LAB REPORT 1

Student's Name
Institutional Affiliation

Question 1

	ITEM	CONTENT	DESCRIPTION
1 Patient level	**Patient's Name**	Peter Parker	This level comprises basic but comprehensive facts concerning the patient, such as the patient's name, physical address, brief history and other matters relevant to the health condition and earlier medication.
2 Study level	**Study**	DX (Digital Radiograph)	This level encompasses information concerning the patient that has already been provided to him. The data from past studies, tests and diagnostics helps provide a precise diagnosis of the patient's existing condition and health problems. Study is enrolled at this level.
3 Series level	**Serie Number**	001	This level refers to the series number that has been accredited to the specific patient and to the patient's precise situation. Series numbers

			display which events have been applied to the patient, and which outcomes have been attained in the course of the diagnosis and study of the patient's situation.
4 Image level	**Image Number**	001	This level covers the basic information concerning the image and its features.

Table 1: Organization of the DICOM chain

The information displayed above comprises of the patient's name, imaging modality, series number, and the image number of the patient in the DICOM server. The details of the patients can be retrieved by clicking on the precise item. Users can view the items in the server from top to bottom.

The functioning of the DICOM server relies on the principles of object-oriented programming (Bourne, 2010). This concept allows information in the database to be stored in the form of objects. Relationships between the classes are defined precisely. Hence, all the related items can be accessed through another item. All future items that have the same characteristics as data items that have already been grouped into objects inherit the characteristics of previous items in the database. Kalet (2009) argues that this feature of classes allows a detailed analysis of all the items contained in DICOM owing to the relationship among items.

Question 2

A novel way of accessing the patient list entails using the keyboard shortcut by concurrently pressing 'CTRL' and 'D'. This method offers many conveniences to the users, since it is quick and easy to remember. Secondly, the users can use two-step clicking. The user first clicks on the 'patient list' menu and then clicks on 'Open DICOM directory'.

One major aim of efficient graphical user interface is to offer simple ways for users to access all the information stored in the database. These two ways are simple to remember, and the users will find them suitable when they are retrieving information from the server (Cowan, 2003). Efficient server and database provide several alternatives for performing similar tasks. This provision aims at ensuring the correct utilization of the resources available in the server. Accurate utilization of server and database resources ensures that other tasks, such as analysis, are conducted properly, and the users can infer meaningful knowledge from the data (Pianykh, 2012).

Question 3

Windowing is a fundamental element of radiology, since it helps users see images clearly. The precision of radiology image viewing governs the accuracy of analysis and afterwards influences the general effectiveness of the medication (Kalet, 2009). Radiologists make verdicts concerning diagnosis after they view these images. Therefore, the diagnosis performed is directly dependent of the efficacy of the image viewing procedures. Bourne (2010) states that precise images allow radiologists to make correct decisions and offer correct treatment to the patients.

The two elements involved in image viewing include window level (L) and

the window width (W). The window level entails the brightness of the image, which differs depending on the quantity of pixels. The width of the image means contrast, which differs contingent on the concentration of the color and the usage of colors inside the image. Radiologists can edit and use elements of the image depending on their needs in order to obtain correct information from the image and make appropriate decisions (Pianykh, 2012).

Users can deploy and alter the image width (W) through the horizontal transition of the crosser. By altering the width, the user can change the quality of the image and place emphasis on specific features to acquire more precise information. In addition to the variations of width, the user can also modify the contrast of the image, thus enhancing the quality of the image and permitting precise focus on a particular aspect of the image. For instance, some images may need changes in contrast in order to disclose possible issues that may otherwise remain unnoticed. Altering the contrast may lead to the detection of darker or lighter parts. Brighter parts of the image may indicate certain health issues in a patient. A possibility to change contrast is very vital in radiology, as it generates greater chances for precise diagnosis and the detection of specific health issues by recognizing the affected parts of the patient's body (Bourne, 2010).

