*

Table 3: *Prevalence of neonatal mortality at Masaka DH*

Variables		Neonatal Deaths	
		Frequency	**%**
Marital status	Single	13	3.37
	Married	28	7.27
Educational Level	Primary	24	6.23
	Secondary and above	17	4.41
Maternal Conditions	Normal	34	8.83
	Abnormal	7	1.81
Antenatal Visit	Yes	28	7.27
	No	13	3.37
Gravidity	First	18	4.67
	Mulity	23	5.97
Maternal age	14-29	27	7.01
	30-45	14	3.63
Occupation Status	Unemployed	15	3.89
	Employed	26	6.75
Insured	Yes	40	10.38
	No	1	0.25
Residence	Urban	34	8.83
	Rural	7	1.81
Neonatal Gender	Male	22	5.71
	Female	19	4.93
Gestational Age	Preterm	23	5.97
	Full-term	18	4.67
Place of delivery	Heath center	13	3.37
	Hospital	28	7.27
Congenital abnormalities	Yes	1	0.27
	No	40	10.38
Mode of delivery	Cesarian Section	20	5.19
	Vaginal delivery	21	5.45
Birth Weight	Low birthweight	36	9.35
	Normal	5	1.29
Apgar Score (1min)	Poor vitality	13	3.37
	Good vitality	28	7.27
Apgar Score (5min)	Poor vitality	25	6.49
	Good vitality	16	4.15
Apgar Score (10min)	Poor vitality	11	2.85
	Good vitality	11	2.85

gestational age and birth weight significantly influenced mortality rates. Neonates born to mothers with primary education, those who did not attend antenatal care, preterm infants, and those with low birth weight had notably higher mortality rates. Additional details on these and other factors

Table 4: *Bivariate explorations of neonatal, socio-economic and maternal variables to predict neonatal mortality.*

Variables		Yes (%)	No (%)	Chi-square	P-Value
Marital status	Married	28(7.27)	227(58.9)	0.087	0.768
	Single	13(3.37)	117(30.38)		
Educational Level	Secondary and above	17(4.41)	115(29.87)	1.049	0.306
	Primary	24(6.23)	229(59.48)		
Antenatal Visit	Yes	28(7.27)	285(74.02)	5.105	0.024
	No	13(3.37)	59(15.32)		
Gravidity	First	18(4.67)	149(38.70)	0.005	0.943
	Mulity	23(5.97)	195(50.64)		
Maternal age	14-29	27(7.01)	223(57.92)	0.014	0.907
	30-45	14(3.63)	121(31.42)		
Occupation status	Employed	26(6.75)	225(58.44)	0.064	0.800
	Unemployed	15(3.89)	119(30.90)		
Neonatal gender	Female	19(4.93)	155(40.25)	1.091	0.296
	Male	22(5.71)	189(49.09)		
Maternal conditions	Normal	34(8.83)	320(83.11)	5.044	0.025
	Abnormal	7(1.81)	24(6.23)		
		34(8.83)	263(68.31)	0.871	0.351
Residence	Urban	7(1.81)	81(21.03)		
	Rural	18(4.67)	230(59.74)	8.185	0.004
		23(5.97)	114(29.61)		
Gestational age	Full-term	28(7.27)	248(64.41)	0.261	0.610
	Preterm	13(3.37)	96(24.93)		
Place of delivery	Hospital	21(5.45)	206(53.50)	1.137	0.286
	Health center	20(5.19)	138(35.84)		
Mode of delivery	Vaginal				
	Cesarian section				
Apgar score (1min)	Good vitality	28(7.27)	279(72.46)	3.722	0.054
	Poor vitality	13(3.37)	65(16.88)		
Apgar score(5min)	Good vitality	16(4.15)	310(80.51)	73.695	<0.001
	Poor vitality	25(6.49)	34(8.83)		
Apgar score(10min)	Good vitality	11(2.85)	333(86.49)	37.972	<0.001
	Poor vitality	11(2.85)	30(7.79)		
Birth Weight	Normal	5(1.29)	219(56.88)	39.884	<0.001
	Low birth weight	36(9.35)	125(32.46)		

are provided in Table 3.

