

## REVIEW ARTICLE

# Role of radiographers in the provision of diagnostic medical ultrasound services in Zimbabwe: past, present and way forward

Bornface Chinene\*<sup>1</sup>, Lavin Mutandiro<sup>1</sup>, Eucaria Y. Mushosho<sup>1</sup>, Lyman Khumbula<sup>2</sup>, Admire Zanga<sup>2</sup>, Josephat Banhwa<sup>2</sup>, Oswald Bwanga<sup>3</sup>

<sup>1</sup>Harare Institute of Technology, Department of Radiography, Belvedere, Harare, Zimbabwe

<sup>2</sup>University of Zimbabwe, Department of Oncology, Medical Physics and Imaging Sciences

<sup>3</sup>Midlands University Hospital Tullamore, Radiology Department, Co. Offaly, Ireland

## ABSTRACT

Ultrasound imaging is an important tool in healthcare, used for screening, diagnosis, monitoring, and treating diseases. It works by using sound waves to generate images based on echoes reflected from the object being examined. Advancements in ultrasound technology have made it more accessible to other healthcare professionals, resulting in its expanded application across all fields of medicine. In Zimbabwe, radiographers play a crucial role in providing ultrasound services, helping to address the shortage of radiologists, and improve patient access to quality imaging. However, there is a lack of available literature on ultrasound imaging human resources in Zimbabwe. This article reviews the historical development of ultrasound training for radiographers in Zimbabwe, highlighting the challenges and opportunities associated with their expanded role in ultrasound. It also emphasizes the benefits of involving

radiographers in ultrasound services, such as improved patient care, cost savings, utilization of their knowledge and skills, and enhanced job satisfaction. The paper provides recommendations for the future, including the need for clear clinical leadership, specialized ultrasound programs, and continuous professional development (CPD) activities to ensure high-quality ultrasound services in the country. The insights presented aim to inform policy decisions and promote equitable access to essential ultrasound imaging in the Zimbabwean healthcare system.

## INTRODUCTION

Ultrasound is a widely used and reliable imaging modality that is safe, non-invasive, and portable. It is used for various purposes such as screening, diagnosis, monitoring, and treating disease. By using sound waves, ultrasound generates images based on the echoes that are reflected back from the object being examined.<sup>1</sup> Historically, ultrasound was primarily used by radiologists in the radiology department. However, advancements in ultrasound

### \* Corresponding Author:

Bornface Chinene,  
Harare Institute of Technology,  
Department of Radiography, Belvedere, Harare, Zimbabwe.  
E-mail: [bornfacechinene@gmail.com](mailto:bornfacechinene@gmail.com)/[bchinene@hit.ac.zw](mailto:bchinene@hit.ac.zw)

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technology have made it more accessible to other healthcare professionals, resulting in its expanded application across all fields of medicine.<sup>2,3</sup> Figure 1 shows an ultrasound machine at a public Hospital in Zimbabwe.



Figure 1. Ultrasound machine at a public hospital in Zimbabwe

The Royal College of Radiologists (RCR) and the Society and College of Radiographers (SCoR) of the United Kingdom (UK) emphasize the importance of ensuring high-quality interpretation of ultrasound examinations for patients.<sup>4,5</sup> Ultrasound imaging is heavily reliant on the skills of the operator, which require time and experience to develop.<sup>2,3</sup> It is crucial that trained and experienced practitioners perform these examinations. It is important to note that ideal images may not always be achievable for every patient. Regardless of who conducts the examination or where it takes place, maintaining high-quality ultrasound examinations is essential as they directly impact patient management.<sup>4</sup> This requires monitoring by regulators and professional bodies to ensure that only qualified healthcare professionals undertake this role in order to protect the patient and maintain standards.

