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Research Article

Assessing The Factors Affecting Maintenance of Medical Equipment at The Kenema Government Hospital, Sierra Leone

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Abstract

The maintenance of medical equipment is one of the major factors that enhance healthcare quality and decrease costs around the world. Proper maintenance of medical devices guarantees assistance, reliability, and efficiency, which are vital for effective healthcare service in resource-limited nations. The failure of properly effective systems of maintenance has caused significant damage to the care high-resource hospitals provide. With proper planning, the managed system has many advantages, including the reduction of maternal, neonatal, and under-five deaths; improved service delivery; and reduction in waste of the limited resources by minimizing the purchase of costly new equipment. This study assesses the factors affecting the maintenance of medical equipment at the Kenema Government Hospital, Sierra Leone. The study employed both quantitative and qualitative research methods in a descriptive cross-sectional design. Data was collected through the administration of a research questionnaire to 315 healthcare workers at Kenema Government Hospital (KGH) and an in-depth interview with 10 members of the KGH administration. Inadequate funding (38%), lack of skilled personnel, inadequate training, and poorly structured maintenance management systems (22%) were identified as the major limiting factors influencing equipment maintenance at KGH. Furthermore, the lack of adequately qualified biomedical personnel (100%) emerged as a significant limitation. The findings also illustrate that these limiting factors have an understated takeaway on operational efficiency and patient care, as 100% equipment downtime impacts patient flow and degrades the quality of the care received. Lastly, the analysis exposed the hospital's over-dependence on corrective maintenance approaches (63% of the time) instead of preventive maintenance. The study recommends that, in order to overcome these challenges and improve the operational functionality, safety, and performance of medical equipment and consequently patient care at KGH, additional resources for maintenance activities, trained biomedical engineers, and a structured preventive maintenance program should be taken into consideration.

Keywords: Healthcare quality, resource-limited settings, preventive maintenance, biomedical engineering, operational efficiency.

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1. INTRODUCTION

Medical equipment significantly improves the overall health outcome of people and a nation [1]. This is evident in developed countries with positive health indicators in different population categories. Medical equipment refers to all those small or heavy machines used in the healthcare setting to enhance patient recovery and make work easier for healthcare workers [2]. This equipment wears and tears with usage and time, making its maintenance essential in maintaining its quality and proper functioning. Medical equipment maintenance involves the planning, executing, and monitoring of maintenance activities to prevent equipment breakdowns and ensure their reliable operation [1], [2]. Tasks include scheduling routine maintenance, replacing equipment when necessary, performing repairs, developing and implementing policies and procedures, and training staff on the proper equipment handling, usage, and maintenance [1]. Effective maintenance is a significant model for improving the quality of care and reducing the cost of health services across developing countries [3]. Medical equipment maintenance is key to enhancing the quality of healthcare delivery in resource-limited countries like Sierra Leone (SL). A country and its medical professionals cannot discuss quality health service delivery for their population without acquiring good medical equipment in hospitals or health facility settings [4]. The success of health facilities and their personnel in providing the needed services in low- and Middle-Income countries like Sierra Leone requires huge attention and investment in quality maintenance of medical equipment [1], [2]. Every country needs to invest in acquiring good medical equipment for a modern medical practice. This can be an incredible strategy for improving the health status of the population in a country, which can be translated into human resource investment and sound economic production through a healthy population [5]. The culture of maintenance can serve as a perfect strategy for cost reduction in the frequent procurement of needed medical equipment [6], [7].

Globally, medical equipment has improved health service delivery across many nations. Severe medical problems have been mitigated all over the world thanks to the modernization of medical equipment. Quality of care in healthcare settings has been greatly affected by the lack of effective medical equipment maintenance, especially in low-resource hospitals and, by extension, low- and middle-income countries [3]. There are many benefits and problems associated with medical equipment. The greatest of these problems is maintenance. Although every hospital has maintenance policies, implementation has been a key challenge for all developing countries. Several factors, such as poor planning for maintenance, inadequate budgets, lack of trained maintenance professionals, and non-availability of spare parts and accessories, have affected health service delivery at all levels of care, thus rendering most of the medical equipment lying idle and unusable [8]. Sierra Leone is ranked among Africa's lowest-income countries and the world. She has one of the poorest

