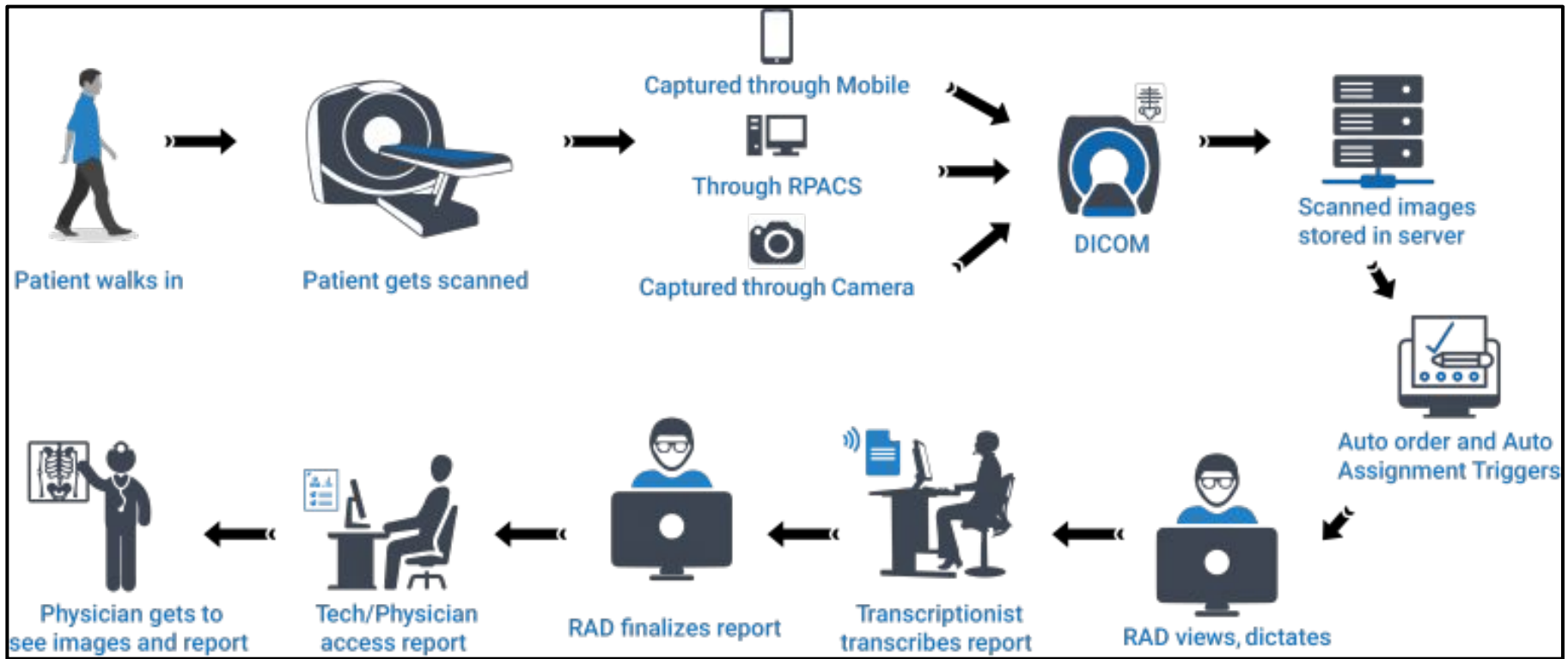


# **Enterprise Medical Imaging in the Global South: Challenges and Opportunities**

**Ernest ZULU<sup>1</sup> and Lighton PHIRI<sup>2</sup>**

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**Two fundamental challenges affecting effectiveness and efficiency of radiological services in the global south:**

- **Critical shortage of radiologists**
- **Limited use of modern medical imaging practices**

**Potential solution to address the second challenge:**

- **Implementation of Enterprise Imaging (EI)—techniques and workflows for**
  - **Acquiring**
  - **Indexing**
  - **Managing**
  - **Storing**
  - **Analysing ....clinical images**

**To:**

- **Highlight challenges that adversely affect effective interpretation of medical images**
- **Explore the opportunities associated with the implementation and adoption of AI strategies in order to enhance medical imaging interpretation in Zambia**

