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Diriyah Hospital CT Scan Service's Readiness for ACR Accreditation: A Gap Analysis

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ABSTRACT

ACR clinical service accreditation Guidelines titled the Practice Parameters and Technical Standards help advance the science of radiology by improving the quality of imaging service to patients. Since the use of computed tomography (CT) has rapidly increased since its introduction in the 1970s, physicians see benefits of using computerized tomography (CT) scanning in their patient care management. It is possible nowadays to perform more examinations on time. However, extending the scope of some examinations, as well as introducing some new techniques occurs sometimes. The ease of acquisition of images results sometimes in unnecessary exposure of patients to radiation, particularly in developed countries. Furthermore, organ doses from CT scanning are considerably larger than those from corresponding conventional X-ray.

The CT scan is the most appropriate modality of receive a traumatic patients. The CT scan is also very effective in diagnosis of traumatic cases with high resolution in real time mode and visualization of fine details with or without the use of contrast medium. CT is now a standard diagnostic tool for patient's pathologies detection, trauma, renal calculi, appendicitis, and heart conditions.

The speed, accuracy and availability of CT technology have rapidly raised the volume of CT scans performed in patients, despite the fact that CT scanning delivers a higher radiation dose to the patient than other available procedures.

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Background Information

CT scan examinations should not be carried out unless a valid request has been received. The request should include such clinical details as are relevant to the examination, clear identification of the person requesting the examination and to whom the report should be directed. CT scan is a high-dose imaging modality and poses relatively high stochastic and deterministic risks to patients.

CT scan earned a well-deserved role in diagnostic radiology, producing cross-sectional and three-dimensional images which permit enhanced diagnosis of many pathogenic processes. The speed, accuracy, and non-invasiveness of this procedure have resulted in a rapid increase in its use. CT imaging, however, delivers a substantially higher radiation dose than alternative imaging methodologies. Another important factor in excessive CT exposures, however, is a documented lack of awareness among medical practitioners of the doses involved in CT usage as well as its significant potential dangers. The bio-effects associated with radiation exposure can be divided into two main groups: deterministic risk and stochastic effects. The deterministic risk is a function of radiation dose delivered to an organ or body region. Deterministic effects of radiation are seen above a threshold dose, with higher doses promoting more severe effects; these are rarely seen in diagnostic radiology, but may become a problem with angiographic procedures, including CT fluoroscopy. In addition, temporary hair loss has been reported in patients undergoing multi-detector row computed tomography brain perfusion studies in combination with digital subtraction angiography. Stochastic effects are dependent upon a complex series of events, including cell transformation. Stochastic effects may appear as a cancer in the patient or as genetic abnormalities in their children. The probability of seeing stochastic effects increases with the amount of radiation, but the severity of the effect is independent of the dose of radiation received and body composition. It is often difficult to obtain reliable values of patient doses from such phantoms. If scan parameters are kept constant for all CT examinations, much larger doses will result with most patients than with adults.

In order to protect patients from undue exposure to radiation, the FDA has established guidelines to: (1) Improve CT exposure factors in order to reduce unnecessary patient radiation dose and perform more extensive quality checks to validate the reported

dose values; (2) Reduce the number of procedures requiring multiple CT scans; and (3) Utilize alternative, lower dose.

Radiographic exams wherever possible to facilitate dose adjustment for patients, some equipment manufacturers have incorporated automatic exposure control (AEC) in their CT scanners. An AEC adjusts dose according to patient size and optimizes radiation dose within a single patient using dynamic tube current. While CT scan remains a crucial tool for patients diagnosis, physicians, radiographers and health authorities need to work together to reduce the radiation dose to patients to as low as reasonably achievable.

The need to train radiology personnel, establish protocols, and continuously monitor the performance of CT equipment to control patient CT doses is of utmost importance. Radiologists and other imaging staff must learn that dose adjustment according to size, weight and scanning area plays an important role in radiation dose reduction in CT. Education about high radiation doses during CT examinations can reduce patient exposure and risk with no loss of image quality.

The Problem

Physicians' use of CT scans has significantly increased since its introduction to medical practice. That medical imaging procedure could increase a patient's risk, the need of better guidelines is necessary.

The Objectives

- To improve CT scan studies.
- To increase productivity by improving the performance of the radiology department.
- To save the time of the patient.
- To find solutions for further development in radiology department.
- To decrease radiation hazards for the patient, practitioner and the environment.

Materials and Methods

The materials and methods utilized in the study is a comparison list about quality imaging standards in CT scan between ACR'S and ***Diriyah*** Hospital. The comparison involved 12 Standards and 55 Substandard [1-3].