The level of image is a very important feature of radiology imaging, since it determines the brightness of the image. Bright images allow the user to place emphasis on smaller areas, which may lead to the identification of issues that would have been unnoticed (Pianykh, 2012). The user can alter vertical movements, which increases the visibility of the image. Filters are also very helpful, as they permit the user to eliminate unnecessary details and place focus on the precise element of concern. The user can filter the image to attain precise information about the target problem (Kalet, 2009).

Question 4

Similar results were obtained from measuring two lungs. They each measured at 22.78 cm. Pixels were employed to measure the size of the body organs and potential anomalies in them. For example, the size of tumor is very different from the size of other parts of vital organs in the human body. It can hence be detected as an outlier and more focus may be employed to identifying the issue facing the patient. Image contrast is related to the amount of pixels. The measuring tool was adjusted to higher levels when measuring the contrast of the images. This approach allowed the user to view the contrast of the measuring tool compared to the contrast of the body organs. Higher contrast set by the measuring tool allows the user to view exact details of the images.

The measurement of the two lungs was performed, and the same results were attained. The patient underwent radiology imaging, and the DICOM was used to measure both lungs. High-resolution imaging was employed to achieve more exact results. The DICOM used a radio-opaque object and measured then adjusted a 40 mm, which permitted the users to attain visible images of the patient's lungs.

The figure below displays the images of the measured lungs.

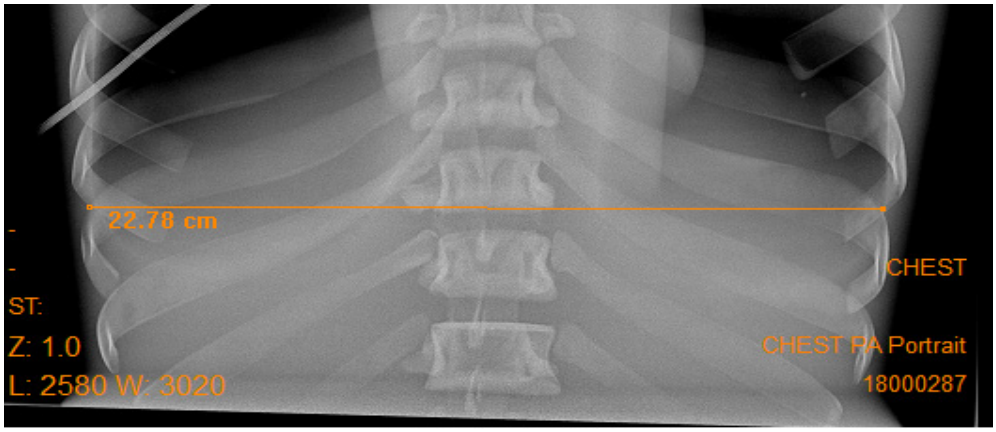

Figure 1: the size of lung bases

Question 5

The word 'Testing' was included in several dialog boxes. The resulting outcome of this process was all dialog boxes immediately updating and changing. The descriptions dialog box involved the use of the supposed diagnosis entered by the user to compare to the outcomes of the testing conducted by the DICOM. The commentaries dialog box also involved the patient commenting on his or her condition and complaining about his current physical condition.

The user provided pertinent information regarding the health of the patient, comprising the initial diagnosis and the supposed diagnosis made by the viewer. Moreover, the user included the subjective information offered by the patient regarding their health condition. The application processed all the facts independently using the data provided by the user. After this information has been processed, the DICOM provided a diagnosis and precise information regarding the health of the patient. All of the information had graphic backup, and the user could obtain the precise information regarding the patient's health. Based on this information, the user could make a certain and accurate conclusion about the patient's diagnosis.

DICOM processed the data provided by the user regarding the patients. The processed information established the issues faced by the patients that were not identified in the preliminary study. Necessary actions were then taken to help the patients recover from the ailment. The dialog boxes were instrumental during the search process for the user, as they helped identify the patients with similar ailments. The patients could then be compared in order to get more accurate treatment.