Diagnostic ultrasound imaging services are an essential component of any healthcare system,

playing a vital role in achieving universal health coverage (UHC) and meeting sustainable development goal (SDG) number 3 by 2030.<sup>6</sup> In Zimbabwe, as well as globally, ultrasound scans and plain radiography are the most commonly performed diagnostic imaging examinations.<sup>4</sup> The Pan American Health Organization (PAHO) and the World Health Organization (WHO) have reported that a significant percentage, ranging from 70% to 80%, of diagnostic issues, can be resolved through the basic use of X-rays and/or ultrasound examinations.<sup>7</sup> Therefore, the use of ultrasound imaging forms an integral part of healthcare in developing countries. Despite the immense benefits of using ultrasound, Africa is lagging in harnessing these benefits, compared to the developed countries.<sup>8</sup>

While an audit of ultrasound units has been done,<sup>9</sup> there is a lack of available literature in Zimbabwe and similar settings, on ultrasound imaging human resources.<sup>10</sup> Therefore, the objective of this paper is to review the role of radiographers in providing diagnostic medical ultrasound services in Zimbabwe. This article reviews the history of ultrasound training for radiographers in Zimbabwe, focusing on the challenges and opportunities of role extension in ultrasound. It also emphasizes the benefits of involving radiographers in ultrasound services and suggests ways to enhance these services. The aim is to provide valuable insights that can inform policy decisions and improve equitable access to this essential imaging modality.

## **Ultrasound Training and Education in Zimbabwe: Past and Present**

### *I. History of ultrasound training in Zimbabwe*

Ultrasound is highly operator-dependent, requiring specialist skills and knowledge.<sup>4</sup> Hence, formal training programs must be designed to ensure the operator can produce diagnostic images in circumstances where this proves difficult. Since Zimbabwe's independence in 1980, the increased use of ultrasound as a diagnostic imaging technology has created a demand for a skilled workforce capable of

performing and interpreting scans.<sup>9</sup> Zimbabwe has adapted the UK model of providing ultrasound services.<sup>11</sup> Radiographers who have undergone postgraduate training are responsible for the majority of ultrasound examinations, both obstetric and non-obstetric, and are registered as “sonographers” by the Allied Health Practitioners Council of Zimbabwe (AHPCZ). These professionals perform, interpret, and report their examinations, and private sonographer-led ultrasound services have become well-established. Radiologists make up the second-largest group of professionals performing ultrasound in Zimbabwe, with other groups, including midwives, obstetricians, emergency physicians, cardiologists, and general physicians, also contributing to the services. Recent literature has documented variability in ultrasound practice across the globe.<sup>12</sup> Limited opportunities are available in several European countries for radiographers aspiring to extend their role into ultrasound.<sup>13,14</sup>

Before the ultrasound training programme was established in Zimbabwe, radiographers received training abroad. Josephine Matsika, the first radiographer to receive ultrasound training in Zimbabwe, trained at Middlesex Hospital in the UK from 1981 to 1982. She obtained a Diploma in Medical Ultrasound (DMU) from the College of Radiographers in London and working at Harare Central Hospital (now Sally Mugabe Central Hospital), the first hospital in Zimbabwe to offer ultrasound services. The hospital's first ultrasound unit, a Toshiba, was a donation. This method of training radiographers in ultrasound abroad was costly and mostly dependent on sponsorships.

Establishing a model of ultrasound service provision took a deliberate intervention by the Ministry of Health and Childcare (MoHCC). The Harare School of Radiography was requested to introduce an ultrasound training program in 1984. This program was specifically designed for radiographers and awarded them a DMU that was examined under the Health Professions Council of Zimbabwe and then

inherited by the AHPCZ. Trainees were drawn from provincial and district hospitals. Harare Hospital and Parirenyatwa Hospitals were seconded for the programme with Chitungwiza Hospital coming on board later. Each hospital typically sent one candidate for each intake. The training lasted for 18 months on block release, with three months at the school and three months at their stations. Lectures at the school were held one day a week, and the school received support from Radiologists, Physicists, and the Department of Obstetrics and Gynaecology. Practical attachment at the central hospitals lasted for four days.

