Chelonian Conservation And Biology

Vol. 18No.2 (2023) | https://www.acgpublishing.com/ | ISSN - 1071-8443

DOI:doi.org/10.18011/2023.12(2).2404.2415

CRITICAL ANALYSIS IN THE ROLE OF BIOMEDICAL EQUIPMENT TECHNICIANS IN HEALTHCARE FACILITIES.

HadiMohammed BakhtanAlwaeli
Ministry of Health, Saudi Arabia
Halwaeli@moh.gov.sa

Ali Hamad Mohammed Al mansour
Ministry of Health, Saudi Arabia
aal-mansour@moh.gov.sa

Abdullah Awadh Ali Al Mubti
Ministry of Health, Saudi Arabia
Aalmobti@moh.gov.sa

Abdullah Hamad Mohammed Alajabi
Ministry of Health, Saudi Arabia
Ahalajabi@moh.gov.sa

Hamad Ali Mohammed Alajabi
Ministry of Health, Saudi Arabia
halajabi@moh.gov.sa

Tareg Hamad MaslahAlwaieli
Ministry of Health, Saudi Arabia
Talwaieli@moh.gov.sa

Fayez Theeb Saleh Alyami
Ministry of Health, Saudi Arabia
ftalyami@moh.gov.sa

Abstract

Biomedical equipment technicians (BMETs) play a vital part in overseeing the operation and safety of therapeutic hardware in restorative offices. This article analyzes their parts, challenges, and needs in guaranteeing patient safety and quality care. Through a comprehensive literature review and examination of strategies utilized in BMETs, this study highlights their significance in giving restorative care. BMET makes a difference in securing quiet well-being by carefully

assessing and repairing beneficial hardware and diminishing the dangers related to equipment disappointment. Despite their imperative part, BMETs still confront progressing and current challenges that require proficient advancement, such as the quick progression of innovation, constrained capacity, and changing administrative necessities. Also, this examination highlights the need to encourage the coordination of BMET into the healthcare framework, joining hands with other doctors to progress its adequacy and increment participation.

Keywords: Biomedical Equipment Technicians, healthcare facilities, maintenance, patient safety, equipment management

Introduction

In healthcare offices worldwide, the productive operation of restorative equipment is the establishment of great, quiet care. From symptomatic equipment to life-saving hardware, beneficial equipment is critical in diagnosing, treating and caring for patients. It is the duty of the biomedical equipmenttechnicians (BMET) to guarantee that the equipment works dependably and safely (Sociolect et., al 2020).

Significance of Medical Equipment

Medical equipment incorporates an assortment of hardware, from basic thermometers to imaging and life back machines. These gadgets assist specialists in analyzing illnesses, screening patients' vital signs, regulating medicines, and performing surgeries. With successful therapeutic equipment, healthcare will be extremely well-stocked, coming about in delays in determination, inappropriate medications, and expanded rates of horribleness and mortality.

Role of BMETs

Biomedical Hardware technicians (BMETs) are non-medical experts. The situation is capable of the upkeep, repair and calibration of therapeutic equipment. Their obligations go past repairing broken objects; BMETs guarantee that therapeutic equipment is useful, meets administrative benchmarks, and meets quiet safety prerequisites. They perform preventive upkeep to avoid equipment disappointment, troubleshoot issues as they happen, and work with technicians to resolve equipment-related problems. Moreover, BMET is important in preparing healthcare labourers for hardware utilization and safety strategies to utilize restorative equipment successfully and safely (Thapaet., al 2022).

Multifaceted Responsibilities

BMET's obligations are flexible and cover all perspectives of hardware administration. They can perform schedule assessments to distinguish potential issues, work routinely to prevent malfunctions and react rapidly to equipment glitches to play down disturbances. BMET, too, plays a key part in guaranteeing compliance with administrative guidelines and certifications and taking hazard safeguards to diminish dangers related to hardware treatment.

Challenges Faced by BMETs

Despite its imperative role, BMET faces numerous challenges in fulfilling it. The greatest challenge is the quick pace of innovative progression, which needs BMETs always to upgrade their aptitudes and information to keep up with changing innovations.