Question 6

HTML is the universal language used by many web browsers today. Changing the file format of the patients to HTML will make it possible for the files to be accessed online from numerous web browsers. The significance of this process lies in the efficient communication and conveyance of information about the patients' issues among (Bourne, 2010). The constraint of geographic distance would be completely removed. Several medical researchers could document their breakthroughs and challenges in HTML format for other medical researchers to study.

This process would help save a lot of time, since the researchers would have access to the breakthroughs and challenges of the previous researchers. They would hence conduct research on the challenges that have already been solved by past researchers. People from different geographic regions would be able to share and conduct research in a more proficient manner. Such efficient sharing of information allows the medical researchers to attain treatments that are more effective at a quicker rate. Researchers can inquire on several aspects where they have difficulties from the online files stored in HTML format. They can hence advance their research and achieve better treatment of current ailments.

Additionally, the progress made by new medical researchers would be available to other researchers via such online platform. Researchers would only be required to use their web browsers such as Mozilla Firefox or Internet Explorer to access the works of other researchers. They could then save the work in order to access it offline. This move would help them access all the information while saving costs. From this point of view, sharing of important information would be facilitated, thereby leading to efficient dispensation of services, since the development of ideas leads to the improvement of service delivery, especially in the medical field.

Question 7

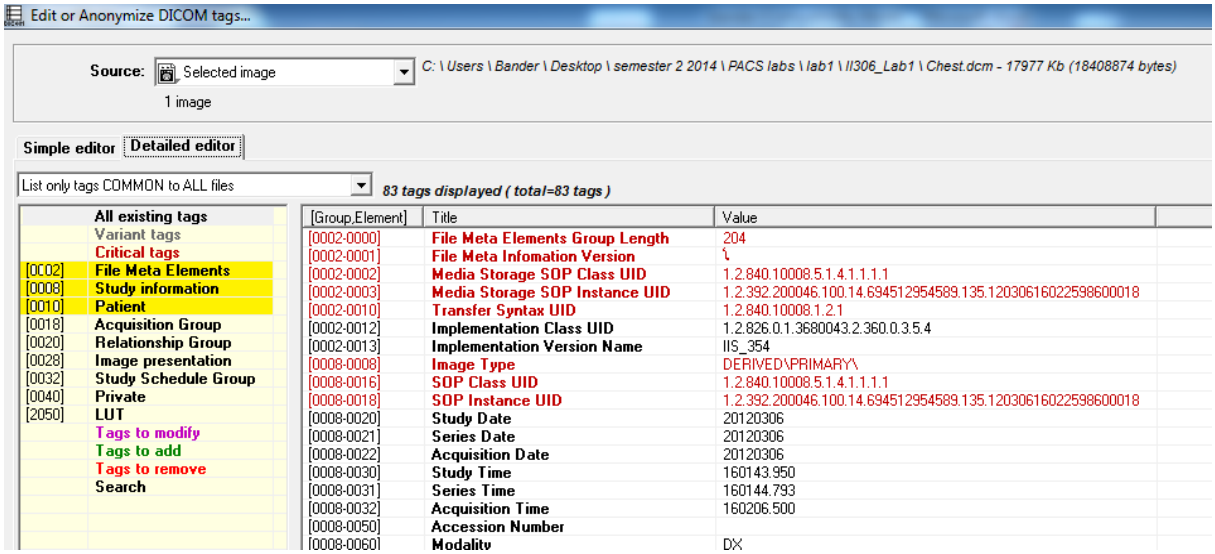

Figure 2: Groups and their numbers in the DICOM

GROUP	NAME
0002	File Meta elements
0008	Study information
0010	Patient

Table 2: Groups and group numbers in the DICOM.

