

Local Frontiers in Radiology

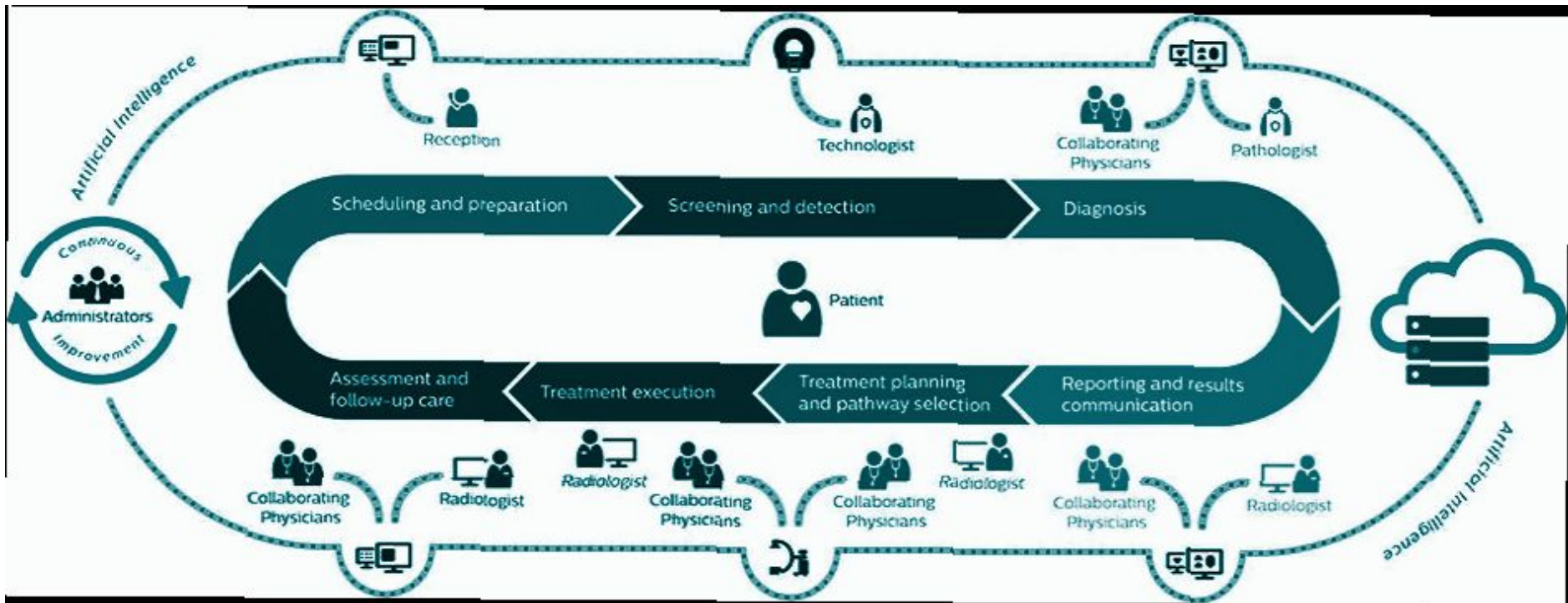
Overview of radiology practice norms and gaps that need to be filled in Guyana- Ultrasound.