health indicators in the world with a life expectancy of 54.31 years, infant mortality rate of 82, neonate mortality of 31, and under-five mortality of 111 Deaths per 1000 live births, respectively [9], [10]. Several factors are responsible for the above data, such as the availability and poor maintenance of medical equipment in healthcare settings; most of these deaths would have been prevented with the introduction and utilization of modern medical equipment in all health facilities across the country [11]. Service availability and readiness assessment are essential to understanding the factors that affect equipment maintenance. According to a study by Gegbe et al. (2019), the lack of service availability correlates with the inability to maintain medical equipment effectively [12]. This situation is worsening in districts with underdeveloped healthcare infrastructure, such as the Kenema district in Sierra Leone. The availability of financial and human resources is a significant barrier to the effective maintenance of medical equipment [13]. Arab-Zozani M (2021) and Zamzam A h (2021) stress the need for a guide to assess surgical capacities in low-income countries, suggesting how inadequate resources directly affect surgical and medical operations [14], [15]. In a similar study by Kushner et al. (2012) on the deficiencies in managing and maintaining medical equipment in Sierra Leone, inadequate resource allocation and management were the main barriers to effective and efficient equipment maintenance in all healthcare settings [16]. The above research emphasizes resource availability and systemic approaches without focusing on the operational challenges specific to Sierra Leone's healthcare dynamics, particularly Kenema Government Hospital. Several factors around quality control are key in maintaining and managing medical equipment. The study conducted by Bahreini et al. (2019) on the influential factors of medical equipment maintenance management suggested that a structure quality control framework can significantly improve equipment longevity and performance [3]. In the same vein, Aizat Hilmi Zamzam (2021) observed a detailed categorization of factors affecting maintenance management systems, identifying themes such as "inspection and preventive maintenance" and "quality control" as a critical component to enhancing effective equipment maintenance [15].

The study aims to assess the factors affecting medical equipment maintenance at the Kenema Government Hospital in Sierra Leone.

1.1 Methods

Research design

The study used both quantitative and qualitative research methods in a descriptive cross-sectional design.

Description of the study Institution

This study was conducted at the Kenema Government hospital, located in Kenema city. The hospital is a regional referral hospital for the inhabitant of Eastern region in Sierra Leone. Over the years, KGH plays a significant role in the diagnosis, treatment and management of infectious disease such as Ebola, Covid

19 and Lassa Fever. KGH is one of the few hospitals in the country with a Lassa fever treatment ward and a biosafety level 3 (BSL-3) laboratory which has been very instrumental in diagnosing and treating cases of viral haemorrhagic fevers (Boisen et al., 2018; Shaffer et al., 2021). The strategic location of the hospital in the hotbed of Lassa fever makes it a center point for medical research in the country.

Kenema city is the economic center for the Eastern region with diverse economic activities ranging from agriculture, banking, mining, farming, fishing, business and trading, transportation and education.

Study population

The study population includes healthcare workers of The Kenema Government Hospital, Maintenance personnel, hospital store keepers, mortuary department, district logistic officer, officers of the ambulance service department, and administrative heads of the hospital.

Sources of data

This study utilizes primary sources of data through questionnaire administration, observation, documentations, and Key in-depth interview.

Method of data collection

Quantitative data was collected through administering a

detail questionnaire to participant of the study. The research instrument was put into Kobo collect, pretested for error detection and correction, before finalizing for data collection. In the case of technologically challenged participants, the research instrument was printed and distributed to the said participant for their responses. All completed questionnaire were collected from the study participants for onwards data processing, cleaning and analysis.

For the qualitative component, an in-depth interview was conducted among the hospital administration. The in-depth interview was recorded into an audio format which was later transcribed for thematic analysis.

Sampling method

The research employed a multi stage sampling by first stratifying the population into departments in order to have a representative sample from each department and later a systematic random sample was applied in each stratum.

Table 1: Sample size determination

Departmental stratum	Departmental population	Percentage (%) of departmental sample	Sample representation of department	size per	Total
Medical department	460	$(460/635) * 100 = 72.44\%$	333.224		334
Surgical department	90	$(90/635) * 100 = 14.17\%$	12.753		13
Laboratory Department	56	$(56/635) * 100 = 8.82\%$	4.9392		5
Operation support and maintenance	17	$(17/635) * 100 = 2.68\%$	0.4556		1
Total	635	100%	351.5986		353

Source: Researcher’s construct 2024

After determining the number of participants for each stratum, a systematic random sampling method was used to select the final study participants. As a result, the sample size for the quantitative component of the study was 353 participants. Additionally, the qualitative component included an indebt interviews with 10 administrative heads of the hospital.

Reliability and validity of the research instrument

The consistency, dependability, or stability of data is referred to as its reliability (Mohajan & Nazrul, 2009) . Similarly, Lütffi SÜRÜCÜ (2020), defines validity as the degree to which a measurement achieve it intended purpose or result (SÜRÜCÜ & MASLAKÇI, 2020). A data is said to be valid if it’s true and accurate in addition to been reliable (Mohajan & Nazrul, 2009) . Therefore, one can conclude that if the outcome of a measurement becomes valid, then it’s also reliable.

After the drafting of the research questionnaire and the interview guide that was used in this study, it was sent to

an experience researcher for inputs and comments so as to verify the reliability and the content (face) validity of the instrument used in the study. Inter rater validity was applied through the testing of the research instrument among the study population in the Kenema Government Hospital.