Different numbers refer to different groups. Competent users using the data should analyze the information accurately using DICOM. This application helps users establish what specific group of the item is being accessed. The viewer is concerned with the specific group and precise information appropriate for that group. Users can combine all groups to achieve a wider image of the specific health condition of the patient. Utilization of DICOM minimizes the chances of an error by reducing human involvement in the analysis.

[Group,Element]	Title	Value
[0002-0000]	File Meta Elements Group Length	204
[0002-0001]	File Meta Infomation Version	\
[0002-0002]	Media Storage SOP Class UID	1.2.840.10008.5.1.4.1.1.1.1
[0002-0003]	Media Storage SOP Instance UID	1.2.392.200046.100.14.694512954589.135.12030616022598600018
[0002-0010]	Transfer Syntax UID	1.2.840.10008.1.2.1
[0002-0012]	Implementation Class UID	1.2.826.0.1.3680043.2.360.0.3.5.4
[0002-0013]	Implementation Version Name	IIS_354
[0008-0008]	Image Type	DERIVED\PRIMARY\
[0008-0016]	SOP Class UID	1.2.840.10008.5.1.4.1.1.1.1
[0008-0018]	SOP Instance UID	1.2.392.200046.100.14.694512954589.135.12030616022598600018
[0008-0020]	Study Date	20120306
[0010-0010]	Patient's Name	Peter Parker
[0010-0020]	Patient ID	CPII306Lab1
[0010-0030]	Patient's Birth Date	
[0010-0040]	Patient's Sex	O
[0010-4000]	Patient Comments	testing
[0018-0015]	Body Part Examined	CHEST
[0018-0060]	KVP	100
[0018-1000]	Device Serial Number	18000287
[0018-1020]	Software Versions	1.40.2.0
[0018-1030]	Protocol Name	CHEST PA Portrait
[0018-1050]	Spatial Resolution	0.125
[0018-1152]	Exposure	2
[0018-115E]	Image Area Dose Product	0
[0018-1164]	Imager Pixel Spacing	0.125\0.125
[0018-1401]	Acquisition Device Processing Code	A6,1:SC12,0,15,0:E5,7,0:D5,10:N1:G1
[0018-1405]	Relative X-ray Exposure	76
[0018-1508]	Positioner Type	
[0018-7004]	Detector Type	SCINTILLATOR
[0018-7005]	Detector Configuration	AREA
[0018-700A]	Detector ID	18000287
[0018-700C]	Date of Last Detector Calibration	20120125
[0018-700E]	Time of Last Detector Calibration	134954.603
[0018-701A]	Detector Binning	1\1
[0020-000D]	Study nstance UID	1.2.392.200046.100.14.6945.12954589.135.1.4448
[0020-000E]	Series Instance UID	1.2.392.200046.100.14.6945.12954589.135.1.2806364.1

Figure 3: Tags and their names in DICOM

TAG	NAME
[0008-0016]	SOP class UID
[0008-0018]	SOP instance ID
[0010-0010]	Patient`s name
[0010-0020]	Patient ID
[0010-0030]	Patient`s date of birth
[0018-0015]	Body Part Examined
[0020-000D]	Study Instance UID
[0020-000E]	Series Instance UID

Table 3: Tags and their names in DICOM.

The display of analyzed information by the DICOM is very easy to interpret. Despite numerous aspects being included in the analysis, DICOM has an efficient interface that allows the user to comprehend the analysis and hence take appropriate action.