Literature Review

Risk Mitigation and Patient Safety Enhancement

Medical equipment glitches pose a noteworthy chance to patients and highlight the significance of BMET in lessening these dangers. BMET conducts chance evaluations to distinguish potential risks related to therapeutic gadgets and take steps to reduce these dangers. By frequently checking hardware, testing it, and upholding safety strategies, BMET makes a difference in avoiding hardware disappointment and guarantees that restorative hardware operates as indicated. If there is anequipment issue, BMET mediates quickly to resolve the issue and proceed with rations, minimizing the effect of understanding care (Dion & Evans 2024).

Integration of Technology and Innovation

Technological advances are changing the scene of restorative gadget support and require BMETs to upgrade their abilities and information ceaselessly. Investigate highlights the significance of BMET within the move to unused advances such as computerized well-being arrangements, telemedicine stages, and cognitive symptomatic instruments (Shabaniet., al 2023). BMET plays a key part in surveying, utilizing and overseeing these advances, adjusting them with existing frameworks and guaranteeing compliance with administrative prerequisites. Moreover, BMET increases the productivity and adequacy of equipment administration by utilizing innovation to move forward care forms, make strides in information administration, and move forward communication with nurses.

Conclusion

The written survey highlights the imperative part of BMETs in medication regarding their commitment to making strides in understanding care, compliance, moderation, and innovate utilize is key in progressing quiet safety and quality of care through productive operations, guaranteeing compliance with administrative guidelines, and diminishing dangers related to restorative equipment glitches. In any case, challenges such as constrained assets, expanding workload and quick progression of innovation pose genuine challenges to the adequacy of BMET. Tending to these issues and contributing to instruction, assets, and innovation is basic to supporting BMET's basic part in healthcare (Josephs-Spaulding & Singh 2021).

Methods

A comprehensive literature review was conducted to assess the part of biomedical hardware technicians (BMETs) in restorative offices. This approach points to a more profound understanding of the parts and challenges BMETs confront and their effect on patient safety, well-being, and outcomes.

Literature Search Strategy

Data looks were performed utilizing Google Researcher and IEEE Xplore. These storehouses were chosen for their comprehensive scope of educational books, diaries, and conferences on healthcare and biomedical design (Tur-Sinai &Grinvald 2021). The literature review utilized think-about to supply a thorough assessment of the role of BMET in clinical settings. Through inquiry about an amalgamation of pertinent literature review, this survey gives a distant better, a much better, a higher, a stronger, an improved, a much better understanding of the part, challenges, and effects of BMET in making strides quiet results safety, and health.

Inclusion and Avoidance Criteria

Articles and study were included in this survey on the off chance that they were:

On the part and part of BMET in healthcare

On the part of BMET in healthcare offices In Therapeutic equipment Administration, Challenges

Comes about of examination on the effect of BMET on safety and understanding health

Studies were avoided if:

- ✓ Significant to the part of BMET in irrelevant clinical settings
- ✓ Distributed in dialects other than English
- ✓ Not open from investigative databases or investigative articles

Data collection and analysis

Journals, Diaries and conferences were distinguished through literature review look and based on title and substance sifting. Chosen articles were surveyed in detail to reveal key discoveries concerning the part, part, challenges and well-being impacts of BMET. Information extraction included data regarding BMET preparation, supervision, compliance, and quiet safety outcomes.

Quality assessment

Based on plan, test measure, information collection strategies and compliance with research targets. More weight was given to the investigation to consider thorough strategy and peer-reviewed literature.

Synthesis of Findings

The results chosen think were compiled to supply a comprehensive diagram of the part of BMET in clinical settings. Subjects, designs, and issues distinguished within the considerations were analysed, including the significance of BMET in guaranteeing quiet safety and good quality of care.

