

Medical Imaging in Guyana, development and status

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Medical imaging services have been rapidly advancing in Guyana over the last decade. It is time to look back, and state the today's situation.

With a population, under 1 million, Guyana, according to the World Factbook (1), is the third smallest country in South America. Guyana was originally a Dutch colony in the 17th century, by 1815 had become a British possession. The abolition of slavery led to settlement of urban areas by former slaves and the importation of indentured servants from India to work the sugar plantations. Tropical rainforests cover over 80 percent, and its agricultural lands are fertile. A resulting ethno-cultural divide has persisted and has led to turbulent politics. Guyana achieved independence from the UK in 1966. In 1992, the country is first free and fair election since independence. The economy is growing; still at a high unemployment.

According to the World Factbook, it is (per 2018) a young population; mean age for both females and males are 28 years, and life expectancy 68y. Compared with other neighboring countries, Guyana ranks poorly concerning basic health indicators (2), basic health services in the interior are primitive to non-existent.

The literacy rate considered be weak, due to poor quality education, teacher training and infrastructure, and has led to high emigration rates. The population is mixed. Guyana has a deficit of skilled workers, especially in healthcare. In addition to a lack of professionals, Guyana's healthcare sector also suffers from a lack of medical resources.

District Hospitals (level III) designed to serve geographical areas with populations of 10,000 or more, provide basic in-patient and outpatient care (although more the latter than the former) and selected diagnostic service. It is planned, be equipped to provide simple radiological and laboratory services, and to be capable of gynecology, providing preventive and curative dental care.

Regional Hospitals (level IV) provide emergency services, routine surgery, obstetrical and gynecological care, dental services, diagnostic services and specialist services in general medicine and pediatrics. Four regions design for X-ray facilities.

The National Referral Hospital (level V) in Georgetown provides a wider range of diagnostic and specialist services, on both an in-patient and out-patient basis; plus psychiatric hospital; geriatric hospital, and also a children's rehabilitation center. The health sector is currently unable to offer certain sophisticated tertiary services, for which the required medical specialists are not available.

Medical imaging, especially X-ray based examinations and ultrasonography, is crucial in a variety of medical setting and at all major levels of health care. In public health and preventive medicine as well as in both curative and palliative care, effective decisions depend on correct diagnoses. Though medical/clinical judgment may be sufficient prior to treatment of many conditions, the use of diagnostic imaging services is paramount in confirming, correctly assessing and documenting courses of many diseases as well as in assessing responses to treatment.

Diagnostic imaging plays a key role in identifying pathology and tracking the progression of a disease in the practice of modern medicine. Imaging allow both

accurate diagnosis and earlier diagnosed; which can shorten the time to proper management. The efficiency of patient management provided by diagnostic imaging can lower downstream healthcare costs. Diagnostic imaging also plays a role in early

detection or prevention of disease via screening. Diagnostic imaging is a core healthcare technology. (Morris and Saboury, 2019)

The situation of radiographers

The University of Guyana Bachelors in Medical Imaging Degree program lasts 4 years. It has site classes as well as clinical attachments at the major hospitals in the capital city- Georgetown. The minimum admission is 10 students per year with roughly 15-20 students graduating per year. Almost off the teachers are from Guyana with occasional visiting lecturers and e-teaching sessions. Majority of the student body are Guyanese but there are students from the rest of the Caribbean because there are limited Medical Imaging schools in the region. Currently only Guyana, Trinidad and Jamaica have established programs. Cuba has a Radiography program but entirely in Spanish. Most of the privately own hospitals and healthcare facilities hire radiographers from India while the Government of Guyana has an agreement with the Government of Cuba to provide Cuban Radiographers to work in the public health sector. Either, Guyana radiographer's assistants/local "X-ray technicians" work independently or Cuban radiographers work in regional hospitals. In the later hospitals, there is usually a mix of Guyanese and Cuban/ Indian Radiographers.

The first step in understanding “access to medical imaging” is understanding “availability.” The Needs Assessment for Medical Devices is a technical review series report published by the WHO in 2011 (http://whqlibdoc.who.int/publications/2011/9789241501385_eng.pdf.)

that outlines exactly how a country’s Ministry of Health can calculate the gaps in access to medical device technology [20]. The situation of equipment

outside of the capital- it is entirely film-screen-based. Almost all hospitals- both private and public- within the city either used computed or digital radiography. Within GPHC Cardiology and Radiology Departments, they have their respective servers and reading stations.