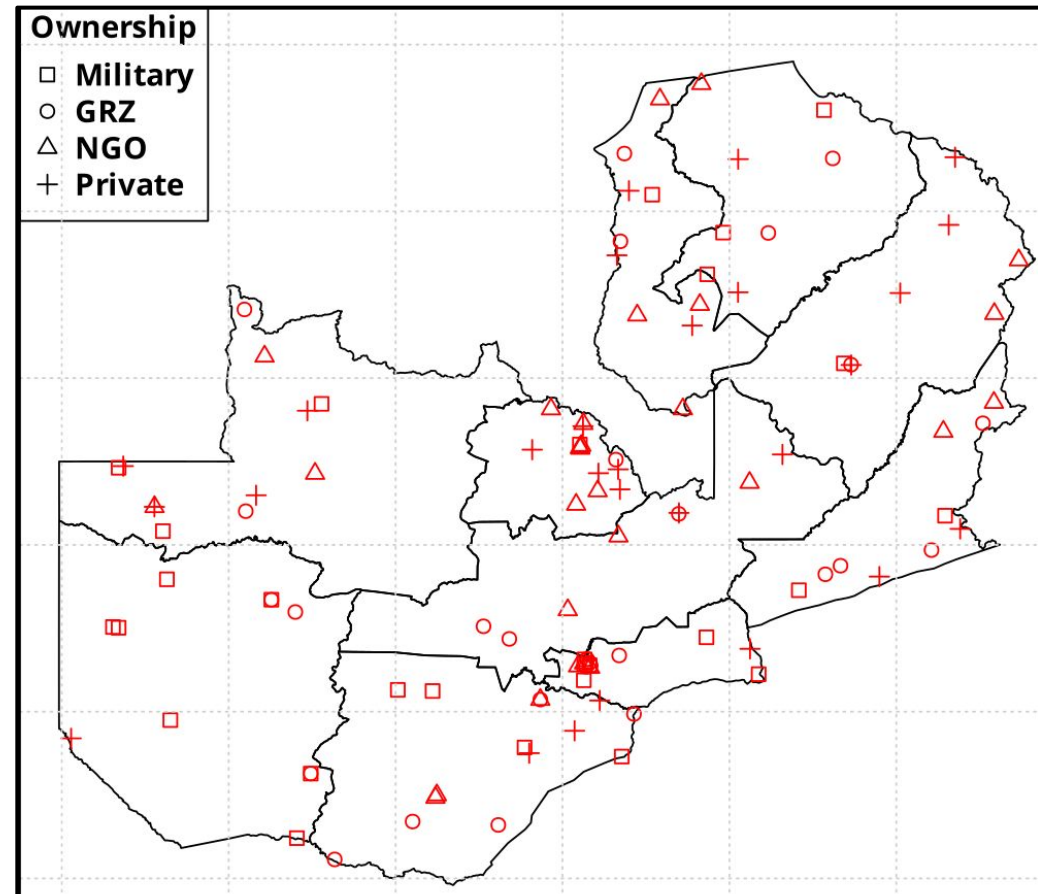
## **Study approach**

- **Mixed method approach**
  - Case study at University Teaching Hospitals
  - Meta-analysis

