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Organisation of acceptance and QA programme (example from X-ray Diagnostic Radiology)

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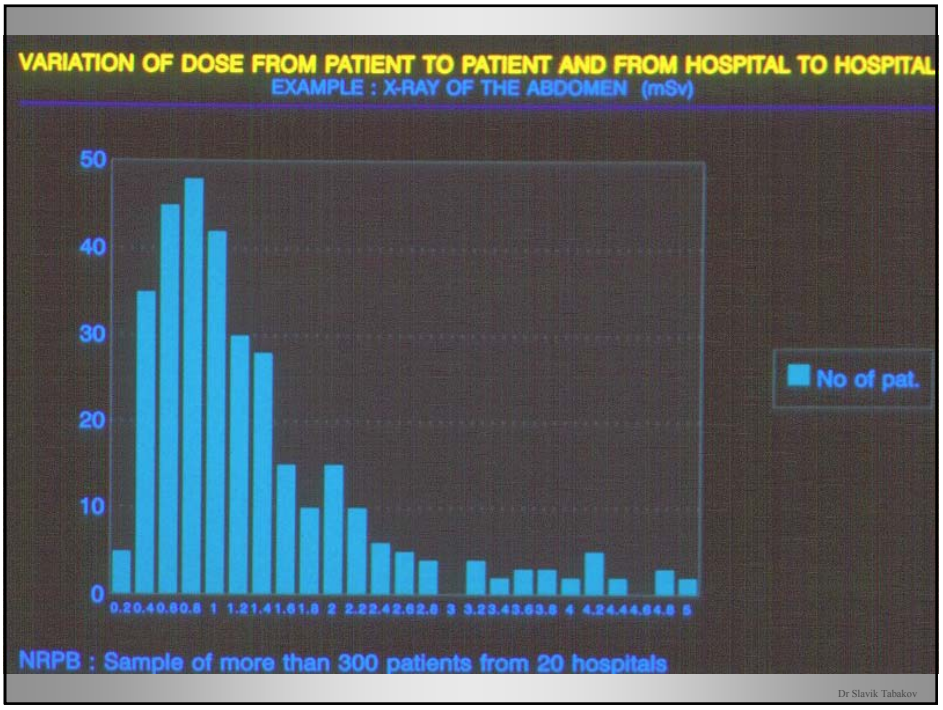
Introducing Quality Assurance programmes, which includes Quality Control surveys of X-ray equipment

Quality Control (QC) in X-ray Diagnostic Radiology includes regular (yearly) tests of various parameters - accuracy and consistency of X-ray tube output, kVp, timer, variation of output with the mA, Half Value Layer, image resolution and contrast, noise, etc.

These parameters are directly related to equipment performance, image quality and patient dose.

Now QC is the main job of most Medical Physicists in Imaging



Development of Quality Assurance measures

- Legislative basis
- Development of QA programme
- Training the staff
- Establishing of QA Group (Department)
- Development of Quality Control protocols
- Close collaboration with the Medical Staff
- Quality Management

EC Directive 97/43 EurAtom

on Radiation Protection of Patient :

…Member states shall insure that:

- appropriate quality assurance programmes including quality control measures and patient dose or administered activity assessment are implemented by the holder of the radiological installation

- Acceptance testing is carried out before the first use of the equipment for clinical purposes, and thereafter perfomance testing on a regular basis, and after any major maintenance procedure …

(introduced May 2000)

EC Directive 84/466
EurAtom : A qualified expert in radiophysics (QEr) to be available to sophisticated departments of radiotherapy, nuclear medicine, *diagn. radiology"*

EC Directive 96/29
EurAtom on Radiation Protection of Workers

EC Directive 97/43
EurAtom on Radiation Protection of Patient:

…each country to assure a **medical physics expert** to be involved in various procedures... to assure adequate training of medical physicists … introduced in May 2000

A number of Conferences and Seminars across Europe
Preparations by EFOMP and all National Societies

QUALITY ASSURANCE IN DIAGNOSTIC RADIOLOGY (Regulations..)

- Quality Assurance (QA) programmes should be set up in X-ray departments to ensure the continual production of optimum quality images with the minimum necessary dose to the patient. These programmes should include checks and test measurements on all parts of the imaging system at appropriate time intervals not exceeding one year..
- A record of maintenance, including QA should be kept for each item of X-ray equipment..

(Guidance Notes for the Protection of persons against Ionising Radiation arising from Medical and Dental Use) UK

Development of a QA programme

- National requirements (Euratom > National Regulations)
- Agreement with the Healthcare Institutions (contracts)
- Necessary QC equipment (special funding)
- QC protocols for various types of equipment
- QA training of the staff
- Report keeping & filing system
- Time-schedule
- Quality meetings/reporting
- Equipment calibration procedure
- External Inspections

Development of QA protocol

- General aim
- Parameters to be measured
- QC Equipment necessary
- Calibration record
- Testing procedure
- Normal values
- Form of the QA protocol
- Protocol Updating procedure
- Address list (specialists/firms)

5.2 ASSESSMENT OF X-RAY TUBE TOTAL FILTRATION

5.2.1 Task
Short explanation of the task; Approx. time for performing the task

5.2.2 Competencies Addressed
Understand and measure the X-ray tube beam filtration

5.2.3 Equipment and Materials
List with necessary Equipment, Materials, Arrangements

5.2.4 Procedures and Measurements

5.2.4.2 For Assessment of X-ray Tube Output Total Filtration
Detailed description of a method to perform the task

Added Al (mm)	Set kV (~80)	Set mA	Set msec	Set mAs (~20-40)	Meas. exp (mGy)	Exp.decr. (%)
+0mm Al	80					100
+1mm Al	80					
+2mm Al	80					
+3mm Al	80					
+4mm Al	80					<50

