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Mini Review

Computed Tomography (CT) Imaging Services in Zimbabwe: A Mini-review Study

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Abstract

Access to healthcare technologies like computed tomography (CT) is essential for diagnosing and treating both non-communicable diseases and communicable diseases, especially in low-resource settings. Unfortunately, there is limited information available globally, and even less so in Zimbabwe, regarding local imaging resources. Therefore, the aim of this paper was to review the current state of CT services in Zimbabwe, to identify the opportunities and challenges presented. The review reveals that access to CT services in Zimbabwe is hindered by various factors. These include the high costs associated with purchasing and maintaining CT scanners, a shortage of certified manpower, a lack of postgraduate CT courses, inadequate information, and communication technologies (ICT) infrastructure, insufficient research, an inconsistent supply of consumables, and a lack of integrated support for CT services. To address these issues, a multifaceted approach will be necessary. This could involve investing in postgraduate training programs and recognizing the skills acquired by radiographers. Additionally, investing in equipment and ICT infrastructure will be crucial in supporting CT services. Providing ongoing education for radiographers and radiologists will help ensure a sufficient number of trained personnel. Establishing centers of reference, allocating funds for the purchase of new equipment, and maintaining existing CT equipment can significantly improve the availability of these services.

Keywords: Computed Tomography, Imaging Services, Radiographer

Introduction

Computed tomography (CT) has revolutionized medical imaging since its introduction in 1972.[1] It was hailed as a ground-breaking invention comparable to the X-rays. Allan M. Cormack and Godfrey Hounsfield earned the joint Nobel Prize in Medicine in 1979 for remarkable contributions to this field.[2] However, CT scanners would take another 24 years to become clinically available in Zimbabwe. In 1996, a single-slice CT scanner was installed at Parirenyatwa Group of Hospitals through a research partnership with the University of Zimbabwe. The main advantages of CT over conventional radiography are the elimination of superimposed structures, excellent image quality, and images that can be viewed as a photorealistic 3D model.[2] Computed tomography uses a rotating X-ray source coupled to a bank of detectors to produce tomograms (slice images) of the body (Figure 1). The fundamental principle of CT is that the attenuation pattern of the X-rays can be measured during rotation and spatially located; the sum of attenuation at each point can then be calculated and displayed.[1] Since its inception, CT has undergone tremendous technological advancements, establishing itself as a vital diagnostic tool in routine medical practice.

Access to healthcare technologies, such as CT, is vital for diagnosing and treating non-communicable and infectious diseases like tuberculosis and COVID-19.[3] This state-of-the-art imaging equipment makes diagnosing and treating various healthcare conditions easier accurately.[4,5] CT imaging is crucial for planning radiotherapy procedures, visualizing image-guided interventions, and sampling tumors for pathology work-up.[3] Therefore, ensuring access to this technology is essential for achieving universal health coverage (UHC) and sustainable development goals (SDGs) by 2030.[6,7] Unfortunately, low-resource settings like Zimbabwe face numerous challenges in acquiring and maintaining CT scanners.[8,9] These settings have significantly fewer

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scanners than in high-income countries, with less than one scanner per million inhabitants in low-resource areas versus almost 40 scanners per million in wealthier countries.[3] It is important to note that low-resource settings bear a significant global disease burden, accounting for 84% of the worldwide population and 90% of the global disease burden.[7]

More research on imaging resources must be published worldwide, and particularly scarce information available about Zimbabwe.[7] Therefore, we reviewed CT services to identify opportunities and challenges. his study aimed to provide valuable insights for policy decisions that can enhance access to this vital healthcare resource regarding the current status of CT services in Zimbabwe. To visualize a real-life example, Figure 2 displays a CT scanner in a Zimbabwe public hospital.