Factors associated with neonatal mortality at Masaka DH

The Bivariate analysis identified key factors associated with neonatal mortality. Antenatal care was particularly significant, with mothers who attended antenatal visits showing a lower neonatal mortality rate (χ^2 = 5.105, p = 0.024). Maternal health conditions also had a significant impact, with neonates born to mothers with health issues showing higher mortality rates (χ^2 = 5.044, p = 0.025). Preterm birth and low birth weight were major risk factors, with preterm infants and those with low birth weight exhibiting significantly higher mortality rates (gestational age: χ^2 = 8.185, p = 0.004; birth weight: χ^2 = 39.884, p < 0.001). Additionally, the Apgar scores at 5- and 10-minutes post-birth were strongly associated with neonatal mortality, with lower scores correlating with higher mortality (Apgar score at 5 minutes: χ^2 = 73.695, p < 0.001; Apgar score at 10 minutes: χ^2 = 37.972, p < 0.001). In contrast, factors such as marital status, educational level, gravidity, maternal age, occupation status, neonatal gender, and residence did not show significant associations with neonatal mortality (Table 4).

The multivariate analysis revealed significant associations between neonatal mortality and several key factors. The Apgar score, a critical measure of newborn health, showed strong associations at both the 5-minute and 10-minute marks. Infants with poor vitality at 5 minutes had significantly higher odds of mortality (AOR = 16.37, 95% CI: 5.90-45.40, p < 0.001), and this risk remained elevated for those with poor vitality at 10 minutes (AOR = 3.55, 95% CI: 0.98-12.79, p = 0.032).

Antenatal care (ANC) visits were identified as a protective factor, with mothers who did not attend ANC being 2.857 times more likely to experience neonatal mortality compared to those who received care (AOR = 2.85, 95% CI: 1.10-7.36, p = 0.030). This finding underscores the critical role of maternal healthcare during pregnancy in improving neonatal survival rates.

Low birth weight and preterm birth were also strongly associated with increased neonatal mortality. Infants with low birth weight had significantly higher odds of mortality (AOR = 127.01, 95% CI: 27.93-577.46, p < 0.001), and preterm infants were at a notably higher risk of death compared to full-term infants (AOR = 0.08, 95% CI: 0.02-0.26, p < 0.001). However, maternal conditions did not show a significant association with neonatal mortality in this analysis (AOR = 2.04, 95% CI: 0.55-7.49, p = 0.282) (Table 5).

Table 5: *Multivariate logistic regression output for neonatal and maternal variables*

Variables	COR	AOR (CI at 95%)	p-value
Apgar Score			
At 5min			
Good Vitality	1*		
Poor vitality	14.24(6.93-29.28)	16.37(5.90-45.40)	<0.001
At 10min			
Good vitality	1*		
Poor vitality	11.10(4.44-27.72)	3.55(1.98-12.79)	0.032
Antenatal Care Visit			
Yes	1*		
No	2.24(1.09-4.58)	2.85(1.10-7.36)	0.030
Gestational Age			
Full-term	1*		
Preterm	2.54(1.32-4.90)	0.08(0.02-0.26)	<0.001

Reference category; COR: Crude odds ratio; AOR: Adjudted odds ratios

DISCUSSION

The study intended to address two specific objectives of the prevalence of neonatal mortality and the associated factors with it at Masaka DH. The findings revealed that the prevalence of neonatal mortality among the 385 neonates in the sample was notably high at 10.6%. This indicates that approximately 1 in 10 neonates experienced mortality, emphasizing the importance of understanding and addressing the determinants of neonatal health. Despite being conducted within a single hospital, this prevalence was higher than the national rate in Rwanda, which was 29.7 deaths per 1,000 live births [9]. The difference in prevalence could be attributed to variations in sample size and study context.