#### *ii. Current ultrasound training in Zimbabwe*

The DMU program continued until 2014 when it was replaced by a postgraduate Master's degree and a postgraduate Diploma in 2019 which were offered by higher education institutions (HEIs) the National University of Technology (NUST) and the Harare Institute of Technology (HIT), respectively. These HEIs provide radiographers with the opportunity to obtain these post-graduate qualifications in ultrasound. The HEIs had the autonomy to create their ultrasound curriculum, establish standards, and conduct assessments under the supervision of the Zimbabwe Council of Higher Education (ZIMCHE). In addition, the Burwin Institute of Diagnostic Medical Ultrasound in Winnipeg, Canada, provides home-study theoretical modules accredited by the AHPCZ. After completing the required theoretical courses, candidates must undergo a 6-month supervised attachment at any locally recognized health facility. However, teething problems with the Master's degree programme resulted in unfortunate legal wrangles that spilled into the courts.

Some sonographers practising in Zimbabwe have gone a step further and sub-specialised in facets of sonography such as echocardiography as well as advanced foetal sonography. This has enhanced the quality of ultrasound services in these sonography sub-specialties to be at par with global trends. Another interesting phenomenon is the

diversification of Therapy radiographers who proceeded to undergo ultrasound training and are now practising as hybrid practitioners now involved in utilising ultrasound imaging as a diagnostic tool.

In contrast to Zimbabwe, the UK does not have a protected title for sonographers, and there is no mandatory registration for this profession.<sup>4</sup> Sonographers in the UK can come from various health professional backgrounds, including radiography, medicine, physiotherapy, and midwifery.<sup>15</sup>

### Role Extension in Ultrasound in Zimbabwe

Historically, ultrasound was performed by radiologists. However, a critical shortage of radiologists in Zimbabwe has led to the adoption of ultrasound tasks by radiographers. This is called role extension. Role extension or extended scope of practice is defined as developing additional clinical skills and taking on more accountability after qualification.<sup>16</sup> This can also mean taking on roles previously done by others, leading to increased autonomy and responsibility.<sup>17</sup> The role extension of radiographers and their level of engagement largely depend on the specific needs of the setting or institution where they work.<sup>18</sup> However, it is important to note that the intention of role extension, particularly in the context of radiographers entering the field of ultrasound, is not to substitute one profession for another. The primary driver for these advances or changes in practice, should always be to offer quality and effective patient-centered care.<sup>12</sup>

Research has consistently shown that with the right education, training, support, and continuing professional development, radiographers can safely and effectively provide ultrasound services.<sup>19-22</sup> In Zimbabwe, the demand for ultrasound services, coupled with the unavailability of radiologists, has led to the adoption of ultrasound imaging tasks by radiographers.<sup>23</sup> This started in the early 1980s when the first radiographer was trained in ultrasound as mentioned earlier. This has helped reduce waiting times, provide timely reports, and streamline patient

pathways. With a population of 15.1 million people, there are only 25 radiologists available, resulting in a ratio of approximately 1 radiologist for every 604,000 individuals.<sup>24</sup> Moreover, out of the 25 radiologists, only one is employed in the public sector.<sup>25</sup> Conversely, there are currently at least 96 sonographers registered with AHPCZ, all of whom are primarily radiographers. This equates to a ratio of 1 sonographer to 157,291 inhabitants. Although the number of sonographers is close to 5 times that of radiologists, it still falls short of the ideal. In contrast, in the UK, there are at least 3000 sonographers for a population of 67.3 million inhabitants, resulting in a ratio of 1 to 22,400 inhabitants as shown in Table 1. Approximately 60% of the sonographers in the UK are radiographers.<sup>26</sup>

Scholarly work has shown that radiographer roles in ultrasound are improving patient pathways and increasing capacity in other jurisdictions globally.<sup>17,27</sup> However, this expansion of roles also comes with increased accountability and responsibility for radiographers. More research is needed to better understand the process of developing and sustaining these initiatives in Zimbabwe.

Table 1: Ratio of sonographers to the population in Zimbabwe and the UK.