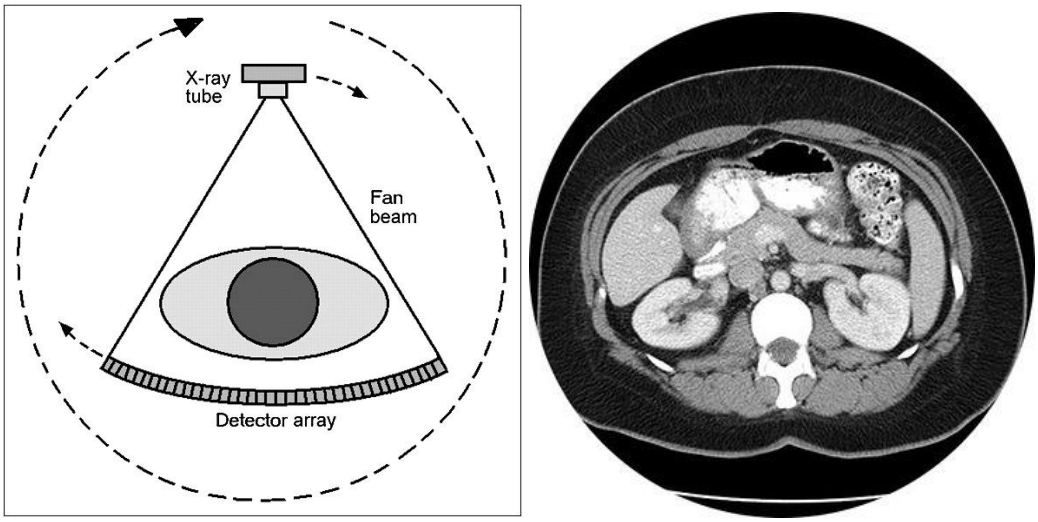

Figure 1. Right: Computed Tomography scanning principle. Left: A CT image of the abdomen. Images adopted from https://tech.snmjournals.org/content/35/3/115

Figure 2. A CT Scanner at a Public Hospital in Zimbabwe

Healthcare and Radiology Service Delivery in Zimbabwe

The Republic of Zimbabwe is located in Southern Africa and is surrounded by the Zambezi and Limpopo Rivers. It shares borders with South Africa to the south, Botswana to the southwest, Zambia to the north, and Mozambique to the east. The capital city is Harare, followed by Bulawayo as the second largest city. In the

early 1980s, Zimbabwe allocated substantial funds to healthcare; however, due to severe fiscal challenges faced by the government, expenditure on health significantly declined towards the end of the decade. While Zimbabwe initially made remarkable progress in health outcomes and the performance of its health services until the 1990s, there has been a steady deterioration since then.[10]

During the 2000s, Zimbabwe's economy collapsed due to debt and corruption, leading to a decline in infrastructure and a scarcity of basic health supplies. The government decreased spending on health from 7% in 2000 to 4% in 2007. Some hospitals lacked essential amenities such as electricity, running water, surgical instruments, and painkillers. This dire situation resulted in the Ministry of Health being unable to pay its healthcare workers, with radiographers and physicians earning less than the United States $1 per month in 2008. These abysmal working conditions compelled 20% of healthcare professionals to seek employment abroad yearly.[11] Although this trend slowed between 2009 and 2013 during the Government of National Unity, it has been on the rise again by 2022.[12]

As of June 2023, Zimbabwe is experiencing one of the highest inflation rates in the world, reaching 86.5%.[13] The government has allocated 11% of total expenditures to the health sector in 2023, which is considered an improvement but falls short of the Abuja Declaration's recommendation of 15%.[13] According to the latest health access and quality index of 2019, Zimbabwe was the only country with no improvement. In 1990, it ranked 133rd globally, but by 2019, it had dropped to 194th, mainly due to the lack of progress in addressing diseases such as inguinal, femoral, and abdominal hernia; idiopathic epilepsy; lower respiratory infections; and tuberculosis.[14]

The healthcare system in Zimbabwe operates on a hospital referral plan, outlined in Table 1.[15] At the primary level, including small rural or urban clinics, nurses initially assess patients. Patients are referred to the secondary level if more treatment is needed at this level. District hospitals, operating at the secondary level, offer general inpatient services and accept referrals from urban and rural health centers and clinics at the primary level. Limited radiology services, such as basic ultrasound and radiography, are available at the primary level. Provincial hospitals at the tertiary level provide general specialist services for patients referred from district hospitals. They offer a more comprehensive range of radiology services, including the presence of radiographers and CT services. However, more advanced modalities like Magnetic Resonance Imaging (MRI), Nuclear Medicine, or radiotherapy are unavailable at this level.

At the quaternary level, which consists of central hospitals in major urban areas, they serve as national referral facilities and provide specialized and subspecialized services.[16] These hospitals have access to the most advanced radiological and radiotherapy services. Specialist radiology personnel, such as consultant radiologists and specialist radiographers, are present at these institutions. Moreover, six of these quaternary-level hospitals also serve as training institutions, further enhancing their capabilities. Therefore, CT services are provided in higher-end hospitals like provincial hospitals (tertiary level) and above.