5.2.5 Calculations

5.2.5.2 For Assessment of X-ray Tube Output Total Filtration
Detailed description of a method to calculate certain parameters

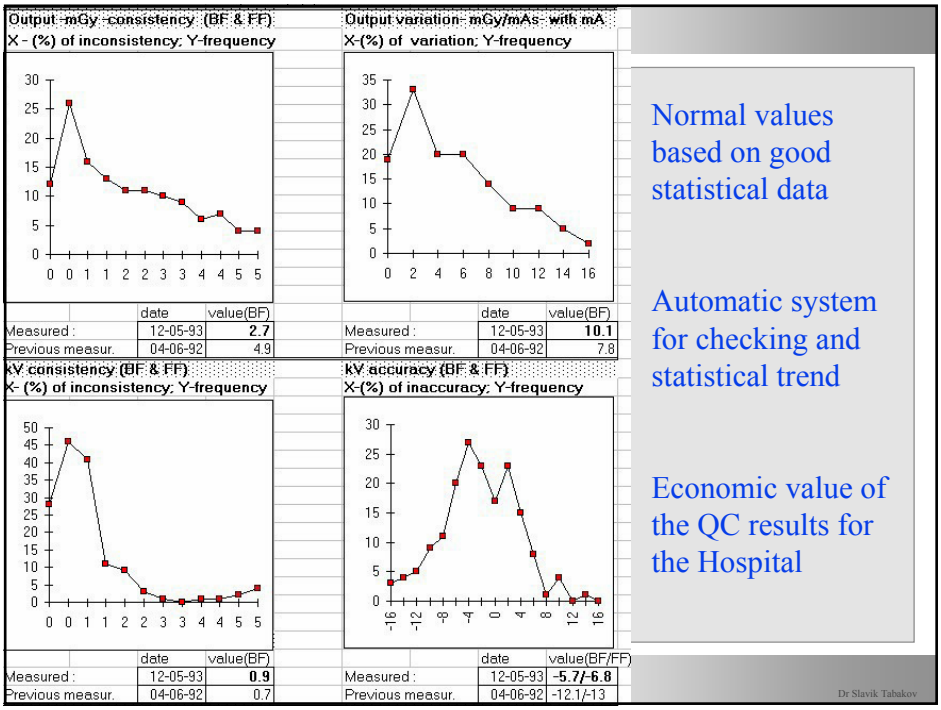
clusions

EMERALD

← **QA protocol with Report sheet**

- strictly followed
- system to update and renew QC
- any problems discussed/reported
- follow-up check
- filing:

BXCT03_115.xls

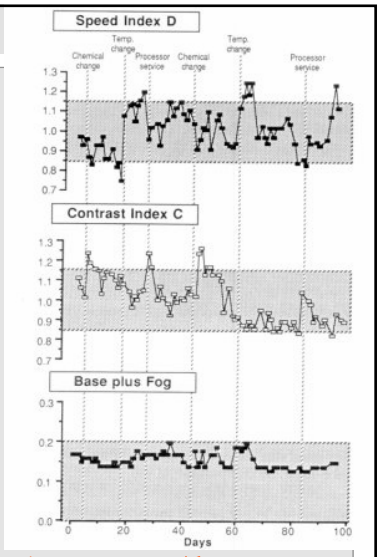


QC surveys - types and intervals

- Acceptance testing (~2d)
- Regular Quality Control
- Radiography (~1/y)
- Fluoroscopy (~2/y)
- Dental X-ray (~1/y or 1/3y)
- CT (~1/y and after some repairs and replacements)
- Other digital X-ray (~1/y)
- After new software install.
- Quality Control on demand
- Special tests/assessments

QC test performed by:

- Physicists (annually X-ray tube and Generator + Image Quality; new equip. Acceptance; on demand or after service)
- Radiographers (daily Film Processing; weekly output dose check; keep record)
- Service Engineers (normally full system check with regular maintenance)



A rough idea for the workload:

Normally 1-2 items (routine X-ray tube or II) per person/day;

A group of 3-4 physicists would serve a region with ~300 items/year

QC survey general schedule

- Booking a time in the Hospital
- Travelling to the Hospital
- Check the X-ray room and equipment for major problems
- Lay out of the QA equipment
- Doing the measurements according to the QA protocol
- Making X-ray pictures
- Writing down all results
- Collecting the QA equipment
- Travelling back to the base
- Calculating the parameters
- Comparing the results with the normal&previous values
- Discussing the recommendations with the QA Officer
- Writing the QA report
- Sending the report to Hospital
- In case with QA problem, check with Hospital/Eng. its solving
- Keeping a copy in the equipment file (in the Med.Phys. base)

How is QC appreciated (most usual pattern) by:

- The public - assuring the safety of the examination;
- Hospital administration - activity required by the law;
- Radiologists - necessary (assures the level of image quality);
- Radiographers - important for their routine work;
- Service engineers - not interested (have their own tests);
- Medical Physicists - essential for the job, but boring…;
- Scientists - not suitable for research;
- Students - enjoyed as the practical part of their learning
- Professional Organisations - very important

Often Hospital management accepts Quality Control (QC) of X-ray equipment as just a necessity linked to specific Regulations.

This might reflect in a superficial attitude to the QC tests linked mainly to "bureaucratic" collection of QC records.

Our studies show the positive effect of regular QC tests on the X-ray equipment performance and image quality, based on long term statistics, and compared with a period without QC tests.

Image Quality / Patient Dose

is the main contradiction in Diagnostic Radiology

due to this reason finding the proper balance between them is the major goal of QC

To ensure:

continuing production of diagnostic images with optimum quality,

using minimum necessary dose to the patient