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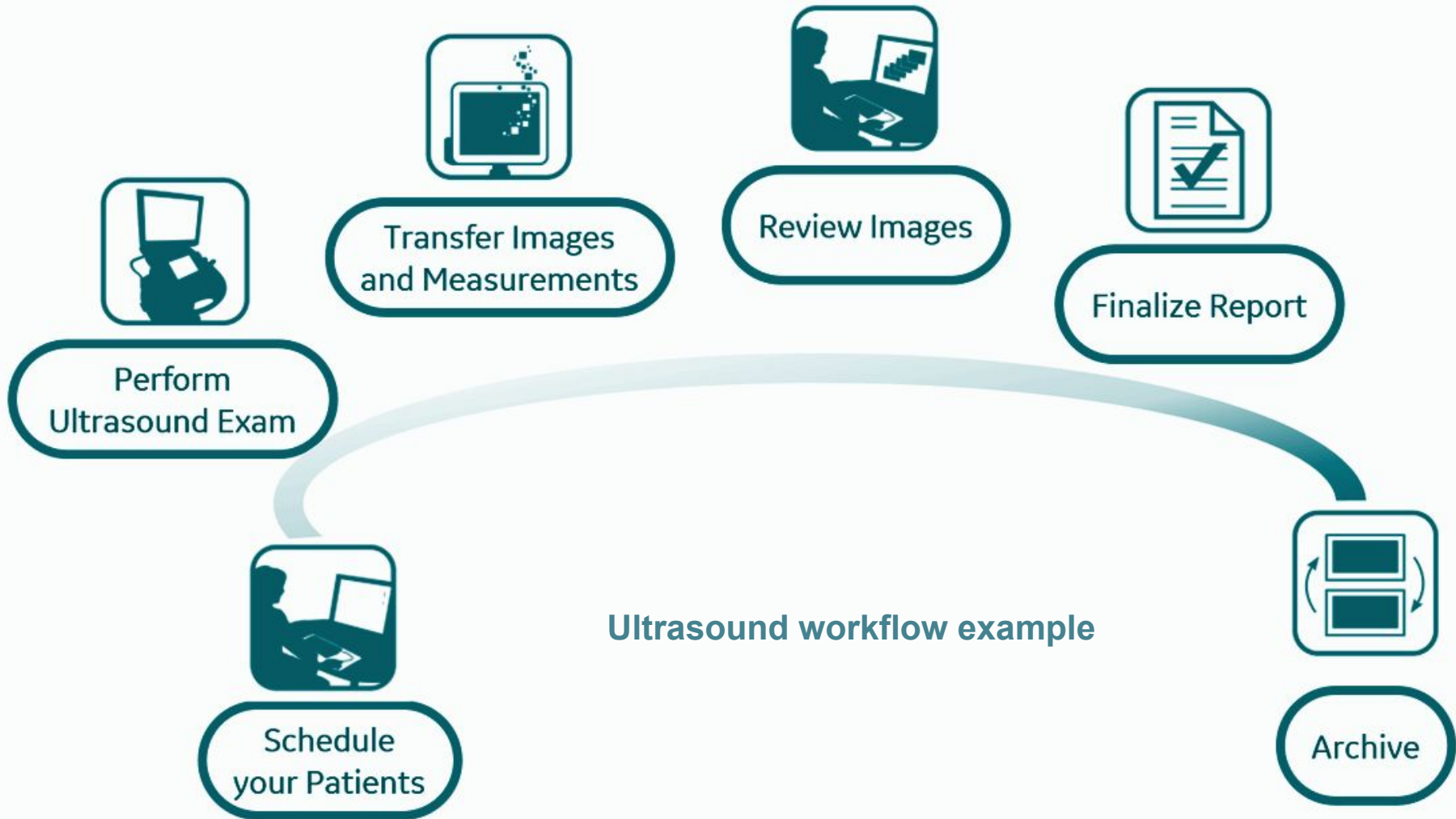


Overview

- General overview of radiology and usual organisation of imaging professionals.
- Technologists in ultrasound.
- Ultrasound international standards versus practice in Guyana.
- Opportunities for standard development in Guyana.