The study's prevalence was also higher compared to findings from other African countries such as Nigeria and Afghanistan, with 32 and 14 early neonatal deaths per 1,000 live births, respectively [10]. This discrepancy highlights the need for localized interventions and the potential impact of hospital-specific factors, such as quality of care and available resources.

Regarding factors associated with neonatal mortality, several key insights were identified. Firstly, the Apgar score, a fundamental measure of newborn health, demonstrated significant associations at both the 5-minute and 10-minute marks. Infants with poor vitality at 5 minutes exhibited notably higher odds of mortality compared to those with good vitality, underscoring the critical importance of immediate assessment and intervention to address newborn health issues post-birth. This finding aligns with studies conducted in India, Saudi Arabia, Bangladesh, and Washington, which indicated that a poor Apgar score at 5 minutes had a strong effect on the risk of neonatal mortality [5]. The implication is clear: immediate postnatal care and resuscitation efforts should be prioritized to improve Apgar scores and reduce mortality.

Secondly, the study highlighted the protective effect of antenatal care (ANC) visits against neonatal mortality. Infants whose mothers received ANC had significantly lower odds of mortality compared to those whose mothers did not receive ANC. This finding is consistent with other studies [11]. Both bivariate and multivariate analyses revealed that the more often a woman attends an ANC for routine checkups, the less the neonatal mortality, aligning with previous research

indicating that even one antenatal visit reduces the risk of neonatal mortality by 39% in Sub-Saharan Africa [12]. The implication is that increasing access to and utilization of ANC services is crucial in reducing neonatal mortality rates.

The study also revealed significant associations between gestational age, birth weight, and neonatal mortality, findings that resonate with global research [13]. Preterm infants were found to have substantially higher odds of mortality compared to full-term infants, highlighting the critical role of gestational age in neonatal outcomes. This aligns with studies from diverse regions, including Nairobi, where similar associations were reported. Additionally, infants with low birth weight faced significantly increased odds of mortality compared to those with normal birth weight, underscoring the vulnerability of low-birth-weight infants. This finding is consistent with research conducted in Nigeria, Indonesia, and Brazil, suggesting that low birth weight is a significant risk factor for neonatal mortality globally [13,[14]. The implication is that interventions aimed at preventing preterm births and improving birth weights, such as maternal nutrition and prenatal care, should be prioritized.

Gender differences were also observed, with the risk of neonatal mortality being lower for female infants compared to male infants. This finding is consistent with a previous study in Uganda [15]. Studies conducted in India and Pakistan also confirmed that neonatal mortality risks were higher among male infants than their female counterparts [16]. This may be due to biological differences, with female neonates having a stronger immune system due to genetic differences. Newborn girls have a biological advantage in survival over newborn boys [17], implicating that understanding these gender-based differences can help tailor interventions and resource allocation to those most at risk.

Despite the absence of statistically significant associations with certain variables, such as maternal conditions, age, and occupation, the study acknowledges the potential presence of complex interdependencies among these factors, warranting further exploration. This recognition emphasizes the need for nuanced, multidimensional approaches in understanding the intricate web of determinants influencing neonatal mortality. The implication is that future research should delve deeper into maternal factors and their indirect effects on neonatal outcomes.

Lastly, the analysis highlighted the predominant

causes of neonatal admissions, with infections, respiratory distress syndrome (RDS), jaundice, and perinatal asphyxia collectively contributing to over 60% of admissions. This substantial proportion emphasizes the urgency for targeted interventions addressing these primary causes. The implication is that efforts to reduce neonatal mortality should prioritize strategies aimed at preventing and managing these prevalent conditions, thereby contributing to improved overall neonatal health outcomes.

