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Rural Mobile Ultrasonography in Africa: Need, Prospects and Feasibility

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Abstract

Ultrasonography has become firmly established in modern medicine cutting across all subspecialties. Unfortunately there is limited access to the technology in much of rural Africa. While access to this and similar technologies is restricted in rural and better in urban African communities, the larger burden of disease is borne by rural communities.Mobile ultrasonography can help bridge some of this gap. It is highly needed, cost effective, feasible and safe in these environments. Primary health centres in rural Africa should be equipped with portable ultrasound machines, supported by physicians from the cities, and the advantages of telesonography fully exploited.

Keywords: Mobile Ultrasonography, Rural Africa.

Introduction

Ultrasonography has become established as a *sinequa non* for modern medical practice, cutting across almost all the specialties and subspecialties. It has been described as the "stethescope of the future".[1] The medical applications of ultrasound are varied, ranging from Obstetric and Gynaecological ultrasound scans, breast, testicular, thyroid, abdomino-pelvic, Doppler, cardiac and musculo skeletal ultrasound, diagnosing a wide variety of diseases such as cystic lesions, fibroids, masses and abscess collections, to mention a few.[2] In addition, medical ultrasound has emerged as a convenient and portable method of imaging in rural communities and austere environment.[2]

Access to healthcare, including ultrasound services is critical to good health, yet rural residents face a variety of access barriers.[3] Rural residents often experience barriers to healthcare that limit their ability to obtain the care they need. It is accepted that unequal distribution of resources can compound ill health in less advantaged areas.[4]The maldistribution of resources is a challenge faced by industrialized nations as well as developing nations like Nigeria,with social change widening rather than reducing the social inequalities.[5] Healthcare services often become financially out of reach for many in the population.[4]

Over the last decade, utilization of ultrasound technology by non-radiologist physicians has grown[6] this is in a bid to bridge this limited access caused by lack of adequate number of radiologists. Recent advances in affordability and portability have brought ultrasound to the fore front as a sustainable and high impact technology for use in developing world clinical settings as well.[7] This short commentary examines the need, prospects and possibilities of mobile ultrasonography in rural Africa.

Need: It is clearly evident that while healthcare resources are restricted in the rural areas, this is where most of the illnesses in Africa occur. Recent surveys have shown high

prevalence of hypertension, strokes, gynaecologic and obstetric complications in the rural areas of Africa.[8,9] In one of such surveys the prevalence of hypertension among some rural dwellers was 44.3% as against urban dwellers ($p<0.001$),with only 6.4% of the rural dwellers having prior knowledge of their hypertensive state. The risk of hypertension was higher among the rural dwellers after adjusting for other variables and their mean arterial pressures higher. The need for simple ultrasonography services that could aid prevention and management of these conditions in the rural areas is incontrovertible.

Prospects: Although ultrasound originated within traditional imaging, novel point of care applications are now being performed by multiple specialties and are contributing to better patient care, providing technologies that are safer and more economical than traditional imaging.[10]

Point of care ultrasonography are now used in emergency medicine, cardiology, critical care and anaesthesiology departments. This point of care ultrasonography involves the use of portable, durable, battery-operated, higher resolution, cheaper and easier to operate ultrasound scans, by other physicians besides radiologists.[10] It can be used in more remote corners such as in the rural communities and prisons and is safer, cheaper and affordable. Other non-physicians that can use these machines include medical students, nurses, midwives, emergency medicare and critical care professionals.

One of such technologies is the V scan, a non-invasive ultrasound device, the size of a smart phone, which provide real time high resolution images that can be used in medical field such as cardiology and obstetric gynaecology.[11] Under the Healthy Imaginations, the device coupled with a limited clinical obstetric training for midwives, aids in the prompt diagnosis of normal low risk pregnancies and critical or high risk ones for necessary referral.[11] Another recent example is the Joseph Ukpo Hospitals and Research Institute, a non-governmental, faith based group in Nigeria with the mission of bringing healthcare to the doorsteps of those who cannot pay. They have set up medical outreaches in several communities in southern Nigeria, including the use of mobile ultrasongraphy for prompt diagnosis of ailments and referrals. These scans and other clinical and laboratory assessments are done by consultant radiologists and senior resident doctors of the nearby teaching hospitals. Thereafter referrals are made to the city hospitals for further management, after the immediate drug therapies have been instituted at these outreaches.[12,13]

Recent reports also show wireless transmission of images to be reviewed off site to determine the patients who should benefit from further testing.[14,15] This is termed telesonography. It has the potential to connect rural patients with quaternary medical centres in real time. Ultrasound images generated at a relatively remote locations are transferred electronically to a specialist who can provide an immediate advice.[14] This can offset the disadvantage of not having specialist physicians in remote and sparsely populated areas.[16]

Telemedicine can greatly expand healthcare services provided in rural areas and save rural patients from multiple visits to the city to see a doctor.[16,17]

Feasibility: Recent reports from rural Nigeria have demonstrated the feasibility and effectiveness of medical outreaches deploying mobile ultrasonography. In a study by Ikpeme et al.[12] five different rural communities in Cross River State, Nigeria were visited. The aim was to examine the health status of participants including carrying out abdomino-pelvic scans with the use of a mobile ultrasound scanner. Five hundred ad seventy four (574) people were assessed. The commonest ultrasound

findings included uterine fibroids and pelvic inflammatory disease for women, fatty liver and prostatic enlargement for men. Some patients were referred for expert care in the nearby cities. Ikpeme et al.[13] in another study evaluated the health status of inmates of a correctional facility in Calabar, southern Nigeria, by examining their blood pressure, BMI and performing abdomino-pelvic scans. One hundred and eighteen inmates were seen ailments such as pelvic inflammatory disease, urinary tract infections and fatty liver were diagnosed at quite high frequencies. In addition to the poor healthcare facilities provided at the correctional facility, the health staff available at the clinic were few and little or no drugs were stocked at the clinic. Both studies have shown that these rural outreaches are feasible and cost effective. Less than one thousand dollars was needed to arrange each of these outreaches. Individuals, NGOs and the government could therefore sponsor more of such.

Conclusions/Recommendations: Rural ultrasonography is highly needed, cost-effective and feasible in rural Africa. Primary healthcare centres in Africa should be equipped with portable ultrasound machines. Medical outreach activities should be made available on a regular basis to these centres. Such centres can be adopted by nearby secondary and tertiary health facilities. Training of primary healthcare workers on ultrasound, who should be linked up with radiologists in the cities, would lead to better outcomes. Private organizations operating in these areas should provide these services or sponsor them as their corporate social responsibility and government should do same as their responsibility to the people.

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