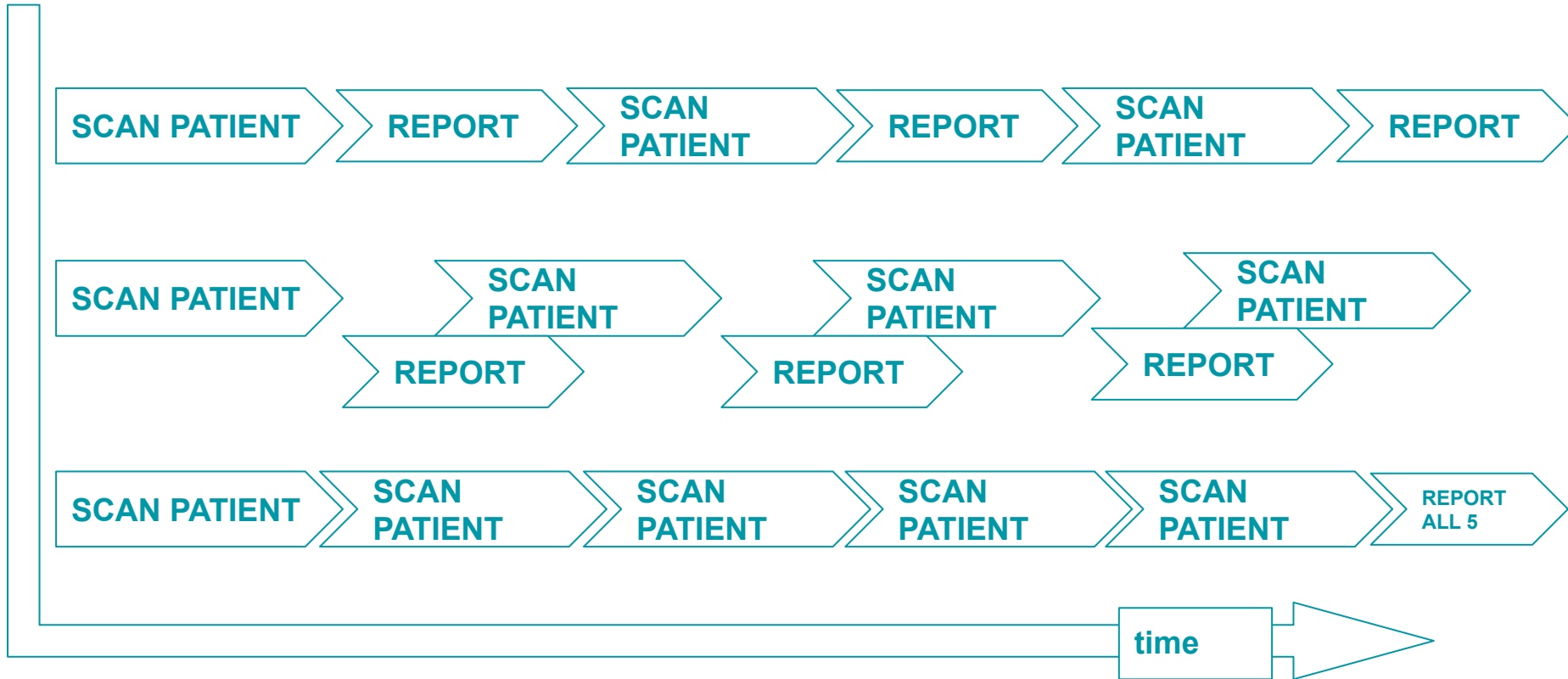
MEDICAL IMAGING IS A TEAM SPORT!



ADVANTAGES OF THE TEAM APPROACH



THROUGHPUT EXAMPLES



REQUIREMENTS FOR TEAM APPROACH

- Skilled and qualified team members
- Clearly defined roles
- Efficient means of communicating medical information
- Efficient means of storing and accessing medical information
- Strict processes involving all team members

Radiology is the medical specialty using medical images and to diagnose and treat diseases.

- Radiologists are medical doctors.

Specialize in diagnosing and treating injuries and diseases using medical imaging.

X-rays, computed tomography (CT), magnetic resonance imaging (MRI), nuclear medicine, positron emission tomography (PET) and ultrasound.

[American College of Radiology](#)

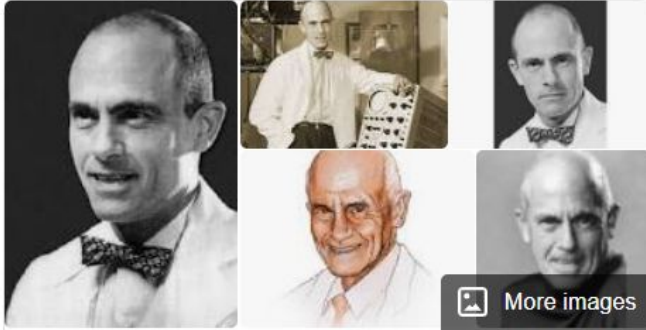
Ever evolving

- Successful imaging techniques and image guided procedures are always first developed in radiology departments by radiologists.
- The technologies /skills as they become more in demand are often taught to technologists and/or other physicians, freeing time for further development.