In Zimbabwe, there is currently no official policy regarding health technologies like CT.[6] The responsibility for registering and inspecting radiation-producing equipment falls under the Radiation Authority of Zimbabwe (RPAZ), as mandated by the Radiation Protection Act [Chapter 15:15], Act 5 of 2004.[17] However, an audit conducted in 2019 revealed concerning findings regarding the availability of radiological equipment in the public sector. Access to X-ray units in public hospitals was found to be only about half of what the World Health Organization (WHO) recommended. Additionally, there was a significant disparity between regions, with the best-resourced areas having five times more access to equipment than the least-resourced regions.

In contrast, the private sector in Zimbabwe had 16 times more radiological equipment than the public sector. However, this equipment was only accessible to 10% of the population. Notably, a majority of the country's radiology equipment, around 57%, is concentrated in the two largest cities.[6]

The healthcare system in Zimbabwe has been facing various challenges, particularly regarding radiology services. These include frequent breakdowns of radiology equipment in hospitals, a shortage of qualified radiographers due to migration to other countries, and a limited number of available radiologists.[6,9-11] As a result, the quality of radiological services is likely to be compromised.

Table 1. The Zimbabwean Public Hospital Referral Plan

Level	Type	Number	Description
Primary level	Rural or urban clinics and health centres	-	• Manned by nurses and nurse aides • No radiographers or radiologists • No radiology equipment • Initial assessment of patients with little or no treatment • No inpatient facilities and hence the referral to secondary level
Secondary	District hospitals	64	• Treatment, monitoring, and education of referred uncomplicated cases. • X-ray operators, one or two radiographers • Elementary radiology equipment like ultrasound scanners and general radiography. • No advanced modalities like CT and MRI • No radiotherapy services • One or two doctors (primarilygeneral practitioners) • Admission of patients. • Complicated cases are referred to level 3
Tertiary	Provincial	7	• Continued management (treatment, monitoring, and education) • Limited specialized doctors, general practitioners, and nurses • Provincial radiographers • Radiology equipment available, CT units available. • No radiotherapy services • Advanced modalities like MRI and Nuclear Medicine are not available • More complicated cases are referred to level 4
Quaternary	Central hospitals	6	• More specialist physicians in radiology, oncology, general practitioners, and specialist nurses. • Specialist radiographers and radiologists present • Advanced modalities like CT, MRI, Angiography, Cardiac imaging, Nuclear Medicine • Radiotherapy services available • Management of patients with complications. • Patients are referred back either to level 2 or 3 when stable

Table 2. List of Health Facilities with CT Scanners in Zimbabwe

Number	Health Facility	Province	Category	Description
1.	Mpilo Central Hospital	Bulawayo Metropolitan	Public	Quaternary
2.	United Bulawayo Hospitals	Bulawayo Metropolitan	Public	Quaternary
3.	Bulawayo Imaging Group	Bulawayo Metropolitan	Private	Private
4.	Diagnostic X-ray Centre	Bulawayo Metropolitan	Private	Private
5.	Mater Dei Hospital	Bulawayo Metropolitan	Private	Private
6.	Parirenyatwa Group of Hospitals	Harare Metropolitan	Public	Quaternary
7.	Sally Mugabe Hospital	Harare Metropolitan	Public	Quaternary
8.	Arundel Hospital	Harare Metropolitan	Private	Private
9.	Avenues Clinic	Harare Metropolitan	Private	Private
10.	Baines Imaging Group	Harare Metropolitan	Private	Private
11.	Diagnostic Imaging Centre	Harare Metropolitan	Private	Private
12.	Diagnostic Radiology and MRI centre	Harare Metropolitan	Private	Private
13.	Diagnostic Radiology Centre	Harare Metropolitan	Private	Private
14.	Medical Imaging Centre	Harare Metropolitan	Private	Private
15.	Westend Clinic	Harare Metropolitan	Private	Private
16.	Westend Hospital	Harare Metropolitan	Private	Private
17.	Victoria Chitepo Hospital	Manicaland	Public	Provincial
18.	Mahusekwa hospital	Mashonaland East	Public	District
19.	Chinhoyi Hospital	Mashonaland West	Public	Provincial
20.	Masvingo Hospital	Masvingo	Public	Provincial
21.	Midlands Private Hospital	Midlands	Private	Private
22.	National Pathology Research and Diagnostic Center	Midlands	Private	Private