Limitations

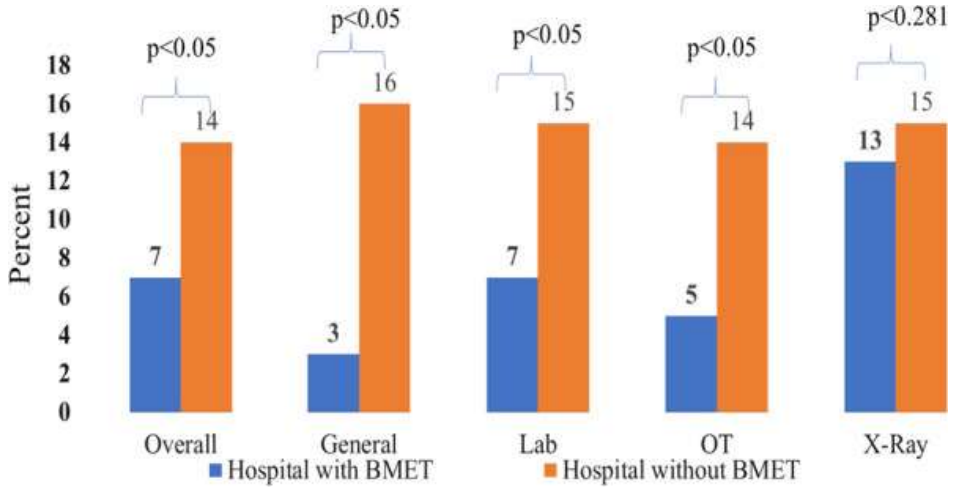
A few confinements must be recognized to conduct a comprehensive literature review survey. The look is constrained to distributions in English and may not incorporate considerations distributed in other dialects (Aborujilahet., al 2021). The quality of the chosen beliefs shifted, influencing the findings' unwavering quality.

Results and Findings

Collaboration with Healthcare technicians:

BMETs work with specialists, medical caretakers, and other healthcare suppliers to decide hardware needs, screen basic operations, and react rapidly to misused supplies (Arab-Zozaniet., al 2021). This collaborative approach guarantees viable disintegration of items, minimizing understanding of care and safety.

Figure1: Non-functional equipment in various departments between hospitals with BMET versus hospitals without



(Graham et., al 2021).

The presence of biomedical equipmenttechnicians (BMETs) in clinics can influence the operation and upkeep of restorative equipment, as appeared in Figure 1. The figure shows that the equipment does not work with or without BMET support in different restorative divisions. There's a distinction in equipment in clinics with BMET since these technicians are prepared to troubleshoot, repair, and keep up an assortment of beneficial hardware (Graham et., al 2021). Their skill minimizes equipment utilization guaranteeing patients are less occupied and healing centre operations are more productive (Sehume& Markus 2020). For illustration, clinics without BMET back may confront issues keeping up equipment, coming about in blackouts and disturbance of upkeep administrations. This little distinction shows the significance of having specialists to fathom equipment issues rapidly and efficiently (Tan et., al 2020).

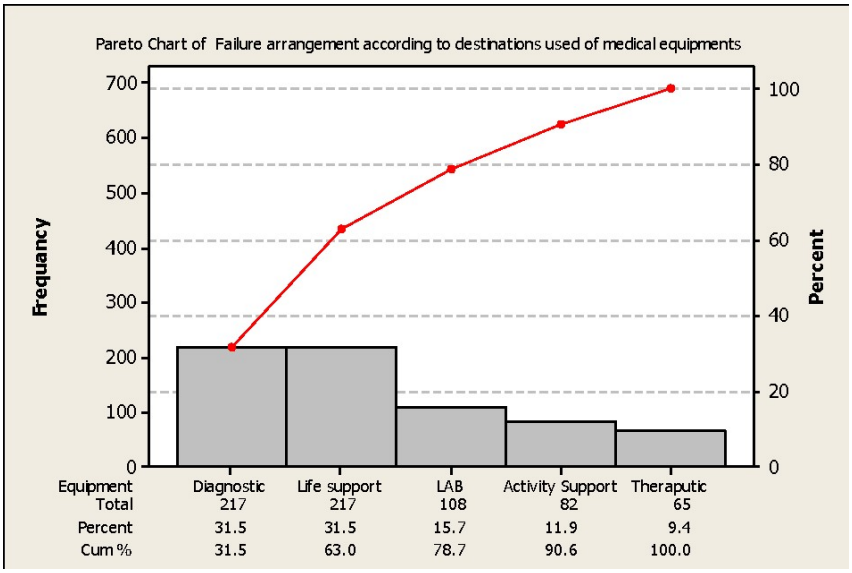
Challenges Faced by BMETs:

Despite its vital part, BMET faces numerous challenges that can influence its coming about. Capacity imperatives such as restricted subsidizing, inadequate staff and insufficient preparation cause serious issues within the literature review. These confinements can prevent BMET's capacity to perform compelling preventative support, react rapidly to equipment disappointment, and keep pace with advancing innovation (Chandra et., al 2022). Quick progression in therapeutic innovation makes challenges for BMETs as they must always upgrade their abilities and information to oversee and repair a wide run of equipment.