Seldinger technique

- Dr. Sven-Ivar Seldinger
.: (1921-1998)
- Swedish radiologist from Mora, Dalarna County, who introduced the procedure in 1953.



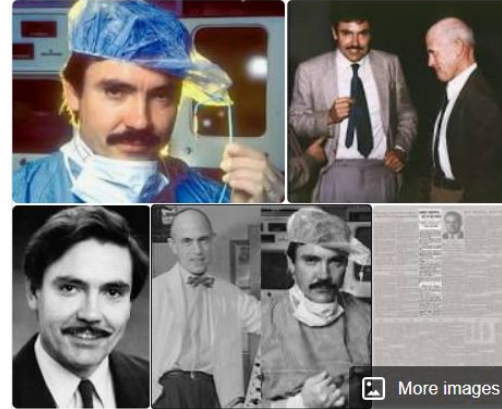


Charles Theodore Dotter



Radiologist

Charles Theodore Dotter was a pioneering US vascular radiologist who is credited with developing interventional radiology. Dotter, with his trainee Dr Melvin P. Judkins, described angioplasty in 1964. Dotter received a bachelor of arts degree in 1941 from Duke University. [Wikipedia](#)



Andreas Gruentzig



German radiologist

Andreas Roland Grüntzig was a German radiologist and cardiologist, with foundational interest, training and research in epidemiology and angiology. He is known for being the first to develop successful balloon angioplasty for expanding lumens of narrowed arteries. He was born in Dresden. [Wikipedia](#)



Ian Donald

Physician



Ian Donald CBE FRFPGlas FRCOG FRCP was an English physician who was most notable for pioneering the diagnostic use of ultrasound in obstetrics, enabling the visual discovery of abnormalities in pregnancy. Donald was Regius Professor of Obstetrics and Gynaecology at the University of Glasgow. [Wikipedia](#)

Not a radiologist
:)