Medical Facilities with CT Scanners in Zimbabwe

There are currently at least 22 health facilities with CT scanners in Zimbabwe, as indicated in Table 2. This number has increased by three since the audit conducted by Maboreke et al. in 2019.[6] Considering the population size of Zimbabwe, which is 15,178,957, this means that there is approximately 1 CT scanner per 689,952 inhabitants. However, it's important to note that the distribution of these scanners is not evenly spread throughout the country. Similar to many other African countries, the availability of radiology services in Zimbabwe is often determined by the population's ability to afford them rather than based on actual need.

Upon analysing the health facilities, it has been found that 50% (11/22) of them are in the private sector. Furthermore, a significant majority of the scanners, accounting for 73% (16/22), can be found in two urban provinces, Harare and Bulawayo Metropolitan Provinces, as illustrated in Figure 3. According to the Zimbabwe 2022 Population and Housing Census, these two provinces have a combined population of 3,093,149, making up around 20.3% of the total population.[18] In terms of healthcare settings, within the public sector, 50% of the scanners are at the highest level of healthcare, known as the quaternary level. However, it should be noted that certain provinces, such as Mashonaland Central, Matabeleland North, and Matabeleland South, do not have representation in terms of CT services, as depicted in Figure 1.

CT services in the public sector are erratic due to several challenges summarised in Table 3.[9] Patients needing CT services are frequently referred to the private sector. Finally, there is an apparent underrepresentation of CT services in rural areas, with only one CT scanner found in a district hospital. However, 61.4% of the Zimbabwean population is in rural areas.[19] In 1999, the first formal WHO policy document declared that imaging was crucial for hospitals and clinics, irrespective of location and size.[4] Indeed, the introduction of imaging services in some rural communities has increased the utilization of facility-based health services as patients do not need to travel to urban areas.[20] A review of medical literature shows disparities in imaging services between urban and rural populations in sub-Saharan Africa.[8,20,21] The challenges in rural areas include a human resource shortage, academic unevenness, high unemployment, low income, poor hygiene, health education, and a lower priority for imaging services.[20]

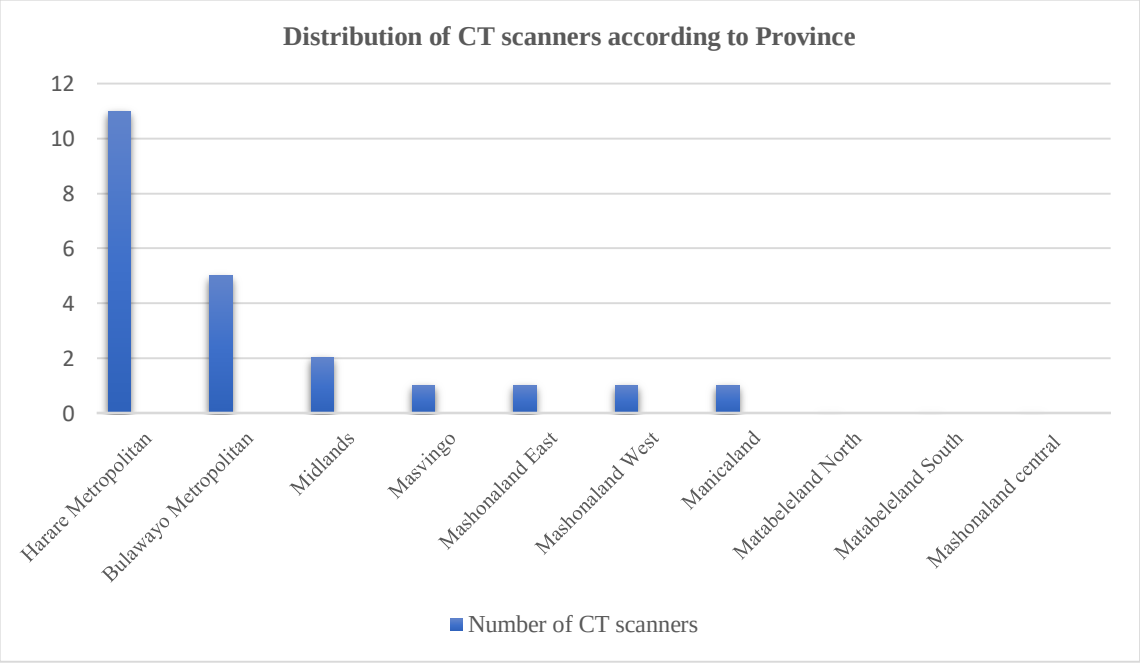

Figure 3. Distribution of CT Scanners According to Province

Education and Training in CT for Radiographers

In Zimbabwe, three institutions currently offer the Bachelor of Science degree in Radiography. To ensure consistency and comparability of qualifications, the Zimbabwe Council of Higher Education (ZIMCHE) has mandated these institutions to align their curricula