It has been suggested that 80–90% of the imaging need in a country as Guyana, can be met by X-ray, and ultrasound alone. X-rays are essential in the diagnosis and treatment for the large proportion of patients presenting with pulmonary or orthopedic conditions, among other things. This is true for acute conditions, such as pneumonia, pleural effusion, hemothorax, fractures, and osteomyelitis, as well as chronic ones, such as tuberculosis (TB), asthma, chronic obstructive pulmonary disease (COPD), and occupational lung disease.

A digital dental unit are located in the city. Several analog dental units are located in both private and public sectors. GPHC performs kidney transplant surgeries and hip and knee replacement through visiting teams, as well as coronary artery bypass and heart-valve replacement surgeries, through Caribbean Heart Institute and other visiting cardiologists. Ophthalmologic surgeries are also available in Georgetown and Berbice as well as private hospital in Georgetown. There are also laparoscopic surgeries performed at both private and public hospitals in the city. Cesarean section surgeries are available in both public and private hospital in the city. Repairs, exploratory laparotomy and amputation, are also performed. MRI units in the Georgetown are located at two private hospitals, one CT unit at GPHC, 3 CT units in 3 private hospitals within the city, 1 CT unit in Berbice at a private hospital, and 1 CT unit are located at Bartica Hospital in Region 7.

Bone Mineral checks (DEXA) are no longer available. Mammography are currently in the infancy phase of starting up services at GPHC. The recommended age group are 40 years and older, if any family history, positive ultrasound, or abnormal breasts. Guyana had (per 2014) a National regulatory agency for medical devices.

Even with substantial improvements in the health sector, the need for overseas treatment for some services might remain. The Ministry of Health provides financial assistance to patients requiring such treatment, priority be given to children whose condition can be rehabilitated with significant improvements to their quality of life.

Although Guyana's health profile falls short in comparison with many of its Caribbean neighbors, there has been remarkable progress since 1988, and the Ministry of Health is working to upgrade conditions, procedures, and facilities. Many Guyanese seek medical care in the United States, Trinidad and Tobago or Cuba.

By increased activity, there are increasing optimism in the radiography-imaging sector. In 2013, the University of Guyana upgraded its dormant Associate's Degree in Radiography to a Bachelor's Degree in Medical Imaging.

The echo program established; undertaken by radiographers. The echo program currently runs for 12 months, but there are plans to have it accredited by the University of Guyana as a post-undergraduate diploma for doctors and radiographers. Radiographers perform and write a preliminary report. Reports review's by reading cardiologists in Canada.

The radiographers procedures echo-studies cover e.g.;

- a, transthoracic echocardiograms
- b, trans-esophageal echocardiograms
- c, dobutamine stress echocardiograms,
- d, bubble studies,
- e, pericardiocentesis, as assistants.

The leading causes of mortality for all age groups are cerebrovascular diseases (11.6%) and ischemic heart disease (9.9%) Pericardiocentesis (PC) is both a diagnostic and a potentially life-saving therapeutic procedure. Currently echocardiography-guided PC are considered the standard clinical practice in the treatment of large pericardial effusions and cardiac tamponade. Although considered relatively safe, this invasive procedure may be associated with certain risks and potentially serious complications. For pericardio-centesis; radiographers provide ultrasound image guidance to the cardiologist in finding the correct site to tap the pericardial effusion, perform all necessary post procedure ultrasound imaging to assess the pericardial effusion.

A stress echocardiogram is a test done to assess how well the heart works under stress. The "stress" can be triggered by either exercise on a treadmill or a medicine called Dobutamine. A Dobutamine stress echocardiogram (DSE) may be used if you are unable to exercise. Dobutamine is put in a vein and causes the heart to beat faster.

Simply having these technologies available does not necessarily mean they are being used or making an effective impact on patient care. It is imperative to decipher the impact of available imaging technologies on clinical management and patient outcomes. A review of studies on ultrasound by Sippel et al. found that ultrasound either changed patient management, increased detection of disease compared to baseline physical exam, narrowed the differential diagnosis, or pinpointed the definitive diagnosis in a range of conditions studied in numerous LMICs around the world [23]. A benefit of ultrasound technology is that it is highly portable and can be utilized in real time at the point of care to rapidly

characterize diverse pathology and guide direct management including image-guided intervention, procedures, surgery, or medical therapy.