The pretesting was done to ensure the instrument is capable of collecting data that will meet the desire outcome of the study. Following the pretesting, corrections and adjustment was made to ensure the research instrument and guide correlate with the study’s goal. This was to ensure that criteria validity was met during the study. The researcher’s ensured data were only collected from participant who met the inclusion criteria

Inclusion Criteria

1. All healthcare professionals, technicians, and administrative staff directly involved in the use,

maintenance, or management of medical equipment at the hospital

2. Health care professionals with at least one year of experience working with or maintaining medical equipment at the hospital.

Exclusion Criteria

1. Staff or departments not directly involved in the use, maintenance, or management of medical equipment.
2. Healthcare workers with less than one year of experience in handling, operating or maintaining medical equipment
3. Per term healthcare worker

Ethical consideration

This study was approved ethically by the Sierra Leone Ethics and Scientific Review Committee.

2. RESULTS AND DISCUSSION (12 pt)

2.1. Results (12 pt)

A total of 353 participants were initially selected for the study; however, only 315 individuals ultimately participated, resulting in a response rate of 89.2%. The non-response rate was 10.8%, attributed to personal commitments and unreturned questionnaires.

Demographic Characteristics of Respondents

The demographic characteristic of respondent includes Age, Gender, Education level attained, years of experience and designation.

Table 2: Demographic Information of Respondents

Age Group	Frequency	Percentage
< 20	0	0%
21-30	63	20%
31-40	130	41%
41-50	73	23%
51-60	46	15%
61-70	3	1%
Total	315	100%
Sex		
Female	200	63%
Male	115	37%
Total	315	100%
Years of experience		
0-1 Year	9	3%
1-2 Years	23	7%
2-3 Years	41	13%
3-4 Years	55	17%
5 years above	187	59%
Total	315	100%
Designation		
Biomedical technician	2	1%
CHA	28	9%
CHO	118	37%
Lab technician	18	6%
Nurse	132	42%
Public Health Superintendent	2	1%
mortuary attendants	8	3%
others	5	2%
volunteer	2	1%
Total	315	100%
Highest level of education		
Diploma	208	66%
Graduate	92	29%
Post Graduate	13	4%
Secondary Level	0	0%
Vocational	2	1%
Total	315	100%

Source: field data, 2024.

From the table above the majority (41%) of respondents fall within the age range of 31-40 years, followed by the 41-50 age group with 23%, the 21-30 age group accounts for 20%, while the 51-60 age group represents 15%. The 51-60 age groups have the smallest representation at 1%. No (0%) respondent falls within the age range below 20 years.

Gender distribution reveals a predominance of females, who constitute 63% of the group, while males make up 37%.

Majority (59%) of the healthcare workers have more than five years' experience, follows by 17% having 3-4 years, 13% having 2-3 years, 7% having 1-2 years, and 3% accounting for less than one year of experience. No

respondents (0%) were having less than a year of experience respectively.

From the table above, Nurses accounted for the majority (42%) of the healthcare workers, followed by Community Health Officers (CHOs) with 37%, Lab Technicians at 6% and Public Health Superintendents at 1%, Biomedical Technicians 1% and Mortuary Attendants 2%, Community Health Assistants (CHAs) account for 9%, and others make up 2%. Volunteers contribute 1% to the workforce.

The educational background data shows that 66% of respondents hold a diploma, while 29% have a bachelor's degree, 4% possesses a postgraduate degree, and 1% have vocational education. Notably, there were no (0%) respondents with secondary education

Table 3: Table 3: Limiting factors affecting the maintenance of medical equipment at Kenema Government Hospital

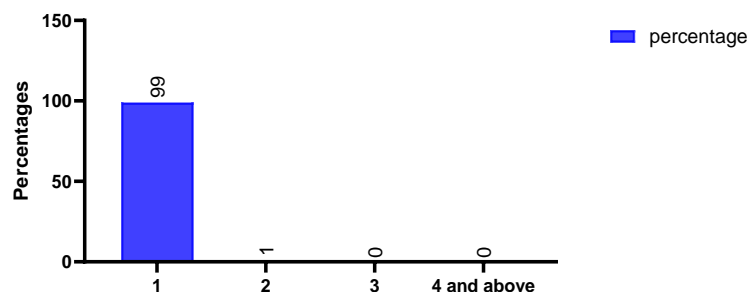
limiting factors affecting the maintenance of medical equipment at KGH	Frequenc y	percentage
Insufficient budget allocation	20	6%
Lack of skilled maintenance personnel	4	1%
Inadequate funding	121	38%
Inadequate training and professional development	41	13%
Poor access to spare parts and supplies	11	3%
Outdated equipment that is difficult to maintain	1	0%
Ineffective maintenance management systems	68	22%
Power outages and infrastructure issues	49	16%
total	315	100%

Source: Field data, 2024.