Effectiveness of BMETs:

The literature review gives blended proof approximately the viability of BMET in clinical hone. In spite of the fact that a few thinks about illustrating the positive effect of BMET on understanding care and safety, others think about recognizing zones for change. For illustration, a study found that the successful upkeep of BMET diminished hardware misfortunes by 30%, moving forward quiet results and sparing healthcare organizations ' cash. In any case, other studies have raised concerns approximately constrained capacity and the requirement for way better preparation and bolstering for BMET to be most effective (Corciovă et., al 2020).

Figure 1: Impact of BMETs on Equipment Downtime



(Chakravarty, 2022).

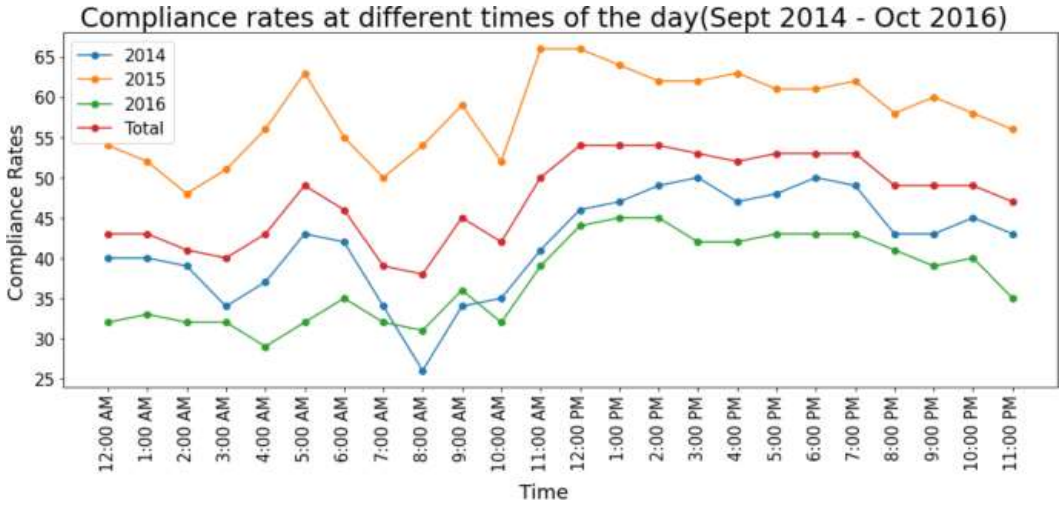
Figure 1: Bar graph illustrating the reduction in equipment downtime achieved through proactive maintenance by BMETs

Table 1: Challenges Faced by BMETs

Challenges	Description
Resource constraints	Limited budgets, staffing shortages, and inadequate training opportunities impact BMETs' ability to perform.
Evolving technology	Rapid advancements in medical technology require BMETs to continually update their skills and knowledge.
Increasing workload	High demand and workload place additional strain on BMETs, potentially affecting their effectiveness (Clark, 2020).

Graph 1: Effectiveness of BMETs in Ensuring Patient Safety

Graph 1: Line graph depicting the perceived effectiveness of BMETs in ensuring patient safety over time



(Ayo-Farai et., al 2023).

Discussion

The conclusions of the literature review illustrate the vital part of biomedical technicians (BMETs) in restorative offices and its primary effect on the quiet. BMETs have numerous obligations, including preventive upkeep, investigation and hardware review. Issues such as restricted assets and creating innovation may pose genuine challenges to its viability. Collaboration between BMETs and healthcare suppliers is pivotal to expeditiously resolve device-related issues and minimize disturbance to understanding care (Degerli&OzkanYildirim 2022).

Importance of BMET in Hospitals

BMET plays a vital part in guaranteeing the efficient working of therapeutic equipment required to supply quality treatment. Their duties incorporate preventive upkeep, which includes normal assessment, testing and maintenance of vital equipment to avoid glitches. BMET successfully settled equipment issues, making a difference to decrease downtime and guarantee proceeded accessibility of basic beneficial equipment. BMETs, moreover, work with investigating apparatuses and perform diagnostic testing to guarantee matters are recognized. Sometime recently, they raised (Shieldingly et., al 2021). The perfect way the ideal way to preserve this gadget is critical to decrease hazards and securepatient safety.