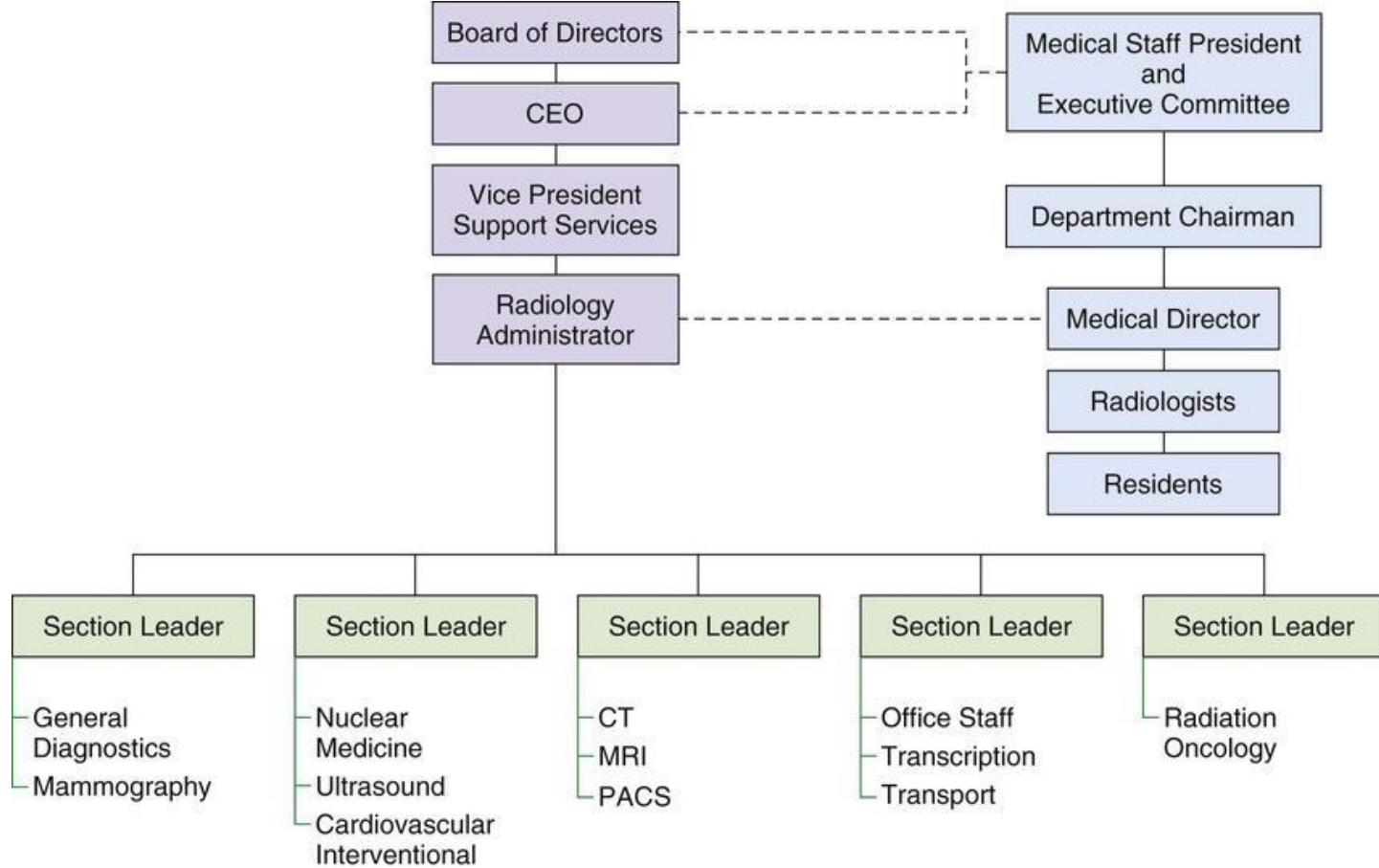
RADIOLOGIST TRAINING

- Radiologists are medical doctors.
 - Most radiology residencies require completion of medical internship before admission.
 - Radiologists trained in Guyana would have had multiple years working in a medical specialty before becoming a radiology resident.
 - For example the first batch of radiologists trained in Guyana worked in
 - Nephrology/transplant and vascular surgery
 - Anaesthesia
 - Emergency medicine
 - Pediatrics
 - Outpatient wound care and sonology

RESIDENCY CURRICULUM

- Residency curriculums include
 - Medical Physics- how all modalities work, the limitations, safety, machine errors, etc.
 - Image quality assessment- proper positioning, machine settings and machine artifacts.
 - Medical Informatics- how the flow of information works from scheduling to reporting, the technologies that support it and how it impacts patient care.
 - Basic image guided procedures- indications, equipment, technique, management and complications.
 - General medicine- clinical presentation, pathophysiology, histology, general work-up and treatment of a wide range of disease.
 - Image interpretation- confirm diagnosis based on imaging findings, provide appropriate differential diagnosis based on imaging findings and clinical presentation/lab tests, recommend appropriate further tests based of imaging findings.

Examples of Radiology Department Organisation



Sonographers

a sonographer, uses imaging equipment and sound waves to form images of many parts of the body, known as ultrasounds.



“A sonographer is a healthcare professional (non-doctor medical) who specialises in the use of ultrasound technology to produce diagnostic scans that will be integrated in the diagnostic process to help the medical doctor to formulate the final diagnosis.”

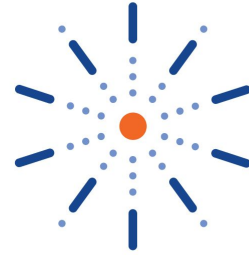
“This profession is well established in the USA, Canada, Australia, New Zealand and most of all in the United Kingdom.”



American Institute of Ultrasound in Medicine (AIUM).

The American Institute of Ultrasound in Medicine is a multidisciplinary medical association of more than 10,000 physicians, sonographers, scientists, students, and other health care providers.

Established in the early **1950's**, the AIUM is dedicated to advancing the safe and effective use of ultrasound in medicine through professional and public education, research, development of guidelines, and accreditation.