From the table above, 38% of respondents reported inadequate funding as the main limiting factor affecting equipment maintenance at the hospital, followed by ineffective maintenance management systems at 22%, other notable factors include power outages and infrastructure issues at 16%, and inadequate training and professional development at 13%, while insufficient

budget allocation is cited by 6%, and poor access to spare parts and supplies accounts for 3%. The presence of 1% reporting an inadequacy of skilled maintenance personnel, and there is a complete absence 0% of individuals reporting issues related to outdated equipment.

Number of maintenance personnel available in the hospital



Number of maintenance personnel available in the hospital

Figure 1

Figure1 data above indicates that the overwhelming majority of respondents, 99%, believe there is only one maintenance officer at KGH, while a negligible 1% reported that there are two maintenance officers, 0% of respondents selected options for three or more

maintenance officers. This data was complimented in the in-depth interview, where all respondents reveals that the hospital have one pin coded maintenance personnel and one volunteer.

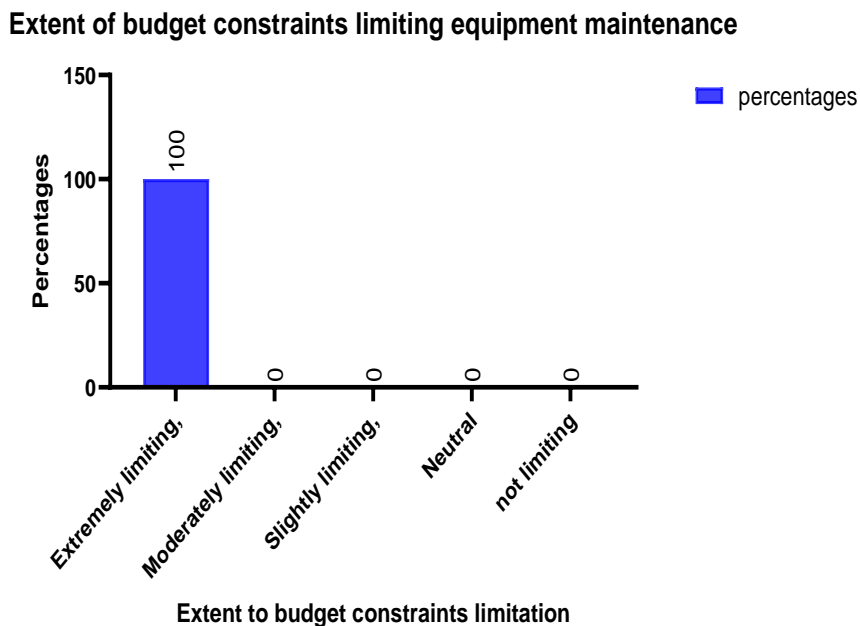


Figure 2 : Budget constraints limiting equipment maintenance

Data from figure 2 reveals that budget constraints is the extreme limiting factor affecting the maintenance of medical equipment 100% of the time, while none 0%

reported that these constraints are moderately limiting, slightly limiting, neutral, or not limiting at all.

Description of the infrastructure and logistics support for medical equipment maintenance at KGH

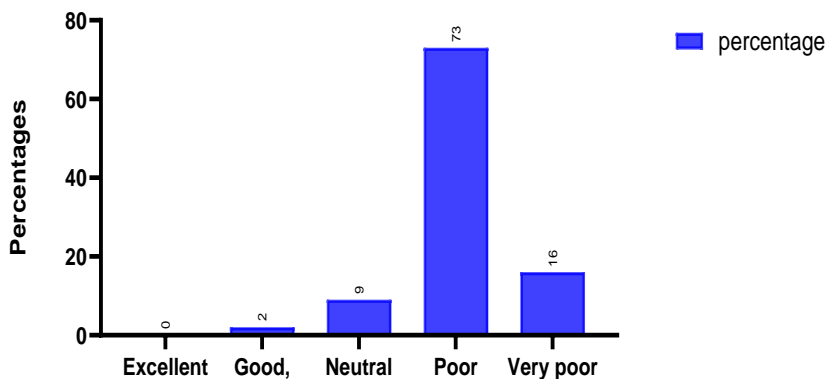
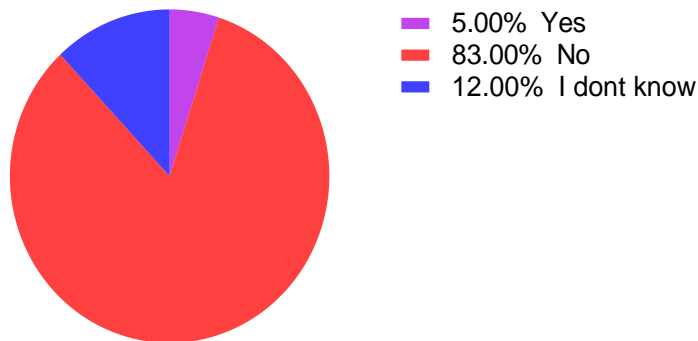


Figure4: Infrastructure and logistics support for medical equipment maintenance at KGH

The figure above depicts respondent description of the infrastructure and logistics support for medical equipment maintenance, with 0% of respondents rating

it as excellent, 2% as good, and 9% remaining neutral. A significant 73% of respondents described the support as poor, while 16% rated it as very poor.