Challenges Faced by BMETs

Despite its vital part, BMET faces numerous challenges that can influence its adequacy in healthcare. One of the biggest difficulties is asset limitations, including constrained subsidizing technicians, understaffing, and insufficient preparation. These impediments may prevent BMET's capacity to viably perform its obligations and cause delays in the upkeep and repair of hardware (Sahoo& Rout 2023). In expansion, the rapid pace of innovative progression makes challenges for BMETs since they ought to continually upgrade their aptitudes and information to keep up with changing innovations. Without satisfactory assets and preparation, BMETs may have trouble fathoming complex hardware issues and keeping up tall guidelines of quiet care.

Collaborative Approach to Equipment Management

Collaboration between BMET and therapeutic technicians is fundamental to resolving device issues expeditiously and guaranteeing proceeded control. BMET works with healthcare staff to get their needs and needs and offers assistance to fix hardware issues reasonably. Viable communication and collaboration between BMETs, doctors, and clinic administrators are basic to recognizing, recognizing and settling device-related issues (Aminabee, 2024). By empowering collaboration for gadget administration, healthcare organizations can move forward with quiet safety, diminish disturbances to understanding care, and increment efficiency.

Integration of Innovation and Innovation

To overcome the challenges related to innovative advancement, BMET must grasp unused developments and utilize the pace of devices and innovation to end up well. Using well-being advances such as inaccessible checking and prescient support calculations can offer assistance to BMET right away, screen hardware execution, and identify potential issues sometimes recently they happen. Furthermore, proficient advancement and customary preparation guarantee that BMETs keep up with the most recent innovations and best-hones in equipment support and management (Fotovatfard&Heravi 2021).

Continuous Improvement and Quality Assurance

Continuous advancement and quality confirmation are vital for the improvement of cleaning equipment and the administration of BMET in healthcare offices. Standard surveys and assessment of equipment upkeep methods can offer assistance in distinguishing regions for enhancement and guarantee compliance with directions. Also, criticism techniques ought to be created to assemble input from BMETs, doctors, and other partners to distinguish challenges and openings for enhancement (Ani, 2021). By making a culture ofpatient advancement and quality affirmation, healthcare organizations can increment the viability of BMET and guarantee the unwavering quality and safety of vital equipment.

The comes about of literature review highlights the critical part of BMET in healthcare settings and its significance in understanding care and safety. In spite of challenges such as restricted assets and advancing innovation, BMET plays an imperative part in progressing the productivity of therapeutic equipment and decreasing costs in its effect onpatient care. Collaboration between BMET and healthcare experts, integration of innovation and development, and centre on ceaseless change and quality affirmation are key to the optimization of BMET in healthcare (Kunduet., al 2022).

Conclusion

BMET plays a critical part in therapeutic offices by making a difference to make strides in unwavering quality, safety and execution in therapeutic equipment. But to maximize effect, healthcare organizations must address challenges such as constrained assets and changing innovations. Speculations in preparing, collaboration and asset allotment are required to back BMETs to fulfil their responsibilities.

Recommendations

- ✓ Increment venture in BMET preparing and proficient improvement to keep pace with technology.
- ✓ Easily oversee equipment to streamline support forms and centre on basic tasks.
- ✓ Advance collaboration between healthcare organizations and BMET to create compelling care methodologies and move forward asset allocation.
- ✓ Integrating BMET into common areas
- ✓ Build up a normal assessment framework to assess BMET execution and distinguish openings for advancement.

Reference

Thapa, R., Yih, A., Chauhan, A., Poudel, S., Singh, S., Shrestha, S., ...&Rajbhandari, R. (2022). Effect of deploying biomedical equipment technician on the functionality of medical equipment in the government hospitals of rural Nepal. *Human resources for*

health, *20*(1), 1-8.https://human-resources-health.biomedcentral.com/articles/10.1186/s12960-022-00719-y

Sociolect, R. T., Sociolect, S., Mumbai, I. G., Tusabe, M. S., Nametag, C., Ngabirano, B. A., ...&Joloba, M. L. (2020). The role of medical equipment in the spread of nosocomial infections: a cross-sectional study in four tertiary public health facilities in Uganda. *BMC Public Health*, *20*, 1-11.https://link.springer.com/article/10.1186/s12889-020-09662-w

