



Saudi Scientific Society for Biomedical Engineering

# Campaign on Radiation Protection in Diagnostic Radiology

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# Imaging Equipment



- **Since the Beginning**
  - X-rays discovery **1895**
  - First chest X-ray **1896** (Edwards) **AND**
  - **Radiation side effects**
- Decades of technology advancement
  - multi-slice CT scanners, digital technologies, portable/compact
- Growth in utilization
  - Radiology, O.R, patient side
- Increase in the associated radiation burden to patient and healthcare workers

# International concern

- Healthcare community, organizations, societies
  - aware of radiation to populations by medical imaging
- In 2010, the Food and Drug Administration (FDA) launched a cooperative initiative to reduce radiation exposure from diagnostic imaging
- Substantial efforts to improve the practice
- **Raise awareness-** universal impact, unregulated radiation exposure from diagnostic imaging equipment in facilities providing services

# Current status in Saudi Arabia

- KACST licensing , does not include diagnostic services
- Several initiatives by the Ministry of Health (MOH)
  - Directorate of Environmental Health & Occupational Health
    - TLD central reading offices
    - Recommendations for building specifications
    - QC program among MOH hospitals
  - Does not include private sector
  - Comprehensive report by SFDA (5 years?)

# Current status in Saudi Arabia

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- Up to Date: “ safety in diagnostic radiology” is subject to individual hospital policies and guidelines.
- The practice is “ not standardized” throughout the Kingdom and is subject to resource availability and qualifications of personnel in each facility.

# Who is SSSBE



The Saudi Scientific Society for  
Biomedical Engineering

Imaging equipment - part of the  
biomedical engineering's responsibility  
from time of pre-installation, acceptance  
and during its use.

operation and function: 'Quality control'  
procedures, to ensure correct operation and  
calibration

# Campaign goals

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- Raising awareness concerning radiation exposure from diagnostic imaging equipment
- Educate and train equipment support team: biomedical engineers, medical physicists, technologists to play their role in dose reduction and optimization
- Ensure continuity and sustainability of the awareness in all provinces of the Kingdom as a whole.
- Work as a **team** to make a DIFFERENCE

# Translate knowledge into action

- Multidisciplinary teams- to encourage & to develop expertise
- To translate evidence into practice
- To establish simple guidelines to be followed by all providers of diagnostic imaging services
- To build a healthcare system that is **standardized** within public and private sectors across the kingdom
- To monitor and audit numbers yearly



# Campaign objectives & rationale

- a year-round diagnostic radiology safety attitude
  - ▣ to educate (high dose services)
  - ▣ to intensify and scale-up national awareness on need to standardize current practice
- Increase awareness of policymakers, and health professionals about the need to enforce regulations and guidelines in their work environment with regards to radiation exposure and dose reference levels.

# Phase I



Started in April 2013 with workshops and lectures on quality control in diagnostic radiology

Includes two leaflets

1. Targets medical practitioners , **9** questions, basic radiation protection principles
2. Targets biomedical engineers, physicists, technicians, the essential quality control tests needed to ensure safe operation (dose optimization)

# Phase I



- Distribution of leaflets in hospitals and healthcare facilities throughout the Kingdom of Saudi Arabia
- Lectures by members of the SSSBE
- Email communication, to receive details on how to perform “essential 5” quality control tests
- The awareness has just begun

# Phase II



- The General Public
  - Misconceptions
  - Translation error
  - Patient imaging card/id
  - Awareness activities & lectures
    - I want it , “ its free”
    - repeated imaging requests (8 in 1 month)
      - Educational tools?! (do they really need it)
      - NICU ( daily portables with no shielding)
      - Insurance (its free, full checkups)

# Image Gently & Image Wisely



Visit [IMAGEGENTLY.ORG](http://IMAGEGENTLY.ORG) for pediatric protection information.



- leading medical societies, agencies, and regulatory groups (JOINED) forces to impact patient care/change practice
  - CT doses to children ; key points:
    - Reduce amount of radiation used
    - Scan only when necessary
    - Scan only the indicated region
    - Scan once
- Referring practice
- Appropriateness criteria
- Patient imaging record
- Pledge to IW
  - to optimize radiation dose
  - to participate in a dose index registry

# “ 10 Pearls” by IAEA

<https://rpop.iaea.org/RPOP/RPoP/Content/AdditionalResources/Posters/index.htm>

**Resist patient wishes to be examined when you feel it is not necessary**

Doctor, don't you think I should have a new chest CT scan? Just to be on the safe side



No Ms Williams, I really think that this examination will not add something to the correct assessment of your condition



Tell me please: Have you had any other CT scans recently?

**Repeat scanning of the patient to save time because previous records are not readily available is not part of a good practice**

# 9 Questions

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1. Do you wear your TLD?
2. Do you wear appropriate protective tools if required?
3. Are the rooms designed for radiology equipment?
4. Do you shield your patients?
5. Do you work with image imperfections to protect your patients from overdose?
6. Do you question the appropriateness of imaging requests?
7. Do you choose the right protocol depending on patient's age and size?
8. Do you conduct lead apron tests yearly?
9. Are quality control tests being conducted regularly?

