

## The challenges of installing Picture Archiving and Communication Systems (PACS) in a low- or poor-income resource nation: Our experience in a teaching hospital in Sub-Saharan Africa

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### Abstract

The practice of radiology as a subspecialty of medicine has undergone remarkable advancement as a result of picture archiving and communication Systems(PACS) technology. This technology allows for storage and retrieval of radiographic images and reports at any time, and possible transfer to other locations for secondary viewing and opinions. PACS enables healthcare professionals to access and review medical images quickly, allowing for faster and more accurate diagnosis and treatment planning. However, there are challenges involved in its installation and operations in our health facility, a teaching hospital in Sub-Saharan Africa. These challenges range from lack of huge financial resources required to acquire PACS equipment and accessories to lack of steady and regular electric power supply. Other challenges include inadequate dedicated space for its installation, inadequate functional cooling systems for its sensitive components, inadequate internet services for end users and paucity of qualified and trained personnel. There is, therefore, need for increased government and private sector funding in order to surmount these challenges, thereby enhancing health promotion in Sub-Saharan Africa.

**Keywords:** Picture Archiving and Communication Systems; Challenges; Radiographic Images and Reports; Health; Sub-Saharan Africa

### 1 Introduction

Picture archiving and communication systems (PACS) have been a revolutionary development in the field of medical subspecialty of radiology. <sup>1</sup>The innovation allows for proper storage and retrieval of radiographic images and reports as well as transference of images and reports to other systems located anywhere in the world for secondary viewing and opinions. The system has reduced the need for production of physical images as well as repeated radiographic exposures of patients in cases of loss of images or destruction from improper handling by patients; a simple click on a button and the images re-appears on PACS.

The system also promotes networking whereby the images and reports are projected widely in a hospital where it is in use, thereby enabling clinicians to see first-hand the images and reports of their patients, without having to walk over to the department of radiology to review images. This is done online via imaging technology that PACS offers.<sup>2-3</sup> But then, the installation and functionality of PACS in Sub-Saharan Africa comes with lots of challenges mainly due to paucity of financial resources. <sup>4,5</sup> We, hereby, outline the myriads of challenges that we faced in our centre.

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## **2 Challenges of installing picture archiving and communication systems in our institution**

**The issue of space:** A well ventilated and spacious hall or large room is needed. The various components of the system need to be installed in adequate space in-between tables and cabinets. There should also be necessary allowances for walk-ways for staff. When the decision was made to install PACS in our centre, the hospital had no dedicated space for PACS in its original architectural plan. However, after obtaining due permission from the supervising ministry of health, our engineers had to do some structural readjustments on the hospital building in order to make adequate space available for PACS.

**PACS equipment and accessories:** The equipment and accessories involved in PACS are quite expensive. The funds was not readily available to the management of the hospital but we were resolute in our desire to having PACS in our health facility. The supervising ministry was also handicapped, the purchase and installation was not included in the budget. However, recognizing the medical benefits of having the PACS installed in our facility, provision was subsequently made in the budget. Funds needed to procure transmission cables from the PACS office to dedicated consulting clinic offices as well as conduit wires, wall tags and computer sets was also provided.

**Regular and steady electric power supply:** Regular and steady electricity power supply is a major issue that must be addressed before installation of PACS. In our centre, electricity power supply was erratic, with occasional power surge that could damage the sensitive components of PACS. We had to seek for alternative electric power supply. This included solar energy and fuel consuming generators, which were expensive to manage. Gas turbine, powered by huge gas plant, was also considered but we could not afford it due to the monumental cost of installation.

**Cooling of sensitive components :** Air-conditioner units are necessary for cooling of sensitive components of PAC, thus enhancing their performance. The space provided for PACS in our facility was some distance away from the outside environment, and therefore, air-conditioning piping system would need to go through considerable distance to reach this space. Conduits for air-conditioner pipes were laid and connected to the PACS room. This came with additional cost for which the supervising ministry came to our rescue.

**Internet services :** For radiologic images and reports to be projected widely in the hospital through PACS technology, there is need for adequate internet services for end users. Also, with support from the supervising ministry we were able to purchase facilities required for adequate internet services.

**Qualified and trained personnel:** PACS is a highly specialized technology that needed qualified and trained personnel. This system needs trained biomedical engineers, technicians and radiologists. However, these personnel were not readily available at the inception of PACS in our health facility. Diaspora personnel were engaged, though at an extra cost to the hospital, these diaspora personnel later trained local biomedical engineers, technologists and radiologists.

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## **3 Conclusion and Recommendation**

Picture archiving and communication systems have been a revolutionary development in the practice of radiology, a subspecialty of medicine. However, there are few health facilities using this technology to advance health care delivery and promotion in resource poor Sub-Saharan Africa due to alot of challenges involved in its installation and operation. In our facility we were able to surmount these challenges through financial support from the supervising ministry of health of our institution. Therefore, in order to make PACS readily available and functional in Sub-Saharan Africa, increased funding by government and private sector is highly encouraged.

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### **Compliance with ethical standards**

#### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

#### *Authors Contributions*

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version

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