ASSESSMENT OF IMPACT OF COMPUTERS ON RADIOGRAPHY

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ABSTRACT

The study is conducted with the aim to analyze the use and influence of computers on the radiological professionals in radiology department of SKIMS, Srinagar. Majority of radiologists find it easier to compose radiology reports with text and images from different modalities and specialties using computers. About 42.85% radiologists agreed that radiologists lack requisite knowledge of instructional design and computer programming. Majority of radiologic technologists believe that computers have great impact on diagnostic radiology. A working understanding of computers for radiological professionals will improve their workflow practices.

Keywords: Radiological Professionals, DICOM, Images, PACS, Teleradiology.

I.   INTRODUCTION

Computers play a very important role in the field of radiography. They help in formulating radiology reports, with images and text from various modalities. Computed Tomography, Ultrasound, Mammography and Magnetic Resonance Imaging are performed by radiologic technologists. 60 percent of United States households had at least one P.C according to the United States Census Bureau. In radiology department computers are used for transmitting, storage of data or medical records. An X-ray image contains pixel information, patient information, type and place of examination. Smart phones or mobile phones are much more dominant than the computers which were feasible less than a decade ago. More smart phones were sold out than the personal computers in 2010. Further this may change the practice of medicine and medical imaging as hard copy is dissipated by computers. For many years in radiology computers were only used for functions like patient registration and billing. In 1980s PACS (Picture archiving and communication) system began to emanate, but until 1990s commercial system straggle behind. World Wide Web is going to change the way we interact with each other 10 years ago.

PACS comprises software, acquisition equipment (digital images), computer hardware, display hardware and from multiple sources networking and database information. It aims to replace conventional analog paper, films, reports and clinical request form. It provides easy and cost-effective access to images and interpretation from multiple imaging tools.

Digital imaging and communications in medicine is an essential part of PACS. DICOM is universal format used in PACS for transfer and image storage. HL-7 (health level seven) is another standard used in databases information system. It deals with the transfer of patient demographic and other related information.

Hospital information systems provide a common source of information about a patient's health history. The system has to keep data in a secure place and controls who can reach the data. HIS provide internal and external communication among health care providers. Portable devices such as smart phones and tablet computers may be used at the bedside.

RIS (Radiology information system) stores the information of patients who are coming to radiology departments, examination schedule which comprises of time, room allocation and also stores data and radiological reports. Modality work list is an important part of PACS. With information and data redeemed from radiology information system database via Heath level-7 at acquisition device it gives patients lists. It avoided the import errors by allowing the fast access to study which is requested and at modality workstation cut the need to input information.

HIS- RIS- PACS INTEGRATION: It is essential to have integration between radiology information system, Hospital information system and picture archiving and communication system. For having integration between

these systems there are three important reasons. It minimizes error because only once input of data is there. It automatically provides status data or any scheduling and also provides event notice well in advance.

Tele radiology is the conveyance of patient images from one part/location to the other location. To share the images with other physicians and radiologists is the main objective. Tele radiology uses telephone, local area network (LAN), internet, wide area networks (WAN) and telephone. The practice of medical imaging is greatly ameliorated by computers. Computers have foremost to the point of permitting for the transmission, interpretation and storage of digital images. The necessity for hard copy medical images is completely abolished by this.
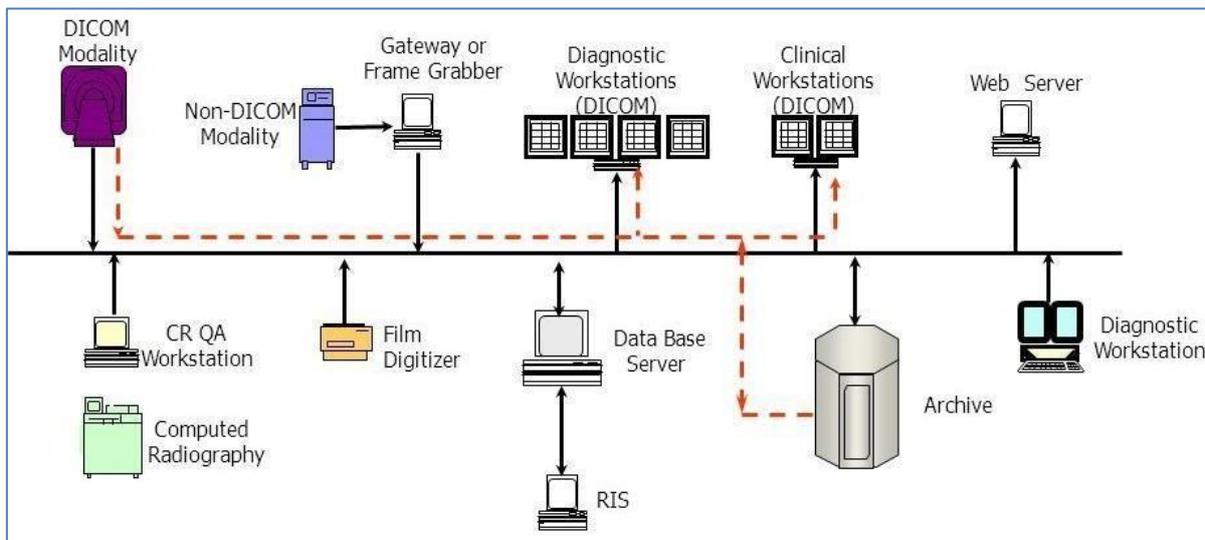
Figure 1: Distributed PACS architecture