In most 1st world countries, Percutaneous Catheter Drainage and Percutaneous Needle Aspiration are first line treatments for simple intra-abdominal abscesses. In countries like the USA, England, and Australia- percutaneous drainage is considered as the gold standard for almost all abscesses and abnormal fluid collections. In a 2006 study carried out in England by Buckley et al, was found that the UK management of percutaneous drains differs from USA practices. The UK offers informal advice and follow-up, with the clinical team supervising the drain. Buckley et al suggests that more formal radiological support after drainage will help improve outcomes. According to Dr H. Charles in a 2012 article in the USA; success of the procedure relies on many factors including choosing the appropriate imaging guidance, percutaneous approach, method of sedation, and drainage technique. For Australian Radiologist- Dr O. Kang- ultrasound-guided percutaneous drainage is advantageous over CT guidance because ultrasonography is a dynamic study, allowing greater precision to control needle insertion, does not expose patients to ionizing radiation, and does not require as wide a range of staff, compared to CT-guided procedures. The global progression of Percutaneous Catheter Drainage and Percutaneous Needle Aspiration hinges heavily on available resources- medical staffing, surgical setting and equipment, and radiological equipment and personnel.

For some countries, eg: the Caribbean region, the situation is one where the overall development of Minimally Invasive Surgery (MIS) has been slow, due in part to lack of training. Most surgical departments in the developing world consist mainly of open surgeons (Leake 2012). Another factor hindering the progression of MIS is financial constraints which affect the surgical equipment available (e.g.: trocars). In Jamaica and Trinidad, image guided percutaneous drainage is routinely performed due to the availability of radiologists and imaging modalities.

Specifically in Guyana in the early 2000s, Guyanese surgeons began to implement the use of minimally invasive surgeries. To date, Woodlands Hospital and Georgetown Public Hospital are the only two facilities that offer image guided drainage of intra-abdominal abscesses and abnormal fluid collections. Percutaneous Intra-Abdominal Drainage has been offered at the Georgetown Public Hospital since 2015. The shift towards minimally invasive surgeries began when residents were

given opportunities to pursue their fellowship abroad. During their time studying, these surgeons would have had the chance to perform modern procedures. As they returned to Guyana, they brought back these procedures. Two of the arguments used were: 1) all intra-abdominal drainage does not necessarily require open surgery, and 2) percutaneous drainage would drastically reduce the high morbidity and mortality rates of that time. At

present, open surgical drainage at the Georgetown Public Hospital requires an average of 10-14 days post-operative hospitalization and can extend to as much as 8 weeks.

Through the RAD-AID International and Georgetown Public Hospital Corporation, both doctors and medical imaging professionals have been trained in various medical imaging modalities. Through this collaboration, the Radiology Residency program was birthed, providing locally trained radiologists in Guyana for the first time. The collaboration also enabled computed tomography services and mammography services in the public sector, which are delivered by radiographers/ medical imaging technologists who completed post-undergrad training with RAD-AID International.

Through these programs and more sub-specialty programs in the works, Guyana will be able to offer state of the art imaging services in the coming decades.

And while all programs have ensured their sustainability by training local professionals to teach and train other local professionals, a unique situation is being created where a developing country is learning to tackle developed world issues like advancing from analog technology to fully digital equipment. Guyana and many low to middle-income countries are tasked for adjusting to this improvement, while omitting initial steps developed countries had encountered while adapting to this transitory phase.

Through collaborations between the University of Guyana, Georgetown Public Hospital and the Guyana Program for Advancing Cardiac Care, Guyanese have had increasingly and sustainable access to an increasingly number of echo-procedures. In addition to the echocardiogram services available, the Guyana Program for Advancing Cardiac Care also runs the Guyana Echocardiography Education Program, which also educates and trains doctors and medical imaging professionals to perform echocardiograms and complete preliminary reports.

Summing up, it's important that leaders are willing to share their knowledge and expertise. Guyana has signed onto to Sustainable Development Goals to end poverty by 2030. Amazing doctors in Guyana are willing to help and give guidance but sadly, it still is a lack of radiographers. Hopefully, the establishing of the local radiography society will ensure that resources and guidance are more easily available.

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