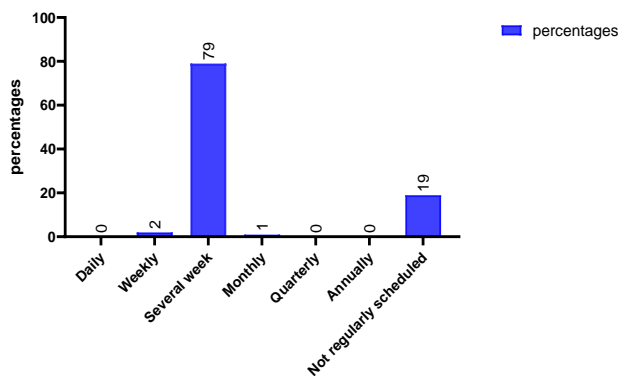
A pie chart showing Availability of set aside funds for maintenance

Figure 51: Availability of funds set aside for the maintenance of medical equipment

Figure 5 above reveals a huge lack of funding for the maintenance of medical equipment, with only 5% of respondents confirming that funds are allocated for

maintenance. In contrast, a substantial 83% indicated that there are no funds set aside, while 11% were uncertain about the availability of maintenance funds.

Frequency of routine maintenance performed on medical equipment at KGH

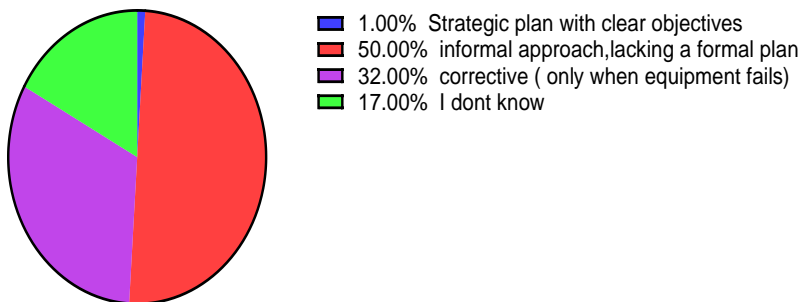


Frequency of routine maintenance on medical equipment

Figure 6: frequency of routine maintenance performed on medical equipment at KGH

From the figure above, daily maintenance was reported to be conducted 0% of the time, while Weekly maintenance occurs at a rate of 2%. The majority, 79%, falls under Several weeks, Monthly maintenance was recorded at 1%, and both Quarterly and annually

maintenance was reported by 0% of respondents respectively. Additionally, 19% of the equipment was reported to not being scheduled for regular maintenance at all.



A pie chart showing the Hospital medical equipment maintenance plan

Figure 7: Hospital medical equipment maintenance plan

The majority, 50%, of healthcare workers reported informal approach as the strategy used for equipment maintenance, while, 32% stated that maintenance is

conducted reactively, only a small fraction, 1%, indicated a strategic plan with clear objectives, while 17% did not know how planning is conducted.

Rating of the overall quality of the strategy employed by the hospital management for equipment maintenance

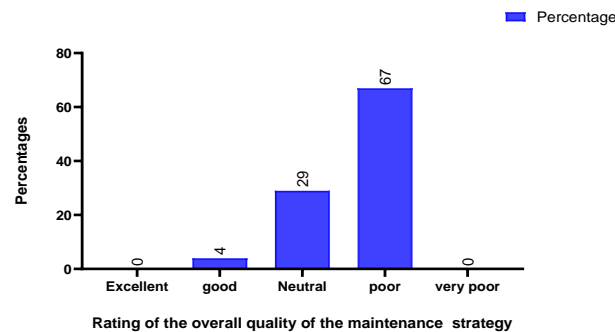


Figure8: Rating of the overall quality of the strategy employed by the hospital management for equipment maintenance

From the figure above, the overall quality of KGH's equipment maintenance strategy is rated predominantly as poor, with 67% of respondents expressing this view. Only 4% rated it as good, while 29% remained neutral about the strategy's effectiveness. Notably, there were no respondents who rated the strategy as excellent or very poor, suggesting a lack of strong positive feedback but also an absence of extreme dissatisfaction.