II.   AIMS AND OBJECTIVES

Aims

The aim of my study was to analyze the use and influence of computers on workflow of the radiological professionals and to determine the effect on the overall performance of healthcare delivery in radiology department.

Objectives

- To assess the impact of computers on the performance of radiological professionals working in radiology department
- To assess the changes occurring due to computers advancement in radiology department

III.   MATERIALS AND METHODS

Retrospective cross-sectional questionnaire design was used to assess the impact of computers on radiography. This study was conducted in the radiology department among radiological professionals that include radiologists and radiologic technologists of SKIMS, SRINAGAR. The study was carried out among radiological professionals working in radiology department. The aim of the research was to analyze the use and influence of computers on workflow of radiological professionals. The questionnaire was prepared by using Google form and was distributed to different radiological professionals WhatsApp group through internet. Two Google forms were generated one for radiologists and another one for radiologic technologists. Self-structured questionnaire were divided into two sections, demographic data was included in first section of questionnaire that include age, profession, gender and experience in years, basic question regarding the impact of computers on radiography were included in section.

STUDY VARIABLES:

Demographic: according to gender, age group, profession and experience in years and their response regarding the impacts of computer on radiography.

DURATION OF STUDY:

Study was conducted from November 2021 to April 2022

SAMPLE SIZE: 50

Radiologists – 21

Radiologic Technologists- 29

INCLUSION CRITERIA:

In this study all interested and available radiological professionals (radiologists and radiologic technologists) of all age, gender and ethnicity of radiology department were included in this study.

EXCLUSION CRITERIA:

In this study following radiological professionals were excluded: Unavailable and those who did not acknowledge the study.

TECHNIQUE OF STUDY:

In this study all radiological professionals who were interested in the study, they filled the questionnaire and collected data was taken for analysis.

Data collection chart table include radiological professionals age, gender, profession, experience in years and name of topic asked in question. Data was analyzed by using descriptive statistical tools, percentage and frequency mean. Through Google form data collection was done in the form of questionnaire, both open and close ended questionnaire containing objectives and check box based questions.

IV. DATA ANALYSIS

Demographic profile:

Demographic profile was analyzed in order such as sex ratio, age group, profession and experience in years. The questionnaire-based survey was performed. It was given to 50 numbers of radiology professionals which include radiologists and radiologic technologists. After that data was analyzed.

GENDER RATIO:

The total number of radiology professionals who take part in study was 50. The gender ratio of both male and female participants was different. Percentage of male Radiology Professionals was higher, with 78%, than female Radiological Professionals with 22%. The left side of pie chart depicts number of females and right side depict number of males.
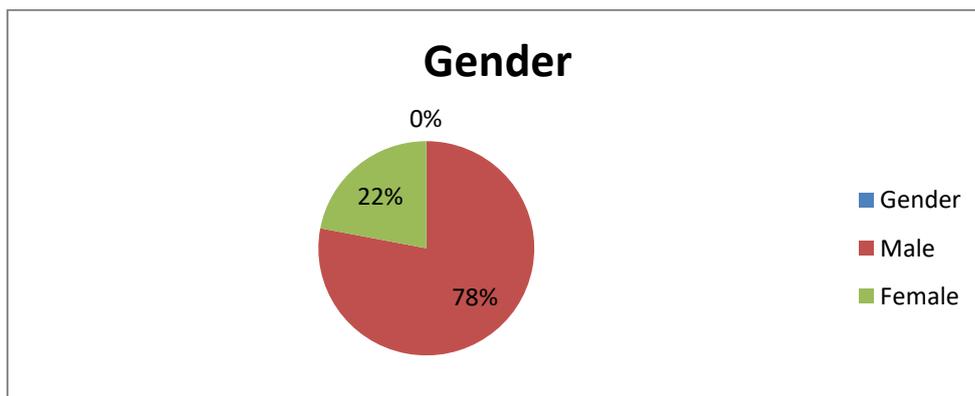
Figure 2: Gender