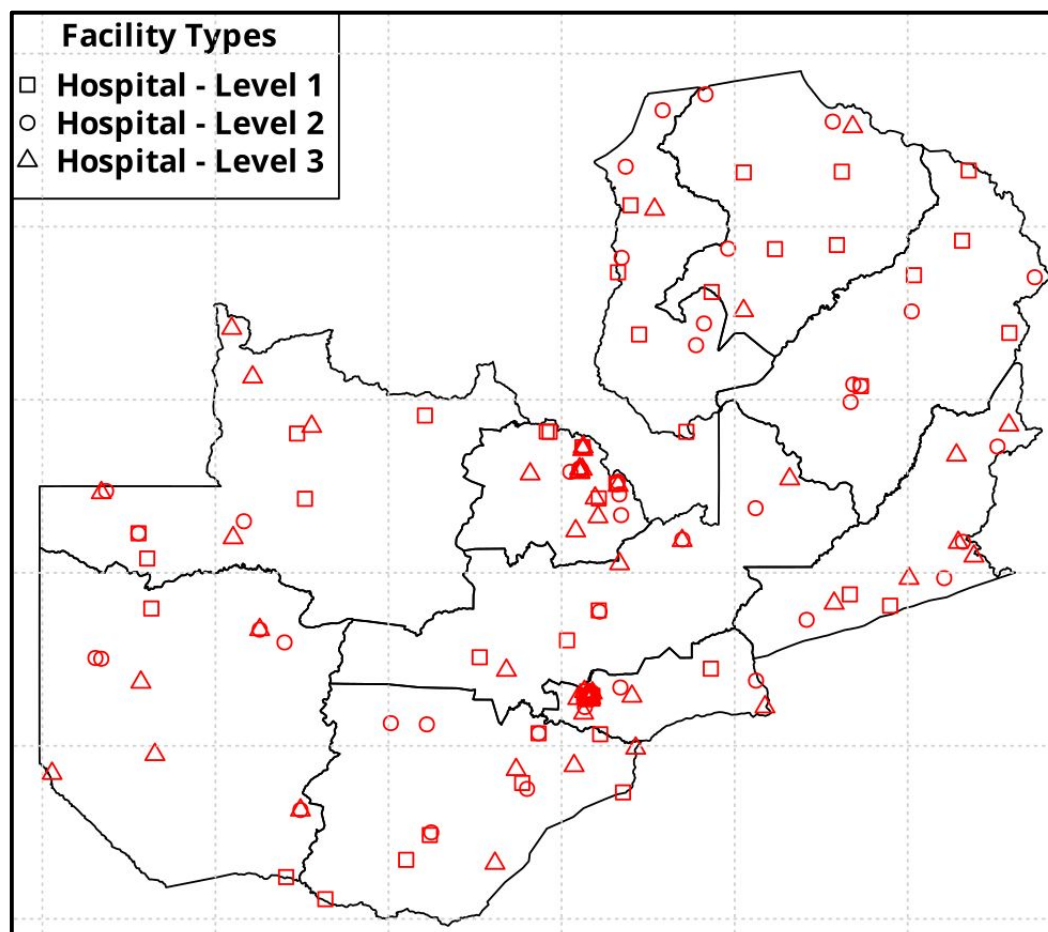
## **Methodology**

- **Strengths-Weaknesses-Opportunities-Threats (SWOT) analysis**
  - Records analysis
  - Personal observations
- **Enterprise Medical Imaging Meta-analysis**

- **2815 health facilities in Zambia**
- **Owned by**
  - **Government of the republic of Zambia (GRZ)**
  - **Military**
  - **Non-Governmental Organisations (NGO)**
  - **Private**
- **Our work focused on public health facilities (GRZ)**



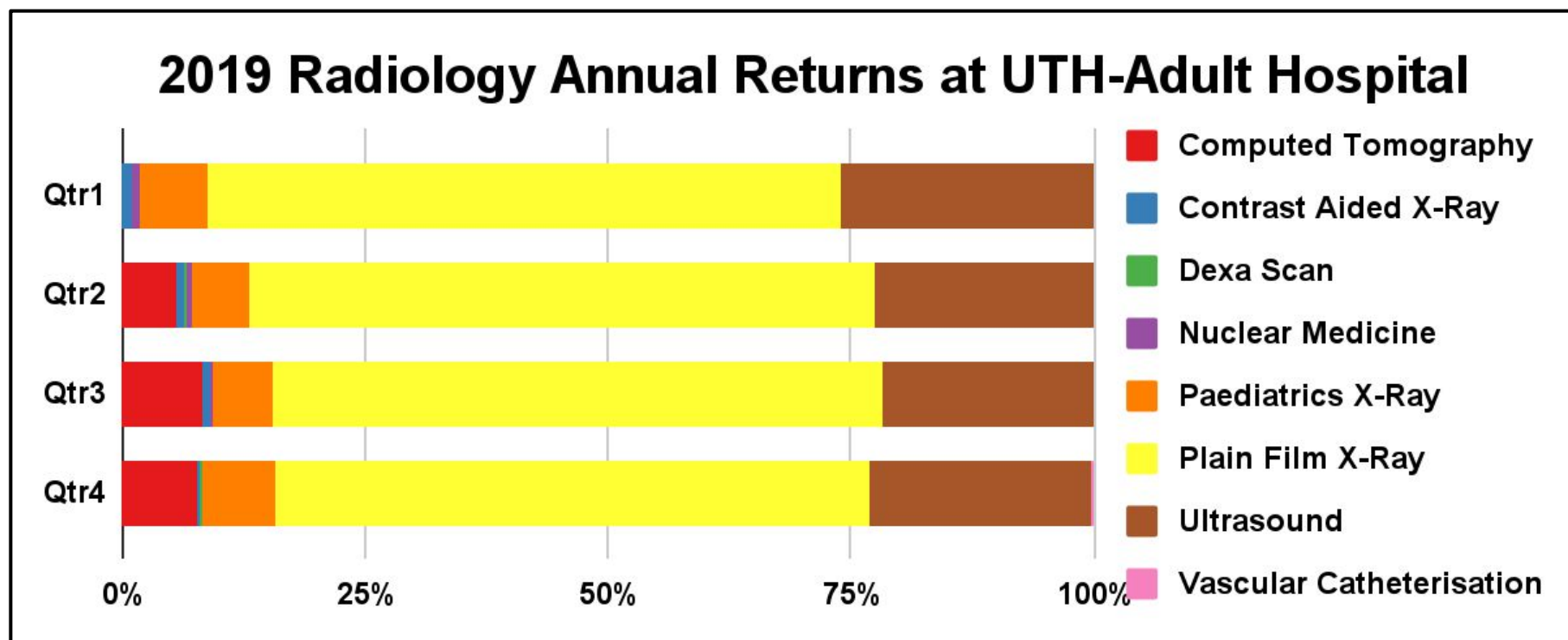
- **151 facilities classified as Level 1, 2 or 3 Hospitals**
  - Majority owned by GRZ
- **Radiologically equipped according to level in GRZ facilities**
- **Only 8 GRZ Radiologists, operating in 5 facilities**