Question 9

[Group,Element]	Title	Value
[0002-0000]	File Meta Elements Group Length	204
[0002-0001]	File Meta Infomation Version	\
[0002-0002]	Media Storage SOP Class UID	1.2.840.10008.5.1.4.1.1.1.1
[0002-0003]	Media Storage SOP Instance UID	1.2.392.200046.100.14.694512954589.135.12030616022598600018
[0002-0010]	Transfer Syntax UID	1.2.840.10008.1.2.1
[0008-0008]	Image Type	DERIVED\PRIMARY\
[0008-0016]	SOP Class UID	1.2.840.10008.5.1.4.1.1.1.1
[0008-0018]	SOP Instance UID	1.2.392.200046.100.14.694512954589.135.12030616022598600018
[0020-000D]	Study Instance UID	1.2.392.200046.100.14.6945.12954589.135.1.4448
[0020-000E]	Series Instance UID	1.2.392.200046.100.14.6945.12954589.135.1.2806364.1
[0028-0002]	Samples per Pixel	1
[0028-0004]	Photometric Interpretation	MONOCHROME2
[0028-0010]	Rows	3287
[0028-0011]	Columns	2800
[0028-0100]	Bits Allocated	16
[0028-0101]	Bits Stored	12
[0028-0102]	High Bit	11
[0028-0103]	Pixel Representation	0

Figure4: A print screen shot taken for the critical tags.

Critical tags defined in the above figure are vital elements of image observing, transmission and additional purposes. They help to find and detect the target image rapidly and accurately. Hence, users do not need much time to find the information they require. Instead, they use the patient list, and the DICOM discovers the needed information instantly.

Question 10

The following instances may require a change in patient name. Firstly, the user registers any patients with a wrong name or spelling, so that the

correction is required. Patients may be anonymous for educational purposes only. When a patient arrives in case of an emergency, a temporary name may be used, while the official name is being identified.

Question 11

[Group,Element]	Title	Value	Found
[0010-0010]	**Patient name**	Anonymized-{initials}	☑
[0010-0020]	**Patient ID**	{uniquedatetime}	☑
[0010-4000]	**Patient Comments**	Anonymized with DicomWorks	☑
[0008-0020]	**Study Date**	20120306	☑
[0008-0060]	**Modality**	DX	☑
[0008-0070]	**Manufacturer**	Canon Inc.	☑
[0008-0080]	**Institution**	???	☑
[0008-1090]	**Model**	CXDI Control Software NE	☑
[0008-0090]	**Referring Physician**	???	☑
[0008-1030]	**Study Description**	Anonymized with DicomWorks	☑
[0008-1080]	**Supposed diagnosis**	Anonymized with DicomWorks	☑
[0020-0010]	**Study ID**	Anonymized with DicomWorks	☑
[0032-4000]	**Study comments**	Anonymized with DicomWorks	☑
[0008-103E]	**Series Description**		☐
[0020-4000]	**Image comments**		☐
[0028-4000]	**Comments**		☐

Figure 5: A print screen shot taken for the changed tags.

The following were changed

Supposed diagnosis

Study ID.

Study comments.

All the tags mentioned were changed.

Patient name.

Patient ID.

Patient comments.

Referring physician.

Study description

Question 12

Anonymization helps radiologists conduct research discreetly. It allows health care professionals and other users to share information about the patients without disclosing their identities. For instance, educational institutions could use anonymization to learn about the concepts of imaging (Cowan, 2003). The students can learn about various patient conditions without violating the confidentiality. In general, anonymization allows patients to feel comfortable when their results are used for research purposes.

Question 13

Image exporting is very useful for sharing information about a patient's health condition. The DICOM offers information and image sharing opportunities to help users increase communication and to augment the effectiveness of health care facilities offered to the patient. Image sharing helps health care professionals share information faster and obtain more accurate data about the health of patients, as well as to create more effective methods of treatment. Images obtained with the help of the DICOM can be printed or exported to a CD (Kalet, 2009). However, some patients request their previous diagnostic images to be consulted by another physician from a different hospital. Exporting images to external storages helps radiologists back up patient data.

Question 14

Importing option available in DICOM helps medical practitioners save time when dealing with patients. For example, patients who have undertaken various diagnostic procedures in the past can have their image imported by

the radiologists when they are conducting follow-up procedures. Radiologists can import the previous images to find the progress of the patients regarding their medical conditions (Pianykh, 2012). Moreover, importing allows radiologists to back up the images of various patients before and after they are prescribed various treatments that suit their conditions.