Filmless Hospital with PACS as a Workflow Controller, Case Study National Hospital Surabaya

by Romeo Romeo

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Romeo[1] and Febriliyan Samopa[1]

Abstract–Traditionally radiology produces a visual representation of medical images in film format for further clinical analysis. While some healthcare providers still used films to display scan results, others are embracing the advancing technology of digital medical images. In radiology, this medical imaging technique is generally equated to filmless radiology. However, modern technology has enabled other clinical areas beyond radiology to use digital imaging, including cardiology, pathology, obstetric and gynecology, orthopedic and dentistry. This widely implementation of filmless system in hospital is known as filmless hospital. This paper discusses filmless hospital using picture archiving and communication system (PACS) as workflow controller as a case study at National Hospital Surabaya.

Index Terms–Filmless hospital, medical imaging, picture archiving and communication system, national hospital Surabaya.

INTRODUCTION

PACS has tremendous and values outside of radiology as well as internally benefits [1]. Generally PACS is adopted in radiology to provide storage and convenient access to filmless radiology images, however, combined with emerging technology, PACS has greater ability to deliver a filmless hospital system.

Filmless hospital is designed to connect all systems and sub-systems installed in a hospital to enable certain stakeholders and users in accessing information resulted from imaging modalities. As a result, this technology has changed the clinical and business aspects of medical imaging in hospitals by delivering substantial cost savings from, improved efficiency and quality, and greater access in an era of high demand and severely constrained resources [2].

FILMLESS HOSPITAL

A filmless hospital that uses PACS as workflow controller is required to involve brokering application to enable PACS communicates with modalities (PACS Broker) and be integrated with other information systems and sub-systems in the hospitals (HL7 Broker). This design is developed using Information Infrastructure (II) approach [3], distinguished by unrestricted number and type of users, interconnection of different systems, modules and applications and dynamic development of system portfolio.

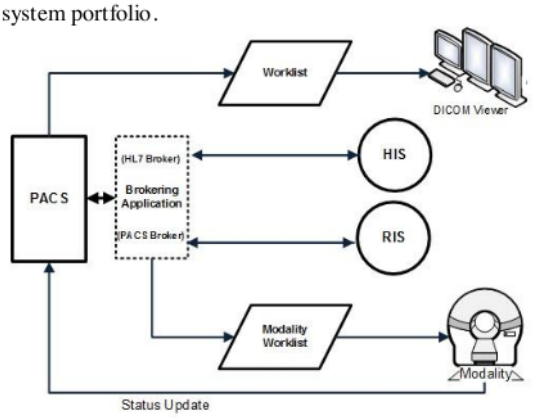

Figure 1. PACS as workflow controller.

Figure 1 illustrates PACS role as workflow controller in filmless hospital, as brokering applications are integrated in PACS. This workflow shows as once a diagnostic appointment is generated, this request is sent through one gate (PACS), before forwarded to modality to produce a work list. As diagnostic appointment is changed (finished or canceled), the information will be communicated through PACS and other associated information systems such as Hospital Information System (HIS) or Radiology Information System (RIS) consecutively. As PACS and RIS have exchanged information to validate the diagnostic results, system will update the work list. Next, the workstation will query data and related medical images to HIS or RIS.

Filmless hospital system has three primary components, including:

I. PACS System

PACS is described as a system that enables acquisition of images and data, storage and display processes are integrated in multiple digital network. In general, a PACS is formed of Client, Modality, Interface and Server. A main server in PACS is functioned as database to store

[1]Romeo and Febriliyan Samopa are with Departement of Information System, Faculty of Information Technology, Institut Teknologi Sepuluh Nopember, Surabaya, 60111, Indonesia. E-mail: romeo@medixsoft.co.id.

digital medical images, which is connected to one or more clients that provide and/or utilise medical images through a local area network or wide area network [4].

II. PACS Broker

The concept of PACS Broker is to enable communication and data and/or information exchange between information systems or applications with imaging modalities that adopt DICOM standard by using WML (Modality Worklist) function and MPPS (Modality Performed Procedure Steps).

III. HL7 Broker

HL7 Broker is application broker designed as hospital information system interface. It has responsibility to translate patient's data into HL7 data format before sent to a system that adopt HL7 standard, for example: HIS, RIS and PACS [5].

SYSTEMS INTEGRATION

Filmless hospital system design in National Hospital Surabaya embraces PACS and existing information systems, HIS and RIS. Integration process for each system to design a filmless hospital system is illustrated in figure 2.

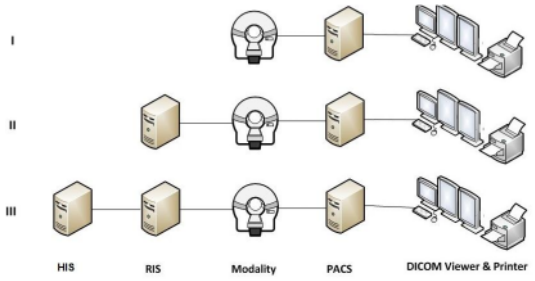

Figure 2. Integration process filmless hospital.

I. Modality is integrated with PACS,
II. Modality that has been integrated with PACS is integrated with RIS,
III. Modality that has been integrated with PACS and RIS is integrated with HIS.

CONCLUSIONS

Developing a filmless hospital requires integration between existing system or sub-system in the hospital and PACS. To succeed the integration, a brokering application and medical standard technology are further requirements. Brokering application is functioned to bridge communication between different systems or sub-systems, while medical standard technology is needed to easily translate data during systems communication, especially when system developers are various.

Specific network architecture implementation in filmless hospital is not necessary except for bandwidth allocation, as medical image files are usually big in size. Compression of medical images is possible to maximize bandwidth usage but image quality should be carefully considered. Compression and decompression method of medical images can be further researched to get better and optimized results

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