# Essential 5 Quality Tests



Saudi Scientific Society of Biomedical Engineering  
Campaign for Quality of Diagnostic Imaging Equipment

Radiation  
safety  
in  
Diagnostic  
Radiology

Patients' radiation  
exposure is  
dependent on  
equipment  
performance.

If the equipment is  
not looked after,  
if yearly quality  
control tests are  
not conducted,  
then patients' radiation exposure  
is your  
responsibility.

If you need  
information on  
how to perform  
these tests  
send us an  
email and we  
will send you  
the complete  
procedure with  
the necessary  
tools to do so.

Send  
RadSafety.Kau@gmail.com

## Essential Quality Tests for X-ray Equipment



- Ionising radiation is used to produce images in diagnostic radiology
- Tracking equipment performance is crucial for safe practice
- You are responsible for the radiation dose every patient received during their radiological examination
- So make sure x-ray producing equipment go through the essential quality control tests every year

## Compulsory tests to be conducted every year

- Automatic Exposure Control (AEC) test
- Kvp & mAs reproducibility and repeatability
- Half Value Layer test
- Alignment of collimator and x-ray field
- Mean glandular dose test (for mammography)

Supported by



KAUH  
Medical Physics



الجمعية العلمية السعودية للهندسة الطبية  
حملة قياسات الجودة لأجهزة الأشعة التشخيصية

## إختبارات الجودة النوعية الأساسية لأجهزة الأشعة

- أجهزة الأشعة التشخيصية تستخدم أشعة مؤينة لتكوين الصورة
- لذا التأكد من أداء الأجهزة مهم لممارسة آمنة
- أنت مسؤول عن الجرعة الإشعاعية التي يتعرض لها كل مريض
- تأكد من أن أجهزة الأشعة تخضع لإختبارات معايرة وجودة كل عام



## إختبارات مهمة للإجراء كل عام

- إختبار التعرض التلقائي (AEC)
- تكرار واستتساخ ناتج الأشعة (الجهد)
- إختبار طبقة تصف القيمة الإشعاعية
- موانسة و توافق مجال الإشعاع و المجال الضوئي
- إختبار متوسط الجرعة (نقص الندى بالأشعة)

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الدعاية من الإشعاع  
في أداء الأشعة  
التشخيصية

الجرعة الإشعاعية التي  
يتعرض لها المريض عند  
إجراء فحوصات في  
أقسام الأشعة تحدد على  
أداء أجهزة الأشعة و  
سلامتها.

إذا كنت الأجهزة مهمة  
ولا تخضع لقياسات جودة  
نوعية بشكل دوري .  
فإن جرعات المرضى  
الإشعاعية في نفسك و أنت  
مسؤولون عنها .

إذا كنت في حاجة  
إلى معلومات حول  
كيفية إجراء هذه  
الاختبارات فأرسل  
لنا رسالة بالبريد  
الإلكتروني وسوف  
نصلك الإجراء  
التفصيلي مع الأوراق  
اللازمة للقيام بها .

Send  
RadSafety.Kau@gmail.com



# Essential Quality Tests

- **5 Essential Tests**
  - Equipment not looked after
  - No yearly quality control tests conducted
  - Patients' radiation exposure is unknown
  
- **Automatic Exposure Control (AEC) test**
- **Kvp reproducibility and repeatability**
- **Half Value Layer test**
- **Alignment of collimator and x-ray field**
- **Mean glandular dose test (for mammography)**

# To change the practice

## □ **Enforce national laws and regulations**

- monitor **diagnostic** imaging equipment performance
- enforce routine **Quality Control tests**
- enforce **shielding** of patients
- enforce **appropriateness** criteria for imaging
- modify protocols (patient size, dose reduction)
- establish patient imaging record
- establish **Dose Reference Levels**
- issue a **license** to DRS
- force full-time in house **RSO**, Biomed, Physicist
- approve **design** and specification of area (purpose built)

# Summary

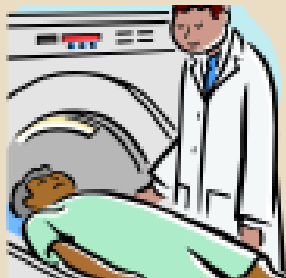
- Collaboration among stakeholders of diagnostic imaging practice, physicians, technologists, engineers, physicists, patients, professional societies, and government sectors **has proven** to effectively change the practice worldwide....
  - **National Dose Reduction Initiatives**
  - **Pledges: appropriateness, monitor, audit, and reduce**
- **We aim for a radiation Safe Culture**

# Thank you & remember

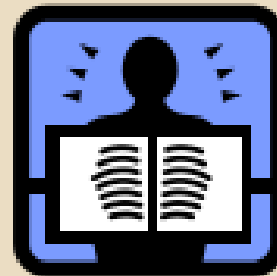
## CT practice- overused, under-regulated

**CT scans are among the most common radiation dose burdening examinations for patients**

**1 x**



**≈ 500 x**



**The effective dose from one chest CT scan may be equal to the corresponding dose of about 500 PA chest X rays**

Reference: <https://rpop.iaea.org/RPOP/RPoP/Content/AdditionalResources/Posters/index.htm>