The study faced some limitations that should be noted. The findings of the study are limited in their applicability and may only be pertinent to Masaka DH, lacking generalizability to other healthcare facilities or regions with distinct healthcare systems, infrastructure, and patient populations. The nature of a cross-sectional study restricts the verification of cause-effect relationships. Notably, the presentation of socioeconomic status, encompassing household income and food security, as predominant risk factors associated with neonatal mortality in developing nations, particularly in Africa, was absent from the study.

It is crucial to acknowledge that this study was confined to documented cases, potentially resulting in an underrepresentation of neonatal deaths occurring outside the specified region.

CONCLUSION

Low birth weight, low Apgar scores, prematurity, lack of antenatal care visit were significantly associated with neonatal mortality at Masaka. Healththcare providers should focus on early identification and monitoring of risk factors through routine screenings and follow standardized management protocols for preterm and low birth weight infants, providing education to expectant mothers about the importance of antenatal care and the risks associated with these conditions is essential. Health policymakers should develop and implement policies that ensure access to quality antenatal care, allocate resources to enhance maternal and neonatal health services, and conduct public health campaigns to raise awareness about the importance of antenatal care. Public health organizations can support this effort by organizing training programs for healthcare providers, supporting research on maternal and neonatal health, and engaging communities to promote awareness. Lastly, non-governmental organizations (NGOs) and advocacy groups

should provide support services to pregnant women, advocate for improved maternal health policies, and collaborate with various stakeholders to enhance healthcare programs and initiatives. By addressing these areas, a comprehensive strategy can be developed to reduce neonatal mortality and improve outcomes for at-risk pregnancies.

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Rwanda
Public Health Bulletin

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All works submitted to this bulletin will have to belong to the types of articles stated below:

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The title of the article should be concise and informative. It should contain enough thoughts on the subject.

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Abstract of 250 words maximum must accompany each manuscript and be divided into 4 paragraphs with the following headings and MeSH keywords:

Introduction: stating the purposes/aims of the work; the research undertaken, the hypothesis tested or the procedure evaluated.
Materials and methods: briefly stating what was done and what materials were used, including the number of subjects, the methods to assess the data and to control bias.
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The text of observational and experimental articles is divided into sections with the following headings: Introduction: should always begin the text, and requires brevity and focuses. It conveys the nature and purpose of the work, and quotes the relevant literature. Only strictly pertinent background information is necessary for understanding why the topic is important. We suggest the final paragraph clearly states the hypothesis or purpose of the study.

METHODS

Details of clinical and technical procedures should follow the introduction. A clear description of the selection of the observational or experimental subjects should be given. The identification of all aspects of the study, its reasoning, and the related relevance should be explicitly justified. In case, the study was done in a particular way, the guiding principles should all be clarified. Exclusion and inclusion criteria or partial inclusion, the reliability index, the confidentiality index, the analysis step, and the data collection processes should be also carefully specified. This section should provide sufficient details on the methods, instrumentation, procedures, all drugs and chemicals used (including generic names, doses, routes of administration). It should allow other workers to reproduce the study if necessary.

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Be clear about the retrospective or prospective nature of the study. Finally, provide references to established methods, including statistical methods that have been published, forthcoming, or that may not be well known. New description or substantially modified methods may be used however, give reasons for the use of these techniques, and evaluate their limitations. Statistical methods should be described with enough details to enable a knowledgeable reader with access to the original data to verify the reported results. A general description of methods would be defined in the methods section, whereas a specific statistical method used into analysis would be summarized in the results section. Any general use of the computer program should be

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Logical sequence of presentation of results is required in the text; along with tables, and illustrations. Repetition of data from illustrations into the text should be avoided; however, emphasize or summary of only important observations would be helpful. Avoid the ''non-technical use'' of technical terms in statistics which should be defined and reserved for the right purpose. Moreover, define all those statistical terms aside with or including abbreviations and/or most used symbols. Any complication and/or unexpected finding should be reported and the more possibly explained and the author should report lost to follow up and dropouts from a clinical trial.