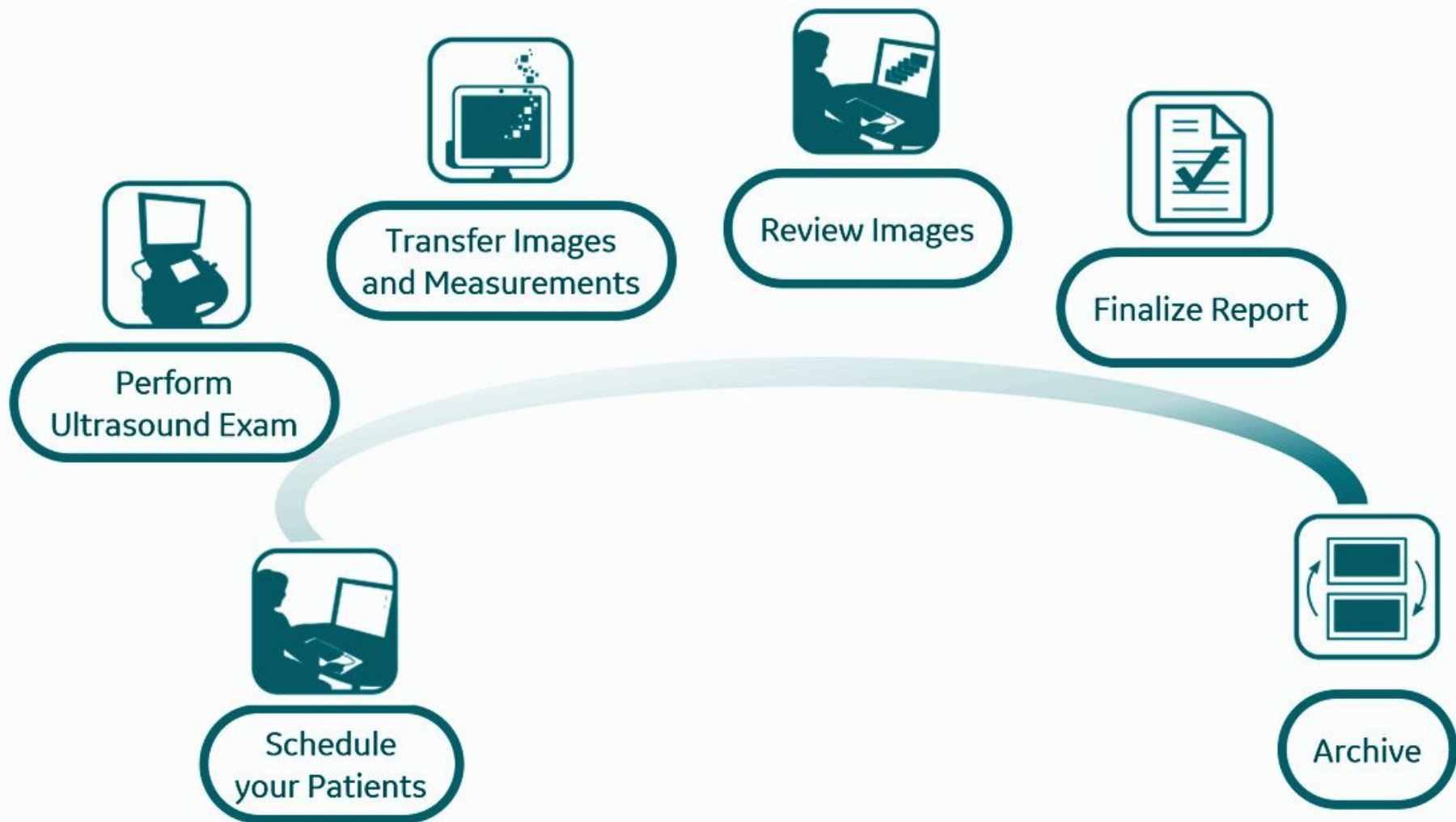
ARDMSTM
American Registry for
Diagnostic Medical Sonography

Registered Diagnostic Medical Sonographer®

[Certifies different types of health professionals in acquiring ultrasound images](#) in the United States and other countries

Ultrasound workflow

example



Ultrasound storage standards

DICOM PACS Linked

7. Image management

Images obtained as part of an ultrasound examination provide a valuable record of the findings and should be used to support the final report.

