THE IMPLEMENTATION OF PACS (PICTURE ARCHIVING AND COMMUNICATION SYSTEM) IN   RADIOLOGY DEPARTMENT OF MARGONO SOEKARJO HOSPITAL

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ABSTRACT

Background: This study aims to determine the evaluation and influencing factors in the implementation of the Picture Archiving Communication System (PACS) at the Radiology Department of Margono Soekarjo Hospital, Purwokerto

Methods: The type of the research is qualitative research with a purposive sampling approach which produces descriptive data in the form of pictures and written or spoken words from informants and observed behavior. Data obtained by researchers is by means of observation, in-depth interviews, and documentation. The data is analyzed using interactive model, for further drawn conclusions.

Results: The results showed that PACS implemented in the radiology department of Margono Soekarjo Hospital, Purwokerto consisted of several components, namely Image Acquisition / Modality, PACS Core Application, Viewing / Reading Station. Image Acquisition / Modality. Factors that influence the implementation of the Picture Archiving Communication System (PACS) at the Radiology Department of Margono Soekarjo Hospital, Purwokerto, were manpower resources, Stability of power supply and Local Area Network, but in the implementation there was no SOP that could be used as operational guidelines for users of inpatient department, polyclinics, and emergency departments.

Conclusions: Suggestions for accessing PACS can be done not only can it be accessed from a personal computer but it can be accessed from a laptop.

Keyword : PACS, Radiology, Margono Soekarjo Hospital

Introduction

Radiology Department is one of the medical supporting units in a hospital. The department serves as patient's medical examination as well as directs the clinicians for their drug treatment. This leads the radiology department to always be ready to provide information needed by other units related to patient services. The given information should be complete, accurate, and fast (Kep Menkes, 2008).

Radiology Information System (RIS) functions as a system which supports the operational function or workflow, and administrative function in a Radiology Department (The Royal College of Radiologists. 2008). RIS does not work alone. It integrates with other systems to hold the establishment of medical procedure

activities. For example, RIS may incorporate with Hospital Management Information System (SIMRS) and Picture Archiving and Communication System (PACS). The latter is a computerized communication method which is able to digitally store medical imaging data, such as digital radiography (DR), computed radiography (CR), computed tomography (CT SCAN), ultrasonography (USG), fluoroscopic, magnetic resonance imaging (MRI), and film-less conventional X-ray image (Tong et al, 2009).

Radiology Information System (RIS) is especially developed for the more advanced information delivery given by radiology department. A part of RIS in hospital is PACS (Picture Archiving Communication System). (Suwarsa, Iwan Iga, 2009).

PACS (Picture Archiving Communication System) has been used since 2014. It presents the advancement of technology in radiology. The change from analog system to the digital one, offers both benefits and challenges. The digital system allows radiology department to manage imaging data resulted from modality, to generate massive images, to produce more equipment, and to diagnose more patients. Besides, PACS also enhances the service efficiency in order to deliver faster and more accurate results to the patients. PACS is a system which functions for receiving, storing, displaying, and distributing medical images.

Methods

The type of the research is qualitative research with a purposive sampling approach which produces descriptive data in the form of pictures and written or spoken words from informants and observed behavior. The research stages are as following:

a. Observation

The researcher directly observed the evaluation of Picture Archiving Communication System (PACS) implementation in Radiology Department of Margono Soekarjo Regional Hospital of Purwokerto.

b. In-depth interview

The researcher had in-depth interview with one specialist, one radiology coordinator in-charge, one ER medical personnel, three inpatient ward medical personnel, three specialists from polyclinic, and one IT technician.

c. Documentation

The researcher used literature, journal, and document which were related the evaluation of Picture Archiving Communication System (PACS) implementation.

Results and Discussion

a. Respondent's Characteristic Description

This was a qualitative research. The data was collected by doing in-depth interview with: a radiology coordinator in-charge, an ER medical personnel, an inpatient ward medical personnel, a polyclinic medical personnel, and an IT technician.

b. The implementation of PACS (Picture Archiving and Communication System)

Radiology service is on of supporting departments in RSUD Margono Soekarjo. The department is led by a radiology specialist. There are also 2 more radiology specialists, 17 radiographers, 3 administration staffs, and a cleaning service officer. The department has 4 units of conventional x-ray devices , 2 mobile units, 1 panoramic unit, 2 CT-Scan devices, 1 MRI unit, 1 Computed Radiography unit, and 1 USG unit.

The department provides some kinds of examination: 1) non-contrast media examinations consists of (a) cranium, b) thorax, c) abdomen, d) pelvis, e) lower and upper extremity, and f) columna vertebra 2) contrast media examinations consists of (a) oesofagusmaag duodenum, b) colon in loop, c) BNO-IVP, e) uretrocistography, f) cistography, and g) HSG, 3) USG examination consists of a) obstetric gynecology and b) abdomen.

