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**College on Medical Physics:
Imaging and Radiation Protection**

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***Patient Dose Reduction in
Diagnostic Radiology***

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THE POTENTIAL AND NEEDS FOR PATIENT DOSE REDUCTION HAVE TO BE CONSIDERED WHEN APPROACHING THE PROBLEM, THE MAIN POINTS TO KEEP IN MIND ARE:

- A. X-RAY DIAGNOSTIC APPLICATIONS REPRESENT AN ENORMOUS BENEFIT TO THE HEALTH CARE SYSTEM, THE EFFORT TO REDUCE DOSES TO THE PATIENT SHOULD NOT JEOPARDIZE THIS BENEFIT.
- B. ALL THE INTERNATIONAL INVESTIGATIONS CARRIED OUT HAVE SHOWN THAT ABOUT 50% OR MORE OF PATIENT DOSE COULD BE REDUCED BY:
 1. AVOIDING UNNECESSARY INVESTIGATIONS
 - * ACCURATE CLINICAL ANALYSIS
 - * EVALUATION OF ALTERNATIVE INVESTIGATIONS
 - * AVAILABILITY OF PREVIOUS TAKEN FILM
 - * REDUCE REPEAT RATE.
 2. IMPROVING THE TECHNIQUES:
 - * PROTOCOLS OF USE
 - * ADEQUATE TRAINING OF STAFF
 3. IMPROVING OF EQUIPMENT PERFORMANCE
 - * Q.C. PROGRAMME
 4. INVESTING IN EQUIPMENT AND DEVICES:
 - * RAD. PROT. DEVICES (SHIELDED BARRIERS, APRONS, ETC.)
 - * RARE EARTH SCREEN, ETC.
 - * REPLACEMENT OF OLD EQUIPMENT

POINTS 1 and 2 HAVE PROVEN TO BE THE MOST IMPORTANT ONES TO REDUCE THE DOSE. A TYPICAL SIMPLE EXAMPLE IS THAT ONE OF THE MOST SIGNIFICANT CONTRIBUTIONS TO HIGH PATIENT DOSE IS THE USE OF FIELD SIZE LARGER THAN REQUIRED. IT IS IMPERATIVE THAT THE RADIOGRAPHERS SELECT THE SMALLEST FIELD AREA NECESSARY TO OBTAIN THE INFORMATION.

C. A REASONABLE COMPROMISE BETWEEN IMAGE QUALITY AND RADIATION PROTECTION HAS TO BE REACHED.

* ALL TECHNIQUES WHICH IMPROVE THE DOSE HAVE TO BE CONSIDERED CAREFULLY.

* THE TIME IN FLUOROSCOPY HAS TO BE LIMITED TO THE MINIMUM ETC. ETC.

D. THE PAUCITY OF DIRECT EVIDENCE OF EFFECTS FROM LOW DOSES MUST NOT LEAD THE RADIOLOGISTS TO LACK OF CONCERN.

STRATEGY TO OPTIMISE DOSE TO PATIENT

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1. PATIENT DOSE MEASUREMENTS SHOULD BE INCLUDED IN QUALITY ASSURANCE PROGRAMME OR ACCEPTANCE TEST. GENERAL INFORMATION IS UNLIKELY TO BE APPLICABLE.

2. THE PRACTITIONERS SHOULD BECOME AWARE OF THE PROBLEM.

IT IS ADVISABLE TO MONITOR THE ENTRANCE SURFACE DOSE IN EACH X-RAY ROOM FOR A FEW COMMON PROJECTIONS WITH TLDS ATTACHED TO THE PATIENTS SKIN (PATIENTS EXPOSURE MONITOR COULD BE BUILT IN THE EQUIPMENT).

3. THE INITIAL EFFECT SHOULD BE TO ACHIEVE MEAN DOSE LEVEL LESS THAN REFERENCE STANDARDS (INTERNATIONAL INVESTIGATIONS).

IF ABOVE: UNDERTAKE REVIEW OF RADIOGRAPHIC PRACTICE AND TECHNIQUES

4. CEC DIRECTIVE S4/465 (3 SEPT. '84) REQUIRES:

- i. ESTABLISHMENT OF CRITERIA OF ACCEPTABILITY FOR RADIOLOGICAL INSTALLATIONS

- ii. STRICT SURVEILLANCE OF EQUIPMENT WITH REGARD TO RADIOLOGICAL PROTECTION AND QUALITY CONTROL

- iii. INSTALLATION WHICH DOES NOT MEET CRITERIA SHOULD BE TAKEN OUT OF SERVICE.

5. AUTHORITIES SHOULD BE RESPONSIBLE FOR:

- o IDENTIFYING PERSONNEL REQUIRING TRAINING
- o KEEPING RECORDS OF TRAINED PERSONNEL
- o ENSURING COMPLIANCE WITH REGULATIONS
- o ENSURING AVAILABILITY OF EXPERT PHYSICS ADVICE
- o DISSEMINATION OF INFORMATION ON AVAILABLE COURSES
- o MAINTAINING AN INVENTORY OF EQUIPMENT USING IONIZING RADIATIONS

6. EQUIPMENT AND DEVELOPMENT IS PRIMARILY AIMED AT IMPROVING THE DIAGNOSTIC VALUE, (FREQUENTLY ENCOUNTER REDUCTION OF DOSE)

CT -- CANNOT REDUCE THE DOSE WITHOUT
DEGRADING IMAGE QUALITY

USE OF MORE SENSITIVE IMAGING RECEPTORS

- RARE EARTH INTENSIFYING SCREENS REDUCES THE DOSE SUBSTANTIALY (DISCOVERED IN EARLY 70s STILL NOT USED VERY MUCH. STILL LESS THAN 50% IN THE U.K.)
- CARBON FIBRE TABLE TOP
- DIGITAL TECHNIQUES (DIGITAL SUBTRACTION AND RECORDING).

COST-EFFECTIVENESS EVALUATION

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- MANY COMPETING DEMANDS FOR RESOURCES IN THE HEALTH SERVICE, RADIATION PROTECTION IS OFTEN NEGLECTED
- HEALTH CARE MANAGERS ARE FREQUENTLY UNSYMPATHETIC TO THE IDEA OF 'SPENDING NOW TO SAVE LATER (A FEW POTENTIAL DELAYED DEATHS ARE NOT A STRONG JUSTIFICATION)
- COST-EFFECTIVENESS OF RADIATION PROTECTION OPTIONS AND OTHER MEDICAL PROCEDURES COMPETING FOR THE SAME RESOURCES ARE VERY IMPORTANT