2.2. Discussion (12 pt)

Results from this study indicate that 41% of the respondents fall between 31 and 40 years of age, 23% between 41 and 50 years, and 20% fall within the 21-30 years category. Surprisingly, no person was found to be below the age of 20 years-old, which begs a question about the issue of entry-level opportunities in the current job market. The dominant number of respondents were between 31 and 40 years of age, indicating a fairly mature working population and possibly an experienced and adaptable one. This is consistent with the trend observed by Pew Research, which states that the median age of the adult working population has increased to 42 years due to an aging workforce that has been retiring and giving way to Millennials (*WORLD ECONOMIC FORUM*, n.d.-a). The lack of representation in the age group below 20 may indicate some form of shift in employment practice or educational requirements that raises the age of entry into the world of work. Previous research demonstrated that young people are more interested in education rather than seeking an immediate job and thus reflects the decline of entry-level positions. Having no respondents below the age of 20 outlines an area possibly weak in the recruitment strategies for entry-level and points toward how organizations may seek to target younger workers. According to recent research, the labor market composition is set to change dramatically as large numbers of older workers continue to stay on well beyond 2032 while the number of younger workers continues to decline (Massimino Ucin et al., 2024a). It is this demographic change that will force organizations to re-think their approach toward the way of hiring and workplace policies in order to create a

supportive environment of age diversity (*WORLD ECONOMIC FORUM*, n.d.-a)

Because women made up over 63% of the study's responses, compared to only 37% of men, the data's outcome plainly indicates an unbalanced sex ratio at the hospital. Results from McKinsey & Company, 2024, support the idea that women should participate more, particularly in the health and education sectors (McKinsey & Company, 2024a). The issue of gender gap in the study raises the question as to whether institutional policies adequately support a balanced representation. The International Labor Organization highlights that woman face greater challenges in labor force participation due to factors such as child-rearing responsibilities, which could further exacerbate gender imbalances in specific age groups (*WORLD ECONOMIC FORUM*, n.d.-a)

The findings from the study reveal that 59% of the hospital staff have more than five years of experience, indicating an experienced professional. This agrees with numerous studies, which have indicated that older workers are remaining in the workforce longer either due to necessity or personal interest. Although they contribute a valuable amount of knowledge and expertise to a company, these employees need proper succession planning in order to be prepared for their ultimate retirement. According to Ucin et al.'s findings, institutions with a generational divide find it difficult to incorporate fresh talent into the ranks of more seasoned employees, which can occasionally cause conflict between opinions of workplace expectations and culture (Massimino Ucin et al., 2024a; Oduro-Mensah et al., 2021; *WORLD ECONOMIC FORUM*, n.d.-b).

Workforce composition and educational background within the health care sector reflect important information, especially when being compared with prevailing studies. From the analysis above, nurses make up about 42% of the workforce, followed by the Community Health Officers (CHOs), which constitute about 37%, while the rest, like Lab Technicians and Public Health Superintendents, are sparsely represented. This also agrees with findings from Guyow et.al which

underscored the fact that diversity in staffing in a primary care setting plays a very critical role and that different health professional roles relate to patient satisfaction and quality of care in a different manner (Guyow, 2021; Khot & Patil, 2020; Uzma Sulaiman & Salim, 2024). High CHO representation in this dataset is also reflected in the global trend where there has been a shift of focus on community health workers as a way of bettering health care, especially in resource-constrained communities (Sakeah et al., 2014; Turienzo et al., 2024).

Furthermore, it shows that the educational background consists of 66% having diplomas and 29% having bachelor's degrees; thus, the staff is highly educated. This corresponds to a study done in the United States that states over half of the registered nurses have at least an associate degree, which corresponds to the world system for higher learning in nursing education (McKinsey & Company, 2024b). However, the 4% attainment rate for postgraduate qualifications would indicate that perhaps barriers to higher learning exist, which also corresponds to other studies showing barriers to higher professional learning due to finances and lack of time (Dahab & Sakellariou, 2020).

Moreover, there was only a small proportion of volunteers at 1%, and these are supporting staff crucial to ensuring hygienic conditions and smooth flow in healthcare facilities. Conversely, literature indicates that volunteer activities promote access to health care, especially in resource-constrained areas (Ibidunni et al., 2018). This study has given an overview of the workforce dynamics, but studies in relation to this aspect should be continuous to identify gaps towards the efficient delivery of health services through appropriate workforce planning supported by strategies on education.

The findings from the analysis reveal inadequate funding as the most pressing barrier or factor as was pointed out by 38% of the respondents and hence was the most highly rated factor. This corresponds to the research by Oleribe et al. (2019), which states that financial constraints are one of the dominant causes that affect healthcare service delivery in resource-poor settings (Oleribe et al., 2019a). Ineffective maintenance management systems, as shared by 22% of the participants, again correspond to the study by Massimino Ucin et al. (2024) that points to poor management practices as one of the major causes impeding the maintenance of medical equipment in hospitals (Massimino Ucin et al., 2024a). The remaining 16% of respondents reported of power and infrastructure problems and pointed to a greater systemic problem of equipment reliability. This finding is in agreement with the work of Zamzam et al. (2021), where infrastructural deficiencies in health facilities were proven to result in increased downtime of medical equipment, hence compromising patient care (Zamzam, Abdul Wahab, et al., 2021; Zamzam, Al-Ani, et al., 2021a). This is complemented by evidence from 13% of respondents who reported a large skill gap and same was noted by Ministry of Health & Family Welfare Government of