	Number		Population (Million)		Ratio (Healthcare worker to inhabitants)	
	Zimbabwe	UK	Zimbabwe	UK	Zimbabwe	UK
Sonographer	96	~3000	15.1	67.3	1:157291	~1:22400

### Benefits of Radiographers' Involvement in Ultrasound Services in Zimbabwe

It has been argued that one of the benefits of radiographers performing ultrasound scans, is they follow protocols and, hence, cover all the areas, for example, the abdomen, diligently.<sup>28</sup> On the other hand, radiologists may be more inclined to focus the ultrasound scan specifically on addressing the clinical issue at hand.<sup>22</sup>

Secondly, radiographers constitute the majority of imaging professionals in the country and are found in most medical facilities offering medical imaging services. In addition, radiographers already possess a strong foundation in cross-sectional anatomy, imaging principles, and applications. This existing knowledge makes it easier for them to undergo postgraduate training and become proficient sonographers.

Thirdly, training radiographers in ultrasound is a more efficient use of time and resources. The shortage of radiologists in Africa is known and has been well-documented.<sup>23,29,30</sup> This problem is also affecting Zimbabwe. By equipping well-trained radiographers with ultrasound knowledge and skills, they can help fill this gap, particularly in remote areas where access to radiologists may be limited. This approach not only addresses the unavailability of radiologists but also ensures that ultrasound services are provided in underserved regions.

The Radiography Association of Zimbabwe (RAZ) emphasizes the importance of involving radiographers in providing ultrasound services. This not only increases the expertise available to patients but also improves patient care and reduces costs. These initiatives also provide opportunities for radiographers to develop knowledge and new skills, achieve their potential, and ultimately enhance job satisfaction, professional recognition, and retention rates.<sup>13,18</sup> Overall, training radiographers in ultrasound is a practical and effective solution to enhance ultrasound service delivery in Zimbabwe.

**Challenges faced by radiographers while providing ultrasound services**

In Zimbabwe's low-resource setting, many challenges are being faced by radiographers in offering quality ultrasound services. At least five challenges have been identified, as summarised in Table 2.

Table 2: Challenges being faced by radiographers in offering quality ultrasound services in Zimbabwe

Number	Challenge
1.	Lack of recognition of post -graduate qualification in ultrasound
2.	Use of old and obsolete ultrasound machines with poor picture quality
3.	Lack of context -specific research to support evidence-based practice
4.	Inconsistent supply of ultrasound consumables
5.	Lack of a constant power supply, capacity for maintenance and servicing of these machines

*1. Lack of recognition of ultrasound qualifications*

Despite radiographers in Zimbabwe acquiring additional skills and qualifications in ultrasound, recent research indicates that these achievements are not fully recognized in the public sector.<sup>23</sup> Consequently, there are no financial incentives provided for the extra skills acquired in ultrasound imaging. Similar findings have been observed in other countries, such as South Africa.<sup>13</sup> As a result, there is a high turnover of sonographers, as they often choose to seek opportunities abroad or in private practice where their skills are acknowledged and rewarded. It is worth noting that the lack of professional recognition has been a longstanding concern for radiographers, as highlighted by a previous study.<sup>31</sup>

It is important to have enough sonographers for several reasons. First, a large portion of healthcare spending is related to human resources, so it is crucial to allocate healthcare workers effectively to ensure cost-efficient and high-quality service. Second, there is a high turnover rate in the profession, and issues such as burnout and work-related stress need to be addressed to retain sonographers. Lastly, sonographers face physical

and mental health risks on the job, so managing workload and other controllable factors is essential to minimize strain.<sup>32</sup>

## 2. *Old and obsolete ultrasound machines*

The quality and sustainability of ultrasound services provided by radiographers, especially in rural Zimbabwe are hindered by the use of old and obsolete ultrasound machines with poor picture quality.<sup>3</sup>

## 3. *Lack of context-specific research to support evidence-based practice*

The lack of local ultrasound research in Zimbabwe is hindering the provision of quality and evidence-based care to patients. For example, much of the imported equipment comes with original or factory presets based on Caucasian/Asian populations, and is used without adapting to regional differences, leading to false positive and false negative results.<sup>33</sup> This can potentially result in inaccurate diagnosis, misclassification of conditions, and suboptimal patient care.