Table 1: Represents the gender ratio of the radiology professionals

Gender	Gender Ratio	Percentage
Male	39	78%
Female	11	22%
Total	50	100%

PROFESSIONS: The Classification of professionals given in Table 5.3

Table 2: represents the profession of Radiological professionals

| Profession	Total count of RadiologyProfessionals	Percentage
Radiologists	21	42%
Radiologic Technologists	29	58%
Total	50	100%

Profession was divided into (n=2) groups. Study was conducted in which total 50 radiology professionals participated. Out of which 21 were radiologists and 29 were radiologic technologists. Figure 5.3 shows there were more number of radiologic technologists 58% than radiologists 42% who participated in study.
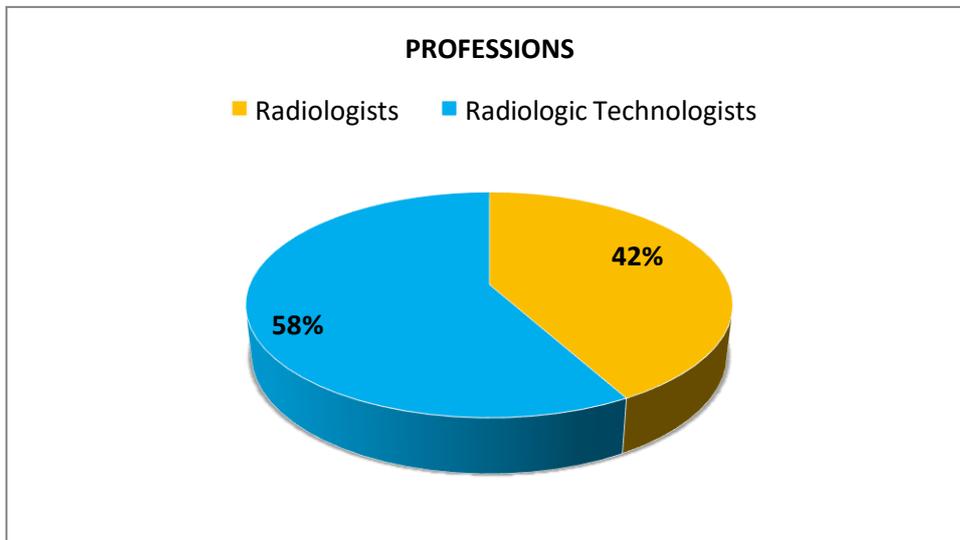
Figure 3: Graphical representation of Professions

Computers made the workflow easy in radiology

Figure 4 below is the graphical representation of the response of radiology professional in the form of funnel graph to the question; do you think computers made the workflow easy in radiology. The red bar or area depicts the 'Yes' response and the absent bar represents the 'No' response.
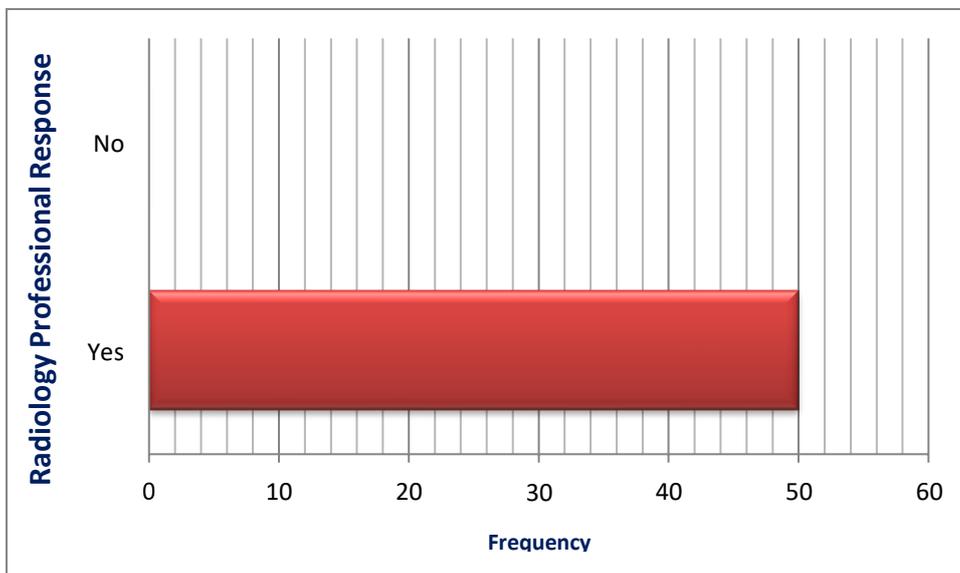

Figure 4: Computers made the workflow easy in radiology

Efficiency of radiologists to interpret images has been increased by computers:

Table 3: Radiologists response to does computer increased the efficiency to interpret images

Response	Frequency	Percentage
Agree	20	95.23%
Disagree	0	0%
Neutral	1	4.76%
TOTAL	21	100%

As we can observe from the table that total 21 radiologists participate in the study, 20 were 'agree', 1 'radiologists' respond was neutral and no one was 'disagree'. The percentage of radiologists who checked Agree was 95.23% and the radiologists who checked neutral percentage for this was 4.76% and for neutral percentage was 0%.
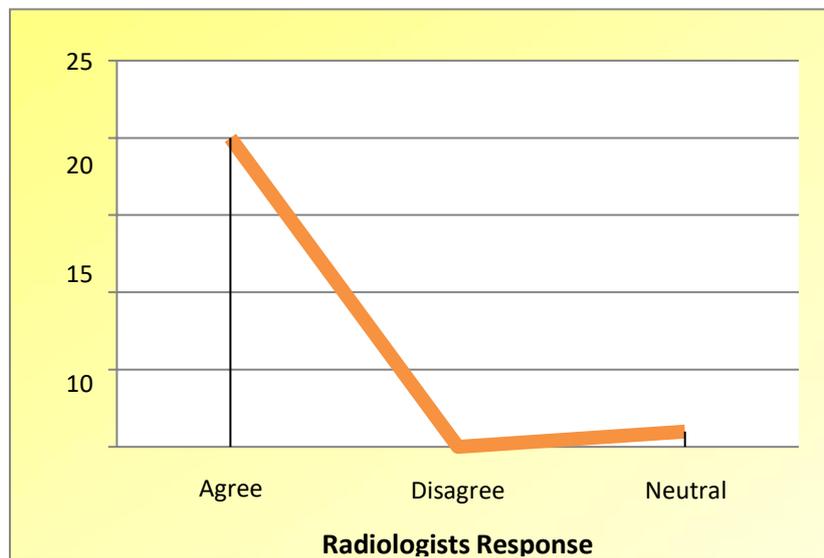
Figure 5: Line graph response of Radiologists

Computers help in composing radiology reports with text and images from different modalities and specialties:

Table 4: Below is showing the number of radiologists who responded either

yes or no and their percentage.

Response	Frequency	Percentage
Yes	20	95%
No	1	5%
TOTAL	21	100%

From above table we can deduct that those 20 out of 21 radiologists responded 'yes', that in percentage come to 95% and 1 radiologist out of the total pool chose 'no' as their response, that values to around 5%.

Figure 6: Doughnut graph of radiologists response

V.   RESULTS AND DISCUSSION

The result of the thesis 'Assessment of Impact of computers on Radiography' conducted is presented here. Total numbers of participants in the study were 50. Out of which 21 were radiologists and 29 were radiologic technologists. The analysis of their demographic profile among the study pool includes gender ratio, age group, profession and experience. Radiologists and radiologic technologists participated in the study. The experience of radiological professionals was divided into 4 groups. In two groups gender ratio was allocated. First group was male consisting of 39 (78%) participants and second group female consisting of 11 (22%) number of participants.

50 (100%) radiological professionals answered yes and 0 (0.00%) to question regarding computers. Almost 20 (95.23%) radiologists agreed that their efficiency has been increased by computers. Majority of radiologists 11 (52.38%) felt that they need a short training on computer. All radiologists 21 (100%) find it easier to measure length, size or volume on computer than on hard copy. The question was given to radiologists to obtain data regarding the knowledge about PACS and DICOM, all radiologists 21 (100%) have knowledge about PACS and DICOM. Radiologists had lack of requisite knowledge of instructional design and computer programming9 (42.85%) radiologists were agree with this statement, 8 (38.09%) radiologists gave neutral response regarding this statement and 4 (19.04%) were disagreed.

VI.   CONCLUSION

Almost all radiologists agree that with the help of computers their efficiency to interpret images has increased. All radiologists find it easier to annotate the organ/pathology on soft copy as it is difficult for them to do it on hard copy. With computers they can interpret more images in less time and also increase their performance. All radiologists find it easier to crop and rotate images on computer then on hard copy. 19 (90.47%) radiologists believe that on contemporary radiology computers have a dramatic influence. Only 7 (33.33%) believe that in term of effective computer assisted instruction other specialties are ahead. Radiologists find it easier to measure size, length and volume on computer than on hard copy. Nearly 9 (42.8%) radiologists feel they have lack of requisite knowledge of instructional design and computer programming. The reason may be they receive only basic training in order to use computer for radiology. All radiological professionals believe that computer enhances image query retrieval and also the future of computer assisted medical imaging is very vivid.

ACKNOWLEDGEMENT

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