All providers of an ultrasound service should have the facility to store whole studies.

Image transfer between providers is now routine. To minimise the possibility of patient harm from reviewing images in the absence of a report, the ultrasound images and reports should be stored/linked together.

The linked report and image can be useful as part of an audit of practitioner accuracy and competency.

Image capture

- Patient demographics should be passed to the acquisition device using DICOM modality work-list (DMWL) Health Language level 7 (HL7).⁸⁵

- Images should be acquired in DICOM format, ready for export to a DICOM archive.

- Images should also be stored locally on the acquisition device, to ensure any transmission failures can be resent.

Image storage

- Images should be archived in a DICOM format in a DICOM WES compliant archive.⁸⁷

- Image archives should be replicated so that more than one instance of an image is available should one copy fail.⁸⁸

- The two copies of images should be stored and managed separately, ideally in separate geographical locations.

- Images should be stored for an appropriate length of time according to the RCR.⁸⁹

- Images should be linked to reports and be able to be viewed as a record together in a PACS.⁹⁰

Image transfer

- Digital images should be imported/exported in DICOM, in line with current guidance on data security. The primary and preferred route for this is to transfer information in an electronic format and not to use removable media.⁹⁴

- Formats include compact disk (CD), Digital Versatile Disc (DVD), Universal Serial Bus (USB), PACS to PACS N3 DICOM link or via a third-party transfer service such as the Image Exchange Portal (IEP).⁹⁴

- Images and reports ideally should be transferred together.

- Where transportable media (for example, CDs) are used, an approved encryption system should be employed and password sent under separate cover.⁹⁵

- Patient demographics, incorporating NHS number, should be included to allow receiving organisations to correctly process the data

Patient info.

Labeled

Retrievable

Image capture

- Patient demographics should be passed to the acquisition device using DICOM modality work-list (DMWL) Health Language level 7 (HL7).⁸⁵
- The capture of images should always be undertaken on the acquisition device.

- Images should be captured and labelled using a minimum dataset.
- Current requirements are as follows:
- NHS number (whenever possible)⁸⁶.
 - Given name
 - Family name
 - Date of birth
 - Gender
 - Postcode.

- Site markers, labelling and measurements should be saved as a separate image.

- Images should be stored for an appropriate length of time according to the RCR.⁸⁹
- Images should be linked to reports and be able to be viewed as a record together in a PACS.⁹⁰

Image access and review

- Images should be accessible through an enterprise-wide viewing application or DICOM viewer. Diagnostic image viewing should be undertaken using DICOM images.⁹¹
- Digital images should be retrievable in a timely manner, at the point of clinical need, across 24/7/365.⁹²
- Reports should be linked to images using desktop integration at the reporting stage.
- Access to images should be restricted to those users with a legitimate relationship to the patient. Role-based access control (RBAC) can be used to provide image/report access to appropriate individuals.⁹³

should be employed and password sent under separate cover.⁹⁵

- Patient demographics, incorporating NHS number, should be included to allow receiving organisations to accurately process the data.
- Audit mechanisms should be employed to evidence transmission and receipt of any transfers.

Approved by the Clinical Radiology Faculty Board: 26 June 2014

Approved by the SCoR Council: 2 July 2014

Ultrasound Acquisition Standards

Practice Parameters

AIUM practice parameters are intended to provide the medical ultrasound community with guidelines for the performance and recording of high-quality ultrasound examinations. The parameters reflect what the AIUM considers the minimum criteria for a complete examination in each area but are not intended to establish a legal standard of care.

The AIUM currently offers its practice parameters in two forms:

PDF—read online or download for later (No CME credit)

Video Tutorial—These step-by-step instructional videos show users how to adhere to the parameters. Video tutorials are available for purchase and vary in the number of CME credits.