## 4. *Inconsistent supply of ultrasound consumables*

In rural limited-resource healthcare settings like Zimbabwe, the cost and availability of commercially produced ultrasound gel are high, which makes it difficult for radiographers to perform a sufficient number of high-quality ultrasound scans, despite having the necessary equipment.<sup>34</sup>

## 5. *Lack of a constant power supply, capacity for maintenance and servicing of these machines*

The lack of a constant power supply and capacity for maintenance and servicing of these machines may be a challenge for radiographers providing ultrasound services, especially in remote areas.<sup>23,33</sup>

## **Recommendations: Way forward**

- All radiographers performing ultrasound examinations are expected to adhere to the standards of best clinical practice, which should be supported by appropriate clinical audit and

good governance processes. This means sonographers should abide by the Standard Operating Procedures of the regulator, AHPCZ.

- Clear and effective clinical leadership is crucial for ultrasound service providers to achieve the desired outcome of providing timely, accurate, and clinically relevant reports while prioritizing patient safety, especially in the public sector. This leadership can be provided by a consultant medical practitioner, such as a sonologist or a sonographer. The key requirement is that the clinical lead possesses both expert clinical skills and leadership skills.
- To cultivate specialist roles in ultrasound imaging, it is essential to establish criteria and policies. This process should involve all relevant stakeholders and be developed collaboratively. The policies must align with the current and future needs of the Zimbabwean health sector, taking into account technological advances, staffing, and the burden of disease. The ultimate goal is to ensure equitable access to ultrasound services and improve patient outcomes.
- To increase the number of ultrasound practitioners in Zimbabwe, the registration of sonographers should be opened up to other healthcare professionals who possess prerequisite sonography skills, such as midwives. This move will allow more ultrasound practitioners to serve the Zimbabwean population. Moreover, HEIs should also open training to other healthcare professionals who wish to train as sonographers.
- Specialist ultrasound programs by HEIs should also be created to address specific clinical needs. Examples of specialist areas include echocardiography, foetal medicine, neurosonology, musculoskeletal, etc. This will ensure that ultrasound services are provided to patients at the highest level of quality and accuracy.

- It is widely recognized that there are many commendable examples of good practice in ultrasound examinations. However, there have been concerns regarding the quality of some examinations, leading to instances of patients being called back for repeat scans. It is crucial, for all healthcare professionals currently providing services in the country to continually update their knowledge as technology advances. Taking CPDs seriously is also essential in ensuring high-quality ultrasound services.
- It is important to save a variety of ultrasound images to the Picture Archiving and Communication System (PACS) to have a comprehensive record of the examination. These saved images can then be used for case review and audit purposes.
- Develop and use local biometric nomograms that are specific to the local population. Much of the imported equipment comes with original or factory presets that are based on other populations, and are used without adapting to regional differences. This often leads to false positive and false negative results. Additional research is required to develop these nomograms. Specifically, in the field of obstetrics, there is a need for studies to gather data on the Zimbabwean obstetric parameters.
- Diversify into advanced uses of ultrasound to include cosmetology and cancer treatment.

## CONCLUSION

The shortage of radiologists in Zimbabwe has led to the adoption of ultrasound tasks by radiographers. The training and education of radiographers in ultrasound have evolved, with the introduction of postgraduate programs and the establishment of standards and assessments by HEIs. Role extension in ultrasound for radiographers has been beneficial in reducing waiting times, providing timely reports, and streamlining patient pathways. However, there is a need for greater recognition and financial incentives for radiographers with ultrasound skills in the public sector. Involving radiographers in

ultrasound services in Zimbabwe offers several benefits, including utilizing existing knowledge and resources, addressing the absence of radiologists, and improving patient care. It is recommended to establish criteria and policies for specialist roles in ultrasound imaging, open registration to other healthcare professionals with sonography skills, and create specialist ultrasound programmes to address specific clinical needs. These recommendations aim to ensure equitable access to ultrasound services, enhance patient outcomes, and improve the quality of ultrasound service delivery in Zimbabwe. By implementing these measures, the healthcare system can effectively utilize ultrasound technology and meet healthcare needs.

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