Di Pietro, L., Piaggio, D., Oronti, I., Maccaro, A., Houessouvo, R. C., Medenou, D., ...& Ahluwalia, A. (2020). A framework for assessing healthcare facilities in low-resource settings: field studies in Benin and Uganda. *Journal of Medical and Biological Engineering*, *40*, 526-534.https://link.springer.com/article/10.1007/s40846-020-00546-3

Arab-Zozani, M., Imani, A., Doshmangir, L., Dalal, K., &Bahreini, R. (2021). Assessment of medical equipment maintenance management: proposed checklist using Iranian experience. *Biomedical engineering online*, *20*(1), 49.https://link.springer.com/article/10.1186/s12938-021-00885-5

Tur-Sinai, O., &Grinvald, L. C. (2021). Repairing Medical Equipment in Times of Pandemic. *Seton Hall L. Rev.*, *52*, 461.https://heinonline.org/hol-cgi-bin/get_pdf.cgi?handle=hein.journals/shlr52&section=16

Roma, M. S. G., & de Vilhena Garcia, E. (2020). Medical device usability: Literature review, current status, and challenges. *Research on Biomedical Engineering*, *36*, 163-170.https://link.springer.com/article/10.1007/s42600-019-00037-8

Shamayleh, A., Awad, M., & Abdulla, A. O. (2020). Criticality-based reliability-centered maintenance for healthcare. *Journal of Quality in Maintenance Engineering*, *26*(2), 311-334.https://www.emerald.com/insight/content/doi/10.1108/JQME-10-2018-0084/full/html

Aborujilah, A., Elsebaie, A. E. F. M., & Mokhtar, S. A. (2021). IoT MEMS: IoT-based paradigm for medical equipment management systems of ICUs in light of COVID-19 outbreak. *Ieee Access*, *9*, 131120-131133.https://ieeexplore.ieee.org/abstract/document/9388663/

Yiek, W. K., Coenen, O., Nillesen, M., van Ingen, J., Bowles, E., &Tostmann, A. (2021). Outbreaks of healthcare-associated infections linked to water-containing hospital equipment: A literature review. *Antimicrobial Resistance & Infection Control*, *10*, 1-19.https://link.springer.com/article/10.1186/s13756-021-00935-6

Lemtiri, J., Matusik, E., Cousein, E., Lambiotte, F., &Elbeki, N. (2020, November). The role of the critical care pharmacist during the COVID-19 pandemic.

In *AnnalesPharmaceutiquesFrançaises* (Vol. 78, No. 6, pp. 464-468). Elsevier Masson.https://www.sciencedirect.com/science/article/pii/S0003450920301115

Araiza, A., Duran, M., Surani, S., &Varon, J. (2021). Aeromedical transport of critically ill patients: a literature review. *Cureus*, *13*(5).https://www.cureus.com/articles/54119-aeromedical-transport-of-critically-ill-patients-a-literature-review.pdf

Shamayleh, A., Awad, M., &Farhat, J. (2020). IoT based predictive maintenance management of medical equipment. *Journal of medical systems*, *44*, 1-12.https://link.springer.com/article/10.1007/s10916-020-1534-8

Dion, H., & Evans, M. (2024). Strategic frameworks for sustainability and corporate governance in healthcare facilities; approaches to energy-efficient hospital management. *Benchmarking: An International Journal*, *31*(2), 353-390.https://www.emerald.com/insight/content/doi/10.1108/BIJ-04-2022-0219/full/html

Shabani, T., Jerie, S., &Shabani, T. (2023). Assessment of work-related risks among healthcare workers in rural hospitals of Chromans District, Zimbabwe. *Safety in extreme environments*, *5*(2), 131-148.https://link.springer.com/article/10.1007/s42797-023-00075-7

Josephs-Spaulding, J., & Singh, O. V. (2021). Medical device sterilization and reprocessing in the era of multidrug-resistant (MDR) bacteria: Issues and regulatory concepts. *Frontiers in medical technology*, *2*, 587352.https://www.frontiersin.org/articles/10.3389/fmedt.2020.587352/full

Graham, H. R., Olajide, O. E., Bakare, A. A., Iuliano, A., Olatunde, O., Isah, A., ... &Falade, A. G. (2021). Measuring oxygen access: lessons from health facility assessments in Lagos, Nigeria. *BMJ global health*, *6*(8), e006069.https://gh.bmj.com/content/6/8/e006069.abstract