India, (2019), emphasizing continuous professional education as a necessary ingredient needed for maintenance personnel to ensure a high level of quality in equipment management (Biomedical Equipment Management and Maintenance Program: Technical Guidance Document for in-House Support and Monitoring of Public Private Partnerships. Ministry of Health & Family Welfare Government of India, New Delhi, n.d.). From the data, there is unanimous agreement (100%) that the budgetary constraints limit the hospital management to a great extent. It further corroborates the need for addressing the financial limitations in healthcare settings. Spare part accessibility, for 28% of the respondents, was an extremely limiting factor. The nightmare of spare parts' accessibility has also been reported by Massimino Ucin et al., (2024b), where logistical challenges in the procurement of spare parts proved to delay maintenance activities to a great extent (Massimino Ucin et al., 2024b).

There is an availability of skilled maintenance personnel, yet there is a large training gap: 100% acknowledgment of availability but paltry 21% staff training. In this light, Li et al. (2022), had pointed out that apart from availability, inappropriate training will reduce equipment maintenance to below acceptable levels [8].

The overwhelming feeling of inadequate numbers of skilled maintenance personnel at KGH was recognized as such by 100% of the respondents. This agrees with the observations of Mahfoud et al., (2016), who had indicated that apart from availability, inappropriate training reduces equipment maintenance to below acceptable levels (Mahfoud et al., 2016a).

The perceived poor infrastructure and logistics support rated as such by 73% of the respondents shows the urgency with which it needs attention. In fact, Lakoh et al., (2020), had concluded that there should be enhanced logistic frameworks put in place to support medical equipment maintenance (Lakoh et al., 2020).

The study found that 80% higher odds of maintenance problem affect operational efficiency at Kenema Government Hospital. This is consistent with the findings of Zamzam et al., due to hospital maintenance practices; there is often many instances of operational inefficiency as a result of increased downtimes (Zamzam, Al-Ani, et al., 2021b). A similar study by Tadia et al., on medical equipment found that system neglect resulted in long delays in caring for patient (Tadia & Kharate, 2020). The analysis also reveals how this equipment downtime affects patient flow and scheduling. While 8% report that this happens quite often, a significant 22% are not sure how often it happens. Respondent reporting of not being sure of how often breakdown happens, suggest the need for effect and efficient medical equipment training on maintenance and policy.

The consensus among 97% of respondents considering preventive maintenances as relevant to operational efficiency and patient care, really drives the point home for having a formidable maintenance strategy in place. This is in line with the findings by Mahfoud et al. (2016),

where it was established, that routine maintenance significantly improves equipment reliability and positive patient outcomes (Mahfoud et al., 2016b). Further reinforcing the gravity with which the issue is held at KGH is the fact that none 0% of the respondents held the opinion that maintenance was only somewhat important. Findings from the analysis also depicts financial constraints as a significant barrier to effective maintenance, as only 5% of respondents confirmed the allocation of funds for maintenance purposes. This extreme lack of financial support mirrors the findings of Oleribe (2019), who noted that insufficient funding for equipment maintenance leads to deteriorating operational standards in healthcare facilities (Oleribe et al., 2019b). Similarly, 83% of respondents reporting the non- available of funds set aside for maintenance of medical equipment is very alarming and hence raises concerns that KGH might eventually fail in maintaining equipment reliability due to a lack of appropriate financial resources set aside for maintenance purposes. The ineffective rating of the medical equipment management policy in the hospital stood at 74%, a situation which has been termed as being below balance, as medical equipment can only be effectively maintained in an environment where the maintenance policy is functional. A well-developed equipment management policy ensures longevity and reliability in medical devices. Failure to have effective policies at KGH would drastically reduce their effective working and also quality care to patients.

The data on the response time to equipment maintenance reveal a poor response time to maintenance request at the hospital as 92% of all respondents stated that there is a complete absence of a standard response time for maintenance request. The absent of respondent reporting that maintenance request is being address within the same day is a cause for alarm for hospital administration taking action in improving response time for medical equipment maintenance request. The above data was also complimented in the key informant interview from administrators of the hospital, where delay in responding to maintenance request was a key theme reported repeatedly. Some even went further explaining how most equipment broken down were never repaired. The study findings also reveal how the frequency of medical equipment breakdown at KGH is troubling, as the majority 58% of respondents experience breakdown or failure of equipment more than 10 times a year, while a significant 16% reported breakdown frequency of 1-3 times a year. The 7% of the respondents not being sure of the frequency of breakdown shows lack of flow of information on medical equipment breakdown and maintenance among hospital staffs.