DISCUSSION

Use ample subheadings. Emphasize the new and important aspects of the study and the conclusions that follow from them. Avoid repetition of details included in other parts. This section requires the mention of the implication of the findings, and their limitations for future research, involving relating the observations to other relevant studies.

Finally, the conclusions should be linked to the goals of the study; though mostly avoiding:

Unqualified statement not completely supported by the data

Statement on economic benefits and costs unless the report includes economic data and analyses

Claim of priority and alluding to work that has not been completed.

Whereas new hypotheses could be suggested when warranted, but they should be clearly labeled as such and recommendations, when appropriate and needed, may be given.

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Disease surveillance summaries are reported following the checklist below:
Title: Compose a title that includes the name of the health condition, population, time and place.
Abstract: Provide a structured abstract including the following sub- headings: Background; Objectives; Methods; Results; and Conclusion.

INTRODUCTION

Context: Summarize the current situation regarding the health condition under surveillance and identify why it is important. Objectives: State the objective of the surveillance report.

METHODS

Setting: Describe the setting, locations and dates of the surveillance period.
Population: Describe the population under surveillance. Definitions: Provide definitions for each health event under surveillance, including

case definitions and any public health interventions. **Information sources**: Describe all data sources, including the objective of any surveillance systems, what data were collected and how data were gathered, transferred and stored. Supplementary data: If appropriate, note where to access supplemental material (e.g., www.opendata.gc.ca). **Data quality, missing data and reporting delays:** Describe how the data quality was assessed. Explain how missing data were addressed. If data is reported by date of diagnosis or symptom onset, include a statement about whether the data for the most recent periods may be revised.

DATA ANALYSIS

Describe any analytical methods used providing sufficient detail to enable a knowledgeable reader with access to the original data to judge its appropriateness and to assess the reported results.

RESULTS

Descriptive: Provide a summary of the descriptive data, including demographics.
Data Quality: Report on data quality (e.g., completeness, missing data, under reporting)
Analytic data: Provide a summary of the analysis including (when indicated) estimates of trends. When applicable, point estimates should include appropriate indicators of measurement error such as 95% confidence intervals (e.g., average annual percentage change used to describe trends or odds ratios used to describe subgroup differences).
Figures: Create the minimum number of figures to highlight key results. Create a title that includes person, time and place.

DISCUSSION

Key results: Summarize key results with reference to study objectives
Comparison: Consider these findings in relation to the current literature. Strengths and weaknesses: Discuss the strengths and weaknesses of the study (data quality, completeness, sources of

potential bias). Interpretation and generalizability: Provide a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies and other relevant evidence.
Conclusion: Ensure conclusions address objectives and follow from the results.

3. PUBLIC HEALTH NOTICES / OUTBREAK REPORTS

Following the Center for Disease Control recommendations, for public heath notices and outbreak reports to be published they need to cover all four components as stated below:

INTRODUCTION

Generally, the introductory paragraph should begin with 1 to 3 sentences establishing the existence of the outbreak or underlying public health problem. E.g., "On January 2, 2008, the Nevada State Health Division contacted CDC concerning surveillance reports received regarding two persons recently diagnosed with acute hepatitis C." The introductory paragraph also usually contains: a) a statement that an investigation was conducted, when and by whom; b) the most important finding(s); c) the actions taken to stem the outbreak; and d) a statement of the public health implications and actions that should be taken in response to the investigation. Investigation and results: First, present the initial investigation and its findings. This might include: 1) a description of the setting and a statement of how the outbreak came to the attention of health authorities; 2) a clinical description of the index case or initial cases; 3) initial key test results; and 4) hypothesis generation activities and results. Next, summarize the full investigation, including: case definition, case-finding activities, method of investigation, and results. Cases should be counted and described by clinical characteristics, treatment, and outcome, as well as time, place, and person descriptive results. Next, present the methods and results of any analytic epidemiologic studies (e.g.,

cohort or case-control studies). Finally, provide the results of any relevant microbiologic, genetic, or toxicologic results, followed by the results of any testing of environmental samples. Public health response: When appropriate, a brief description summarizing any public health interventions taken and the results of the interventions follows.