through the adoption of minimum bodies of knowledge and skills (MBK/S).[22] These MBK/S serve as standardized curricula guidelines.

In the previous curriculum, CT imaging was taught as a current trend. However, the current radiography MBK/S has improved this by incorporating CT as a standalone module with specific clinical placements. Unfortunately, there are no training institutions in Zimbabwe that offer postgraduate courses in CT for radiographers. As a result, radiographers interested in specializing in CT must seek training abroad to acquire the necessary skills. On a positive note, the University of Zimbabwe has recently introduced a Master of Medicine (MMED) degree in Clinical Radiology and a Master of Science in Biomedical Engineering. This development has been welcomed as a significant step towards enhancing radiology services in the country. The Radiography Association of Zimbabwe (RAZ) organizes continuous professional development (CPD) seminars to ensure that radiographers stay updated on current CT imaging trends. These seminars serve as opportunities for radiographers to enhance their knowledge and skills in CT imaging.

Challenges for CT Services in Zimbabwe

In Zimbabwe's low-resource setting, there are many challenges to providing quality CT services. At least eight challenges have been identified, as shown in Table 3.

Table 3. Challenges for CT Services in Zimbabwe

Number	Challenge
1.	CT scanners are expensive to purchase and maintain
2.	Shortage of manpower to maintain, operate CT scanners and interpret images
3.	Absence of local post-graduate training and inadequate continuous professional development for Radiographers
4.	Lack of recognition of post-graduate training for radiographers
5.	Poor ICT infrastructure
6.	A paucity of CT research
7.	Inconsistent supply of consumables
8.	Lack of wider integration and support for CT services.

CT Scanners are Expensive to Purchase and Maintain

Computed Tomography scanners are expensive to purchase and maintain for African hospitals, including Zimbabwe. A new 16-slice CT scanner ranges from $285,000 to $360,000, while 256+ slice scanners = cost between $1.35 million and $2.1 million.[23] Additionally, these scanners require specially designed rooms with air conditioning and radiation protection measures. Regular maintenance is also necessary to address potential failures, which can be costly and cause delays.[3] As a result, if CT scanners are available, they significantly contribute to the hospital's expenses, making careful planning crucial. Hospital management sometimes abandons CT equipment due to the high costs associated with maintenance and repairs. This also explains why CT equipment donations may only sometimes succeed, as various factors need consideration in the day-to-day provision of CT services. One potential solution is the adopting a holistic imaging organization concept called Centres of Reference (COR). Center of reference involves establishing imaging hospitals offering CT and other advanced modalities like MRI and Nuclear Medicine. These CORs can serve as referral centers for all imaging needs in Zimbabwe's tenprovinces. They would have a dedicated team of radiology professionals, including radiographers, radiologists, medical physicists, biomedical engineers, IT technicians, and radiology nurses. Educating the workforce is an integral part of the COR concept.

Shortage of Certified Manpower to Maintain, Operate CT Scanners, and Interpret Images

A well-trained workforce is essential for operating radiology equipment, including radiologists, radiographers, and medical physicists who undergo structured training.[3,24] Computed tomography is considered a specialisation in medical imaging.[2] While the undergraduate radiography program in Zimbabwe includes a CT module, it is limited in theory and clinical practice. Therefore, radiographers need to undergo additional training to become truly proficient in CT. CT, like other imaging modalities, is operator dependent. The image quality depends on various factors that must be adjusted for each examination and tailored to each patient. Moreover, due to the high radiation dose associated with CT, all operators of CT equipment should receive training to optimize assessments and ensure patient safety.[1] Zimbabwe's Radiation Protection Act mandates specific additional training requirements.[17]

Furthermore, a shortage of radiologists contributes to a significant national backlog of unreported images.