The findings from the analysis shows infrequent routine maintenance of medical equipment as daily maintenance were conducted 0% of the time, while weekly and monthly maintenance accounted for a combination of 3%. 79% of respondents reporting that maintenance are conducted only after several weeks reveal a complete absence of routine maintenance and compliment the result on the delay in response time. The most shocking parts of the data is the report by 19% of the respondents

revealing how equipments are never schedule for regular maintenance. The culture of preventive maintenance is lacking to a greater extent with 70% of respondents reporting it absence and practice. The above data were justified by the key informant interview the lack of funding for equipment maintenance was a problem reported by all stakeholders of the hospital. Improving the hospital maintenance policy to incorporate preventive and proactive maintenance protocols will enhance the reliability and safety of equipment.

Of the 30% who reported the practice of preventive maintenance in the hospital, majority confirmed that is only being carried out quarterly and yearly. This still shows it ineffectiveness and thus the need for maintenance policy review.

The timeline for repair shows a notable delay, with 48% of repair taken longer than a month, and 32% not having knowledge on repair timeline shows the lack of importance place on medical equipment maintenance among healthcare staff. This might be due to lack of regular training on medical equipment operation and maintenance for healthcare staffs. The result on the availability of alternative equipment during breakdown shows that alternative equipment is available 78% of the times, which is a good indicator, but needs improvements as the 22% unavailability of alternative equipment is a significant concern which need urgent redress. The evaluation of maintenance policy and protocols is significantly low with only 3% reporting annually, while a startling 72% of respondents are unclear about how frequently they are reviewed. This indicates a notable disparity in the effectiveness of repairs and maintenance policy review at KGH.

From the data analyzed, a noteworthy 77% of respondents said that just 51–75% of the equipment is in working order, and Merely 3% of participants evaluated the medical equipment's operability as falling between 76 and 100%. These statistics indicate that there is a considerable reliance on partially functional equipment, which may have an effect on patient care and hospital productivity. The data on respondents' satisfaction on equipment maintenance at KGH shows a stacking 74% expressing dissatisfaction about the current state of maintenance at the hospital. The absence of respondent indicating either very satisfied or satisfied, highlighting a clear lack of approval regarding the current state of equipment maintenance at the facility.

The findings from the analysis reveals that hospitals predominantly rely on corrective maintenance for equipment upkeep, with 63% identifying it as the primary strategy. other strategies, such as condition-based maintenance and preventive maintenance, received limited consideration. The 15 % of respondent reporting not having any knowledge on maintenance strategy indicate a gross inadequacy of training and information dissemination on hospital maintenance protocols.

The study's findings show the absence of a formal maintenance plan for equipment, as 50% of the respondents identify the hospital to be using an informal approach. This shows maintenance is only conducted after equipment failure. The significant number of 17%

respondent not having any idea on the hospital maintenance plan or approach shows the need to bridging the gap on training and enhance communication with staff and hospital administration. Despite 65% of respondents reporting that the hospital adheres to national and international standards for medical equipment management, policy review is still necessary to formalize maintenance strategies and planning, as a stack 29% of healthcare staffs reported having knowledge on whether they follow any standards or not. Findings from the analysis above reveal 77% of the respondent reporting hospital investment in maintenance as limited. The above data was supported by the key informant interview where stakeholders of the hospital reveal the lack of a special budget set aside for maintenance. This is a great concern as non-respondents 0% reported of the hospital making huge investment in equipment maintenance.

The data on monitoring and evaluating of medical equipment reveal a worrisome statistic where only 1% of the respondents reported the use of regular audit and performance metric, 76% reported having no idea on any monitoring and evaluation performed on medical equipment of the hospital. The above data was also solidly complimented by the report from 26% of the respondents indicating a complete absence of monitoring and evaluation of medical equipment at the hospital. Importantly, all respondents (100%) recognized that a failure of medical devices poses a high risk to patient safety, highlighting the urgent need for KGH to enhance its maintenance evaluation practices to ensure better patient care.

Equipment maintenance strategy employed by KGH was rated as poor 67% and neutral 29, with no 0% respondents rating it as excellent reveal both the lack of positive feedback and extreme dissatisfaction. A lack of maintenance strategy in a regional hospital like KGH will lead to an increase in equipment downtime, negative impact on patient outcome, and overall affect the operational efficiency of the hospital.

CONCLUSION

The result highlight significant barriers to effective maintenance, including inadequate funding, lack of skilled personnel, insufficient training, and a poorly structured maintenance management system. Among these factors, inadequate funding, and ineffective management system was identified by healthcare workers as the primary limiting factors affecting equipment maintenance at the Kenema Government hospital. Additionally, there was a lack of adequate qualified personnel. The impact of these challenges on operational efficiency and patient care is huge, as equipment downtime disrupts patient flow and compromises the quality of care. In addition, the result also reveal that the hospital predominantly relies on corrective maintenance strategies, with a complete absence of preventive maintenance protocols. Advocating for increased funding, recruiting trained biomedical engineers, and implementing a structured preventive maintenance program will enhance the

operational efficiency, safety and functionality of medical equipment at KGH.

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