Table 1

The Accreditation standards	Substandard	Facility +ve or -ve	+=1 -=0
1-Personnel Qualifications	1-1. The Medical Director Each radiation oncology program must have a medical director who is a radiation oncologist	Positive	1
	1-2. Radiation Oncologist Certification in Radiology by the American Board of Radiology (ABR)	Positive	1
	1-3.Qualified Medical Physicist American Board of Medical Physics (ABMP).	Positive	1
	1-4.Radiation Therapists and Simulation Staff:- American Registry of Radiologic Technologists (ARRT),	Positive	1
	1-5.Dosimetrist Medical Dosimeters Certification Board (MDCB)	Negative	0
	1-6.Patient Support Staff should have appropriate nursing credentials and appropriate experience in the care of radiation therapy patients. Oncology nursing certification is encouraged.	Negative	0
2-Check list for Site Survey	2-1.paper charts :- A list of physician, physicist, and dosimetrist with their signatures and initials found in the patient records with printed identification beside each signature	Negative	0
	2-2.CVs for all physicians and physicists	Positive	1

3-Quality Control and Improvement documents, including:	3-1...Radiation Safety Program documentation. 3-2.Physics Quality Control documentation. 3-3.Quality Assessment and Improvement Meeting minutes. 3-4.Focus Study and internal outcome documentation. 3-5.Physician Peer Review documentation 3-6.Continuing Medical Education (CME) credits for all staff. Licenses and/or certification for all staff.	Positive Positive Positive Positive Negative Positive	1 1 1 1 0 1
4-Case Review	**4-1.A minimum of two computers** with dual monitors, each with wired internet access **4-2.Two staff members** (Radiation oncologist, dosimetrist, physicist, etc.) available throughout the day to provide assistance as needed	Positive Positive	1 1
5-On-Site Survey	5-1.Procedures for instrument Calibration and periodic instrument constancy checks. 5-2.Establish baseline performance values for radiation therapy equipment. 5-3.Physics chart check protocol for reviewing treatment delivery 5-4.Procedures for checking the integrity of mechanical and electrical patient care devices 5-5.Radiation protection program As it pertains to radiation oncology. 5-6.Calculations related to patient dosimetry and/or physics measurements when such Needs arise or per clinician's requests.	Positive Positive Positive Positive Positive Negative	1 1 1 1 1 0
6-Random On-Site Surveys	6-1.verify that accredited facilities maintain consistent quality during the three–year accreditation period	Negative	0
7-Multiple Sites Surveys	7-1.The physician group Has a single medical director. 7-2.The physicist group Has a single director. Physicians' peer review includes all the practice sites 7-3.All practice site Utilize uniform treatment methods. 7-4.All practice sites have uniform chart organization and forms	Positive Positive Positive Positive Positive	1 1 1 1 1

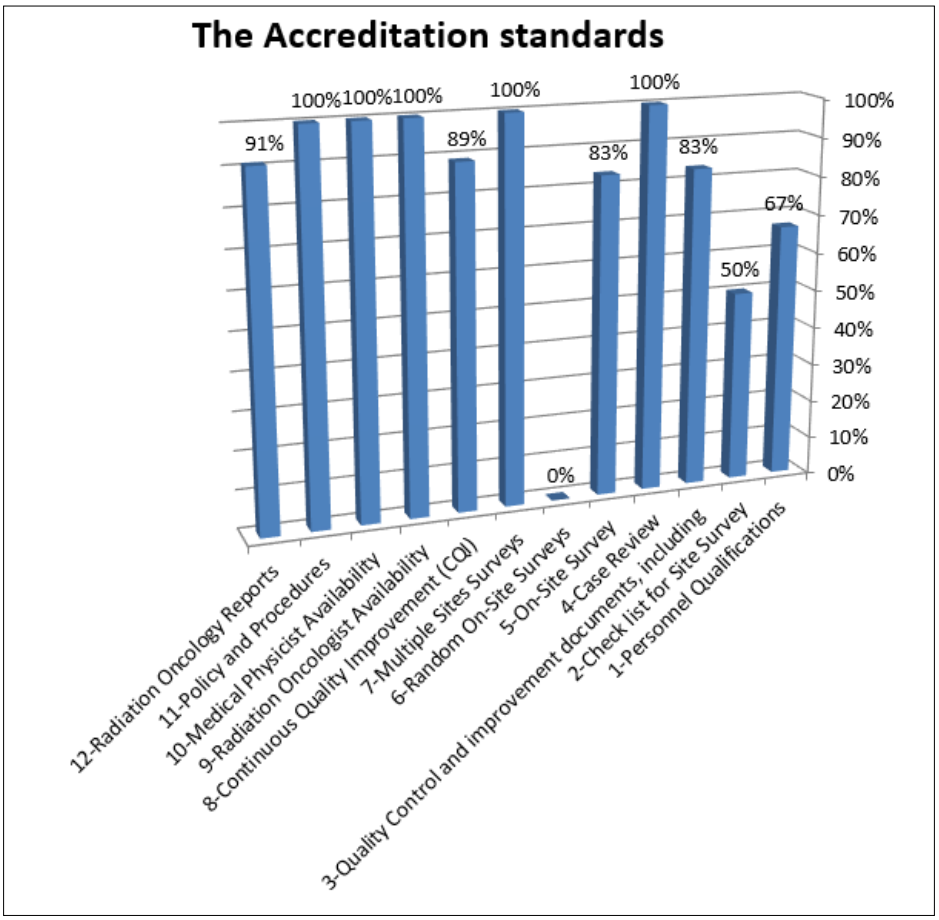
8-Continuous Quality Improvement (CQI)	8-1.Chart review is required and should include cases in which there is a variation from prescription of greater than 10% of intended total dose, 8-2.Morbidity and mortality review. 8-3.Review of internal outcome studies (patient related to post treatment issues, i.e., side effects, quality of life) which include radiation oncology patients. 8-4.Focus studies (Facility Practice Improvement-department improvement activities/ projects that are measured). 8-5.Individual physician/physicist peer review 8-6.Patient satisfaction surveys. 8-7.New patient conferences 8-8.Port film/image review. 8-9.Chart rounds.	Positive Positive Positive Positive Positive Positive Negative Positive Positive	1 1 1 1 1 1 0 1 1
9-Radiation Oncologist Availability	9-1.A radiation oncologist should be available for direct care and quality review and should be on the premises whenever radiation treatments are being delivered.	Positive	1
10-Medical Physicist Availability	10-1The medical physicist must be available when necessary for consultation with the radiation oncologist and to provide advice or direction to technical staff when a patient's treatments are being planned or patients are being treated.	Positive	1
11-Policy and Procedures	11-1.Time out policy for simulation and treatment 11-2.Administration of contrast (if applicable) 11-3.Image guidance and port film policy: A set of patient positioning or target localization images should be taken at least weekly and for any new fields. Verification images should then be reviewed by the radiation oncologist prior to the next treatment. 11-4.Disaster Plan: The facility should have a written disaster plan incorporating plans for: -Prolonged power failure -Prolonged information system failure -Loss or release of radioactive materials -External threats including natural disasters. 11-5.Infection Control. 11-6.Radiation Safety.	Positive Positive Positive Positive	1 1 1 1