## **Workflow challenges**

- **No Radiology Information System (RIS) or Hospital Information Service (HIS)**
  - Inadequate request forms
  - Repetitive entries of patient details
  - Uncollected final reports
  - Tedious annual returns report generation
- **No Picture Archiving and Communication System (PACS)**
  - No systematic storage of images and reports
  - Manual reporting
  - Multiple registration of same patient
  - Use of non-DICOM image acquisition
- **Long report turnaround time**
  - Few Radiologists
  - Heavy workload





- **Total examinations: 92, 599**
- **Majority of modalities are X-rays and Ultrasound, mostly done in lower-level hospitals**

## **Challenges affecting EMI implementation**

- **Challenges of integration of various clinical imaging disciplines into unified EI**
  - Differences in workflows (e.g. ordering of an imaging exam)
  - Challenging patient identification in non-DICOM images
  - Differing image qualities and standards (measurements, image colour, patient positioning)
  - Linking of all patients' images and reports in the EMI viewer to the patients' EHR
  - Lack of EMI-specific ontology and standard nomenclature
  - Medico-legal concerns
  - Use of mobile devices for image acquisition and personal privacy

## **Additional challenges facing EI implementation in the global south**

- **Substantial cost and ongoing investment for maintenance**
- **Requirement for good Information and Communication Technology (ICT) support service,**
- **Training of users and requirement for a good understanding of complexities involved in EI implementation**

- **Well-trained radiologists**
- **Organised existing imaging stakeholder departments**
  - Well-established administrators
  - Standard Operating Procedures (SOP)
  - Manual workflows in place, could be incorporated in EI-centric ecosystem
  - Fairly equipped imaging ecosystem at all levels (level 1, 2 and 3), DICOM-compatible machines
- **Ongoing mobilisation of Teleradiology equipment**

- **Subsidiary departmental imaging services not integrated into mainstream clinical imaging**
- **Continued use of analog imaging in some modalities**
- **Use of visible light based image capturing equipment in some subsidiary services**
- **Poorly-serviced equipment with frequent and long downtimes**
- **Lack of good ICT infrastructure**

- **Developing EHR system (SmartCare)**
- **Pre-existing e-Government services for internet connectivity**

- **Unreliable internet connectivity**
- **Uncertain acceptability of EI**

- **SWOT analysis was conducted; highlighted the challenges and opportunities of implementing successful EI strategies**
  - Motivation for implementation of EI strategies
- **Meta-analysis conducted to consolidate information on general challenges of EI implementation against local challenges**
- **Ongoing: Pilot study to fully understand current imaging workflows with expected outcome of automation of the workflows**
- **In pipeline: Implementation of**
  - PACS and RIS
  - Machine learning models
- **Further research required in exploration of automatic radiology report generation**



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