Sehume, O. L., & Markus, E. D. (2020). A critical analysis of medical robotic assistive systems for early diagnosis of common ailments in South Africa. *Int J MechEng Robot Res*, *9*(10), 1451-1456.http://www.ijmerr.com/uploadfile/2020/0916/20200916053714710.pdf

Tan, J. J. M., Cheng, M. T. M., Hassan, N. B., He, H., & Wang, W. (2020). Nurses' perception and experiences towards medical device-related pressure injuries: A qualitative study. *Journal of Clinical Nursing*, *29*(13-14), 2455-2465.https://onlinelibrary.wiley.com/doi/abs/10.1111/jocn.15262

Chandra, M., Kumar, K., Thakur, P., Chattopadhyaya, S., Alam, F., & Kumar, S. (2022). Digital technologies, healthcare and COVID-19: Insights from developing and emerging nations. *Health and Technology*, *12*(2), 547-568.https://link.springer.com/article/10.1007/s12553-022-00650-1

Corciovă, C., Andrii, D., & Luca, C. (2020). A modern approach for maintenance prioritization of medical equipment. *OperManag-Emerg Trend Digit Era*.https://books.google.com/books?hl=en&lr=&id=uGEtEAAAQBAJ&oi=fnd&pg=PA233&dq=Critical+Analysis+in+the+Role+of+Biomedical+Equipment+Technicians+in+Healthcare+Facilities&ots=BQGKZTzqxp&sig=Xlc7_jKcHBmRwZ7V6J0HXi8wfpo

Chakravarty, S. (2022). Resource constrained innovation in a technology intensive sector: Frugal medical devices from manufacturing firms in South Africa. *Technovation*, *112*, 102397.https://www.sciencedirect.com/science/article/pii/S0166497221001784

Clark, J. T. (2020). Medical equipment replacement planning. In *Clinical engineering handbook* (pp. 227-235). Academic Press.https://www.sciencedirect.com/science/article/pii/B9780128134672000377

Degerli, M., &OzkanYildirim, S. (2022). Identifying critical success factors for wearable medical devices: a comprehensive exploration. *Universal Access in the Information Society*, *21*(1), 121-143.https://link.springer.com/article/10.1007/s10209-020-00763-2

Shieldingly, B., Tekalegn, Y., &Woldeyohannes, D. (2021). The critical role of infection prevention overlooked in Ethiopia, only one-half of health-care workers had safe practice: A systematic review and meta-analysis. *PloS one*, *16*(1), e0245469.https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0245469

Ayo-Farai, O., Olaide, B. A., Maduka, C. P., & Okongwu, C. C. (2023). Engineering innovations in healthcare: a review of developments in the USA. *Engineering Science & Technology Journal*, *4*(6), 381-400.https://fepbl.com/index.php/estj/article/view/638

Sahoo, P. M., & Rout, H. S. (2023). Analysis of public health-care facilities in rural India. *Facilities*, (ahead-of-print).https://www.emerald.com/insight/content/doi/10.1108/F-07-2022-0098/full/mohfw.gov.in:https://www.mohfw.gov.in/pdf/AdvisoryforHospitalsandMedicalInstitutions.pdf

Aminabee, S. (2024). The Future of Healthcare and Patient-Centric Care: Digital Innovations, Trends, and Predictions. In *Emerging Technologies for Health Literacy and Medical Practice* (pp. 240-262). IGI Global.https://www.igi-global.com/chapter/the-future-of-healthcare-and-patient-centric-care/339355

Fotovatfard, A., &Heravi, G. (2021). Identifying key performance indicators for healthcare facilities maintenance. *Journal of Building Engineering*, *42*, 102838.https://www.sciencedirect.com/science/article/pii/S2352710221006963

Ani, V. A. (2021). Provision of reliable electricity to primary health care facilities in Nigeria-a new focus of interventions. *International Journal of Energy for a Clean*

Environment, *22*(2).https://www.dl.begellhouse.com/journals/6d18a859536a7b02,61194f5b322f5961,1df423910acb7e2d.html

Kundu, P., Görçün, Ö. F., &Küçükönder, H. (2022). Medical device selection in private hospitals by integrated fuzzy MCGDM methods: A case study in choosing MRI (Magnetic Resonance Imaging) system. *Journal of the Operational Research Society*, *73*(9), 2059-2079.https://www.tandfonline.com/doi/abs/10.1080/01605682.2021.1960910