12-Radiation Oncology Reports	12-1.Chief complaint	Positive	1
	12-2.History of present illness	Positive	1
	12-3.Past medical illness including any prior radiation or other cancer therapies	Positive	1
	12-4.Current medications and pertinent allergies (e.g., medications, contrast agents, foods, latex)	Positive	1
	12-5.Family medical and patient social history	Positive	1
	12-6.Vital signs, including pain and nutritional assessments	Positive	1
	12-7.Physical examination	Positive	1
	12-8.Diagnostic test results, particularly pathology, imaging, and staging studies	Positive	1
	12-9.TNM classification of the tumor(s) and/or the clinically appropriate staging	Positive	1
	12-10.Impression or clinical assessment	Positive	1
	12-11.Plan of care or management	Negative	0

Results

This study took four months from October 2022 to February2023 at ***Diriyah*** Hospital. It investigated CT scans Service's readiness for ACR Accreditations. After analysis of the collected data using the measure of central tendency descriptive statistics - graphical Excel program the following results were found:

The Data Analysis



Data Analysis Results

NO.	The Accreditation standards	Percentage of Accreditation standards In King Khalid Hospital compared to ACR'S
1	Personnel Qualifications	67%
2	Check list for Site Survey	50%
3	Quality Control and improvement documents,	83%
4	Case Review	100%
5	On-Site Survey	83%
6	Random On-Site Surveys	0%
7	Multiple Sites Surveys	100%
8	Continuous Quality Improvement	89%
9	Radiation Oncologist Availability	100%
10	Medical Physicist Availability	100%
11	Policy and Procedures	100%
12	Radiation Oncology Reports	91%

Discussion

In the twelve Accreditation Standards and fifty five Sub-standards, eight facilities of them are negative which equal 15% Gap in quality imaging standards in CT scan service: They are 1-medical dosimeters certification board,2-support staff, 3- paper charts ,4- physician peer review documentation, 5-calculations related to patient dosimeter, 6-verify that accredited facilities maintain consistent quality during the three–year accreditation period,7-New patient conferences and 8-plan of care or management, while forty seven are positive, which equal 85% readiness in quality imaging standards in CT scan service's at Diriyah Hospital. Service staff of medical dosimeters certification board was not available at King Khalid Hospital compared to ACR'S. Also, there was no patient support staff with appropriate nursing credentials and appropriate experience in the care of radiation therapy patients. A list of physicians, physicists, and dosimeters with their signatures and initials found in the patient records .There are no dosimeters beside each signature, printed identification, most of the Physician Peer Review documentation is not applied. The calculations related to patient dosimetry or physics measurements when such needs arise or per clinician's aren't requested. Accredited facilities maintain consistent quality during the three–year accreditation period is not available. Also there are no new patient conferences, and rating scales for measures of symptom severity, treatment response and the efficacy of treatments in treatment studies of patients with mental disorders.

Conclusion

The role of quality imaging Accreditation Standards in CT scan mission is obviously clear in serving patients and society. Also, with advance radiology which improves the quality of patients care and ACR guidelines that assists in improvement of practitioners performing CT scan services in the radiology department, will lead to a high level of CT scan services readiness We Recommended The physicians peer review documentation should be applied. The calculations related to patient dosimeter or physics measurements should be available.The patient conferences are very important as a substandard to take place in Diriyah Hospital about CT scans Service.

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