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administrative function in a Radiology Department (The Royal College of Radiologists. 2008). RIS does not stand alone. It integrates with other systems to hold the establishment of medical procedure activities. For example, RIS may incorporate with Hospital Management Information System (SIMRS) and Picture Archiving and Communication System (PACS). The latter is a computerized communication method which is able to digitally store medical imaging data, such as digital radiography (DR), computed radiography (CR), computed tomography (CT SCAN), ultrasonography (USG), fluoroscopic, magnetic resonance imaging (MRI), and film-less conventional X-ray image (Tong et al,2009)

c. In implementing Picture Archiving Communication System (PACS), there are some influencing factors:

1) Human Resources

Human resource plays important roles in establishing radiology services as well as in handling and maintaining the newest radiology technology. The resources in Radiology Department of Margono Soekarjo Hospital include 3 radiology specialists, 2 medical physicians, 17 radiographers, 4 general administration staffs, and 2 cleaning service officers

2) Power supply stability

Power Supply is the hardware supporting the computer and other devices' work by supplying electrical current after converting it from AC to DC power. The DC power supply is needed by, for example, hard disk, fan, and motherboard. The power supply is connected through various cables with their own functions which are also needed by computer. Therefore, to support the efficient PACS implementation, power supply stability is much needed as good computer performance is also needed for information delivery.

3) Hospital Local Area Network

Local Area Network is interconnected computer network within hospital working area. This network functions for sharing and editing file securely from one computer to another. It also allows flexible data accessing from different computers, and saves hard-disk memory capacity.

d. Discussion

1) Human resources

The Radiology Department of Margono Soekarjo Hospital is led by a radiology specialist who has worked for 20 years. In addition, there are 3 other radiology specialists as functional doctors, 17 radiographers (5 diploma 4/bachelor graduates and 12 diploma 3 graduates), 4 administration staffs, and 2 cleaning service officers. Those resources perform the implementation of very well. Their competences meet the PACS operational effectively. Thus, it minimizes the damage or trouble which might occur.

Polyclinic PACS users claim that PACS has made the medical services run a lot easier because patients do not need to carry their medical images around since the doctors in polyclinic can directly access them from the computers installed in the polyclinic. The patients have their medical images in form of CD as it can save the images more durable. Besides polyclinic doctors, other personnel who can access the images are the polyclinic nurses and administration staffs.

However, the implementation of PACS in polyclinic does not run well compared to that in radiology department. As much as 50-90 % of the access turns into blank screen or else long loading time. This, of course derails the polyclinic services. Doctors cannot directly decide what the best tratment for the patient since they have trouble reading the images. As a result,

it prolong the patient handling time. Even when the network and server experience error, some of the patients cannot be taken care of. In polyclinic, image access by computer can be done as long as there are network and application, and the access using laptop sometimes is harder. It takes longer time to open an image. SOP for trouble shooting is needed to support the PACS implementation.

Similar to the users from polyclinic, doctors in inpatient ward state that they are helped by the implementation of PACS. The same problem occurs especially when the network is in trouble, they face difficulties in accessing the image needed for examining patients. PACS SOP is required here to anticipate future errors in its implementation.

2) Power supply stability

PACS implementation requires stable power supply in order to avoid damage on the installed devices. The power supply in Radiology Department of Margono Soekarjo Hospital is considered enough and stable. Nevertheless, it still has dangerous potential, especially with the PACS server components. Problem may occur when there is quite long power off, so the PACS server still uses UPS. It is an electrical apparatus mainly functions providing electrical supply for certain parts of computer, such as monitor and CPU. In Radiology Department of Margono Soekarjo Hospital, UPS is installed in all servers or other important parts which need to get sustaining electrical supply.

Here are some functions of UPS:
a) Protecting electronic devices from unstable current or sudden power cut. In the long term, UPS extends the device's life.
b) Stabilizing the current. Gen-set or diesel machine may bring unstable power supply. This potentially breaks the electronic devices. UPS helps the power become more stable.
c) Storing back up power. When there is a power off, UPS prevents the devices experiencing sudden shut-down because it supplies back up power so that we can turn off the devices properly.
d) Saving back up data

3) Local Area Network in Margono Soekarjo Hospital, Purwokerto

The network in PACS server room uses network with UTP Cat 6 gigabyte cable, while the network interconnecting the buildings, uses optic fiber.

UTP cat6/cat6e cable is the premium version of cat5, therefore the price is also much more costly. It gives almost-zero delay in sending data. It also has the maximum length of more than 100 meter with the data width which can be sent is 10 Gbit/s. at its first installment, all of the internal hospital network used UTP, and the network connected to RIS (PACS) was the same network as the network for SIMRS. This caused all network ran slow. However, the problem solved when the network was upgraded from UTP Cat 6 to Fiber Optic, and this results in faster interaction speed.

Conclusion
a. PACS implemented in Radiology Department of Margono Soekarjo Hospital Purwokerto, consists of some components: Image Acquisition/Modality, PACS Core Application, Viewing/Reading Station. Image Acquisition/Modality is the device for generating images which will send the images to PACS, such as, CR, CT, MRI or USG .
b. Factors influencing the implementation of Picture Archiving Communication System

(PACS) in Radiology department of Margono Soekarjo Hospital , Purwokerto, are 1) human resources including radiographer in-charge, competent users from inpatient ward and from ER, 2) stable power supply, because of the installed UPS, and 3) the Local Area Network in radiology department is already upgraded from UTP Cat 6 cable to Fiber Optic.

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