DISCUSSION

Same as for a Full Report, except that a Limitations paragraph might not be required for an Outbreak Report.

4. POLICY BRIEFS

This bulletin will use guidelines on reporting/ publishing policy notes as they are suggested by the Center for Disease Control (CDC). As the CDC defines them; Policy Notes are intended to announce new official policies or recommendations (e.g., from ACIP or CDC). These reports can be thought of as briefs. Maximum word count at submission is 1,400 words. Up to three tables, figures, or boxes may be included. Policy Notes contain no Discussion or Limitations, and a summary box is not required. Although policy notes or brief might vary, following is a rough guide of what basic notes should have: Introduction: The introductory paragraph should be limited to 150–200 words. It might contain all or some of the following components: a brief introductory statement orienting the reader to the topic and placing it in context, a brief description of the public health problem, a brief statement of the rationale for the policy or recommendation, mention of the most important parts of the policy or recommendations, and one or two sentences stating the conclusions and the public health implications of the new policy or recommendations.

BACKGROUND

The Policy Note should include a paragraph after the introduction that summarizes background information relevant to the policy or recommendation that can help the reader understand the context and need for the policy or recommendation.

Methods: Should include a summary of the methods used to establish the policy or recommendation, including answers to some or all of these questions: Who was involved in the production of the guidelines or recommendations, and how? What evidence base was considered? What was the rationale for considering this evidence base? Was other evidence excluded from consideration and, if so, why? Rationale and evidence: The Policy Note should provide a concise review of the rationale for the policy or recommendation and a descriptive review of the scientific evidence used to establish it. It should include an explanation of how the policy or recommendation adds to, or differs from, relevant policies or recommendations established previously. Presentation of the policy or recommendation: The policy or recommendation should state clearly when it takes effect and to whom and under what circumstances it applies.

DISCUSSION OR COMMENT

The Policy Note should comment on the likely impact of the new policy or recommendation and plans for assessment of the policy or recommendation

5. CASE REPORTS

These are reports of an individual patient on their symptoms, treatment reactions on a disease or condition of interest. These reports normally focus on unusual reactions or occurrences. Similar cases to other research reports, case reports might include a literature review of previous similar. Case reports might also address positive patient outcome on particular treatment guidelines or individual impact of a particular intervention. These are mainly used for educational and decision-making purposes. Case reports are normally reported following a checklist found at the CARE Guidelines.

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6. CASE STUDIES

We recommend authors to follow the "EQUATOR Network" for ample explanations and guidelines in the writing of such articles. They have to be well-described case studies on health care interventions of public health concern. These could be:

Rigorous assessments of processes and program interventions.

Recommendations on possible health interventions.

Never on individual patient (= case report)

7. COMMENTARIES / OPINION / METHODOLOGY ARTICLES

We recommend authors to follow the "EQUATOR Network" for ample explanations and guidelines in the writing of such articles. Though these articles are moderated, they should be:

Short, focused, opinionated to previous articles or any subject related to the journal entirely. Contemporary and focusing on specific issues. Normally up to 800 words.

Frank critics to the journal are bravely motivated and would be as much as possible published.

8. FORMATTING THE MANUSCRIPT

Please note that articles which are not correctly formatted will be returned to the authors

Format text: Style: No Spacing, Single column, Single Spacing
Font: Single Spacing, Times New Roman - size 12
Titles: Capitals and bold, size 14
Format tables: Times New Roman, Font size 9 No vertical lines. Horizontal lines in the table can be removed. No table should be larger than a single A4 page. Footnote should be size 9 and italic

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