ACCREDITATION

example

The Manual for Ultrasound Practice Accreditation

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Sonographers Who Perform Ultrasound Examinations

Qualified sonographers who perform ultrasound examinations will be responsible for those tasks specified by the Director of Ultrasound. Although a sonographer may play a critical role in extracting the information essential to deriving a diagnosis, the rendering of a final diagnosis from ultrasound studies represents the practice of medicine and, therefore, is the responsibility of the supervising licensed medical provider.

Sonographers must have appropriate training for the ultrasound examinations they perform. All sonographers must be certified in the specialty or specialties in which they perform ultrasound evaluations or must become certified before the next reaccreditation application. If the sonographer is unsuccessful at obtaining the relevant credential, he/she must not perform this type of ultrasound for the practice except for the purposes of training and in these cases only with supervision of a physician or sonographer who meets the training guideline. If a sonographer is required to become certified in multiple specialties, the sonographer must obtain a minimum of 1 additional specialty certification per accreditation cycle.

The following certifications are acceptable:

- Certification (active status) by the American Registry for Diagnostic Medical Sonography (ARDMS) in abdomen, breast, fetal echocardiography, musculoskeletal, obstetrics and gynecology, and others as applicable;
- Certification in general sonography for abdomen and obstetrics and gynecology by the American Registry of Radiologic Technologists (ARRT) or the ARRT certification in breast sonography.
- International applicants may provide equivalent credentials for review by UPAC.

[https://www.aium.org/accreditation/
Final_Accrediation_manual.pdf](https://www.aium.org/accreditation/Final_Accrediation_manual.pdf)

4. The Examination

When assessing a particular organ in the abdomen with ultrasound, the organ should be thoroughly scanned from one border to the other, in a minimum of two orthogonal planes. Archived images are obtained in standard planes to document a normal study, and specific views are taken to illustrate detected pathology.

When an abnormality is found, the following basic sonography rules apply:

- Quantify abnormality in two planes,
- Assess echogenicity, borders, echotexture and vascularity/hemodynamics.

Protocols

- http://ultrasound.net.ua/fileadmin/user_upload/File/article/Abdomen_protocol_CME.pdf
- <https://www.utsouthwestern.edu/education/medical-school/departments/radiology/protocols/us.html#b>
- <https://www.asum.com.au/files/public/SoP/curver/Abdo/Guidelines-for-Abdominal-Ultrasound-Examination.pdf>

Cuba

- A resilient and resourceful people
- Partially isolated
- Many unique practices and systems
- Heterogeneous practice standards- higher in Havana.
- In cuba only doctors do ultrasound
 - Radiologists
 - Sonologists
- Limited access to computers and networking technology. Radiology developed without it in most of the country.
 - No requirement for storage, only printing.
 - No protocol for scanning that can be quality checked.

IMPACT OF WORKING WITHOUT STANDARDS

- Mysticism of ultrasound
- Misdiagnosis without accountability
- No image data for quality assessment
- Unnecessary transfers
- Unnecessary reimaging
- Unnecessary treatments
- No image data for research or education

Guyana- Opportunities for Development

- Radiologists with international training and exposure working in the public system-
 - Dr Joel Joseph
 - Dr Angelita Sue
 - Dr Richie Vyphuis
 - Dr Vijai Persaud
 - Dr DOLwin Ritch
- On-going Radiology residency at the Georgetown Public Hospital Corporation.
- Ongoing technologist training suitable to become sonographers
- Partnerships with PAHO, IEA and Rad-Aid.
- All ultrasound machines made in the last 20 years will have the storage and transfer capability.
- Internet is potentially a great tool to link technologists with radiologists in different part of the country to ensure a consistent, high standard for ultrasound imaging.

QUESTIONS?

Summary

- Radiologists are medical doctors essential in the development of good radiology practice in Guyana.
- Technologists working with radiologists in ultrasound can vastly improve the access and quality of ultrasound in Guyana.
- The technology and basic infrastructure are underused and can be leveraged to improve diagnostic capabilities and patient care in all regions of Guyana.
- International partners are willing and available to provide a wider view of world wide best practices.

Fluoroscopy