Some images may never be reviewed by qualified personnel. Additionally, experts such as medical physicists and biomedical engineers should have control over CT image quality and raise concerns if the quality of patient care is compromised. There are only nine registered medical physicists in Zimbabwe, primarily in radiotherapy departments.[25] However, there are now institutions offering postgraduate courses in medical physics and biomedical engineering, which is expected to improve the quality of CT services. On the other hand, retaining radiology personnel can be achieved by recognizing their skills and improving their welfare and working conditions, which helps reduce the loss of critical staff.

Absence of Local Post-graduate Training and Inadequate Continuous Professional Development for Radiographers

Many African countries need more specialized radiography training programs, which leads to a shortage of trained personnel.[24] Zimbabwe has no postgraduate CT programs, resulting in a scarcity of certified CT radiographers who can fully utilize the available equipment. According to the Allied Health Practitioners Council of Zimbabwe (AHPCZ) register, there are no registered specialist CT radiographers. The field of CT has seen rapid advancements in equipment and procedures, increasing the complexity of imaging examinations and associated technologies. As a result, radiographers now require specialized skills to perform these tasks. However, in Zimbabwe, most practicing radiographers have received on-the-job training with only a basic understanding of CT. This form of training needs to have the scientific foundation provided by formal education and varies in quality depending on the trainer's capacity.[26] Therefore, offering formal postgraduate education and training for radiographers to acquire the necessary knowledge, skills, and competence in CT is imperative. Introducing postgraduate CT courses for radiographers will help address the shortage of certified personnel and increase their numbers.

Lack of Recognition of Post-graduate Training

Radiographers in Zimbabwe report that post-basic radiography qualifications like ultrasound, CT, and MRI need to be fully recognised by the employer. This means that there are no financial incentives for the extra skills acquired. The absence of CT radiographers in the AHPCZ register may be due to employers' non-recognition of CT skills. While there are several radiographers with postgraduate qualifications in CT from other countries, they are not willing to be registered as specialists. Registration as a specialist attracts a higher registration fee without attendant financial benefits. So radiographers prefer to remain on the main register, which has a lower registration fee.

Additionally, the need to recognize post-basic qualifications contributes to the high turnover of radiographers in the public sector. Specialist radiographers move to the diaspora or private practice, where their skills are recognized. A previous study done in South Africa shared similar sentiments.

Radiographers in Zimbabwe have expressed that employers must fully acknowledge their additional qualifications in ultrasound, CT, and MRI. Consequently, no financial incentives are provided for acquiring these extra skills. Employers' lack of recognition of CT skills may contribute to why no CT radiographers are registered with the AHPCZ. Although there are radiographers with post-graduate qualifications in CT from other countries, they are unwilling to be registered as specialists. This reluctance stems from specialist registration incurring higher fees without corresponding financial benefits. Therefore, radiographers prefer to remain on the main register with lower costs.

Moreover, the failure to recognize post-basic qualifications exacerbates the high turnover among radiographers in the public sector. In response, specialist radiographers often practice abroad or in the private sector, where their skills are acknowledged. A similar study conducted in South Africa echoed these concerns.[27] Brain drain, outside the public sector or the country, is a major challenge for Zimbabwe.[3] Therefore, to arrest the brain drain, recognition of the specialist skills of radiographers by way of financial incentives is needed.

Poor ICT Infrastructure

Previous studies have shown that adopting these digital technologies improved report turnaround time, increasing CT service responsiveness.[28,29] Teleradiology systems allow radiologists and other medical imaging professionals to interpret images and provide a diagnosis remotely. This can be particularly useful in

remote and underserved areas where access to imaging services is limited and a shortage of trained personnel.[24] However, it is important to note that teleradiology implementation in Zimbabwe can be challenging due to unreliable internet connections, poor infrastructure, and electricity shortages. On a positive note, the government of Zimbabwe has recently embarked on a drive to adopt telehealth services.

A Paucity of Research

While there is extensive global literature on CT imaging services, Zimbabwe needs more local research. This lack of research hinders professional growth and advancements in the field and poses a potential risk to the quality of patient care in CT. It is crucial to conduct indigenous research exploring the experiences of both patients and radiology personnel involved in providing CT services. However, the absence of a supportive research culture and recognition for research contributions within the healthcare system in Zimbabwe aggravates the issue even further. Radiographers often do not receive appropriate incentives, recognition, or opportunities for career advancement regarding their research efforts.

Consequently, they encouraged to invest their time and effort into conducting research and publishing their findings. However, in today's era of evidence-based practice, undertaking research is essential for improving patient care in CT.[30] There is, therefore, a need to encourage radiographers, radiography students, and radiologists through the schools of radiography, the Zimbabwe Government Radiographers Association (ZIGRA), and the Radiography Association of Zimbabwe (RAZ) to conduct and publish research to improve the quality of CT services.

Inconsistent Supply of Consumables

Hinrichs-Krapels et al.,[31] stated that essential consumables such as contrast media, films, gloves, and syringes were in limited supply in Zimbabwe's three central hospitals. During one observation, a patient was referred to another hospital for a CT angiogram. No contrast pump was accessible at one of the public hospitals for more assessment. Another public hospital's pump has been out of commission for nearly two months. Radiographers stated they could not provide excellent service due to a lack of consumables. There is a need to increase financing for imaging consumables and establish a distinct budget for sophisticated modalities such as CT.

Lack of Wider Integration and Support for CT Services

Human resources for health in Africa typically focus on primary care needs, which means specialisations like CT services seldom get the necessary recognition. However, CT imaging is essential to ensure timely diagnosis and appropriate treatment of diseases, and it would be unethical not to provide the best service. Encouraging and facilitating public-private partnerships in medical imaging services can help bridge the funding gap. Private sector companies can provide funding and resources for the purchase of equipment and the development of infrastructure

In Africa, the focus of human resources for health is mainly on primary care, often neglecting specialized services such as CT imaging. However, CT imaging is crucial in ensuring timely diagnoses and appropriate treatments for various diseases. It would be unethical not to prioritize providing the best possible service in this regard. Encouraging and facilitating public-private partnerships in medical imaging services to funding is important. Private sector companies can contribute funding and resources for purchasing equipment and developing infrastructure.[24] An example of a successful CT private-public partnership was implemented at Chitungwiza Central Hospital with Baines Imaging Group. This model can be adapted and replicated throughout the country to maximize its benefits. By establishing more of these partnerships, the necessary recognition and support for CT services can be achieved while ensuring efficient and effective healthcare delivery.

Recommendations

i. It is important to have economically viable and well-designed national strategies to improve the quality of CT services. One strategy that can be implemented is the establishing an imaging organization called COR. This organization can be based on Zimbabwe's existing public health hospital referral planWhen considering the models for CT services in Zimbabwe, it is crucial to factor in the total cost of running the equipment rather

than just the acquisition cost. Decisions should consider immediate results and the costs associated with poor quality, errors, and diagnostic delays.

ii. Increasing the number of certified personnel can be achieved through the introduction of post-graduate courses in CT for radiographers. Retaining radiology personnel by recognizing their skills and improving their welfare and working conditions is also important, thus reducing turnover.

iii. Recognizing specialist CT skills acquired by radiographers and providing training opportunities for radiologists, medical physicists, radiology nurses, and biomedical engineers by local institutions will greatly enhance the quality of CT services in Zimbabwe.

iv. Investments in ICT infrastructure are critical to ensure secure internet access, enabling the adoption of new technologies such as teleradiology, artificial intelligence, and robotics in CT imaging.

v. To further improve the quality of CT services, it is necessary to encourage and incentivize radiographers, radiography students, and radiologists to conduct and publish research. The schools of radiography, ZIGRA, and the RAZ can play a role in promoting and supporting research efforts.

Conclusion

Improving access to CT services in Zimbabwe will positively impact patient outcomes and health care delivery. The review reveals that various factors hinder access to CT services in Zimbabwe. These include the high costs associated with purchasing and maintaining CT scanners, a shortage of certified workforce, a lack of postgraduate CT courses, inadequate information and communication technologies (ICT) infrastructure, insufficient research, an inconsistent supply of consumables, and a lack of integrated support for CT services. To address these issues, a multifaceted approach will be necessary. This could involve investing in postgraduate training programs and recognizing the skills acquired by radiographers. Investing in equipment and ICT infrastructure will also be crucial in supporting CT services. Providing ongoing education for radiographers and radiologists will help ensure sufficient trained personnel. Moreover, establishing centers of reference, allocating funds to purchase new equipment, and maintaining existing CT equipment can significantly improve the availability of these services.

Conflict of Interest

The authors declare no conflicts of interest.

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