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Quality Control and Patient Dosimetry on line for Computed Tomography

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RP Issues in Nuclear Medicine

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Objective

- To present the functionalities and first results in a big university hospital, of an **automatic system** on quality control and **patient dosimetry** for diagnostic radiology, and its initial application to **Computed Tomography.**

Introduction

- Between 1993 and 2009 the use of CT scans in the United States **increased more than 3-fold** (70 million scans per year are performed)
- The **European Directive** on Medical Exposures requires Member States of the European Union **to assess patient doses.**
- There is a need to use **automatic systems** to archive and process patient dose data.

Methods (1)

- The **QCONLINE system is directly connected to the PACS** of the hospital and extracts useful information contained in the DICOM headers and **Radiation Dose Structured Reports** (RDSRs).
- The full process is automatic and was tested during the past **6 months for 11,500 procedures in three CT units**.

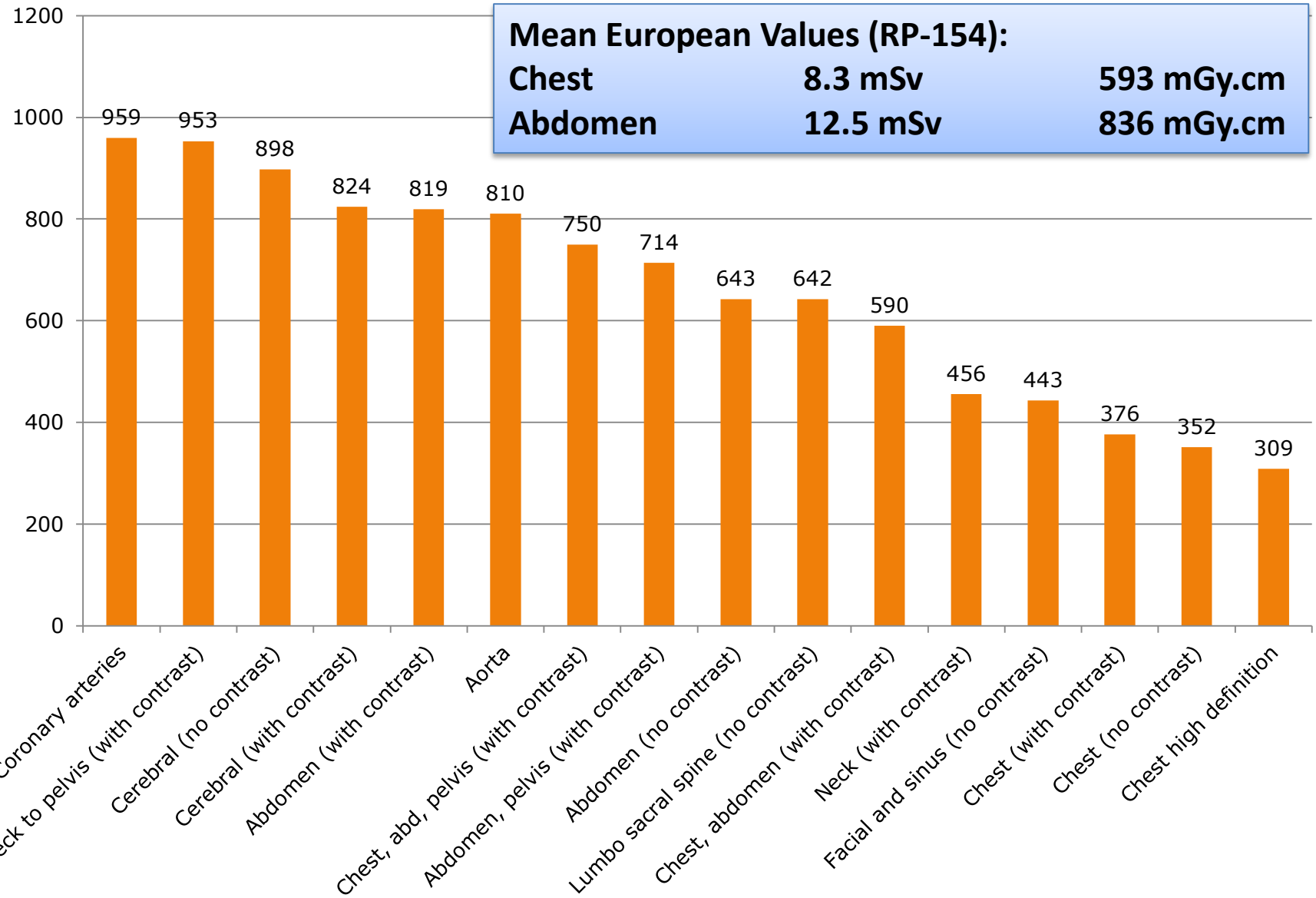
Methods (2)

- The system allows to **extract, archive and process** the parameters and information contained in the DICOM headers and RDSRs for a **quality control "on line".**
- With all this information, several trigger conditions can be implemented **to generate alarms** and to launch corrective actions in cases such **as:**
  - **individual dose values** per examination higher than **3 times** the diagnostic reference level (DRL),
  - **median values of the last 30 procedures** higher than the DRL, etc.

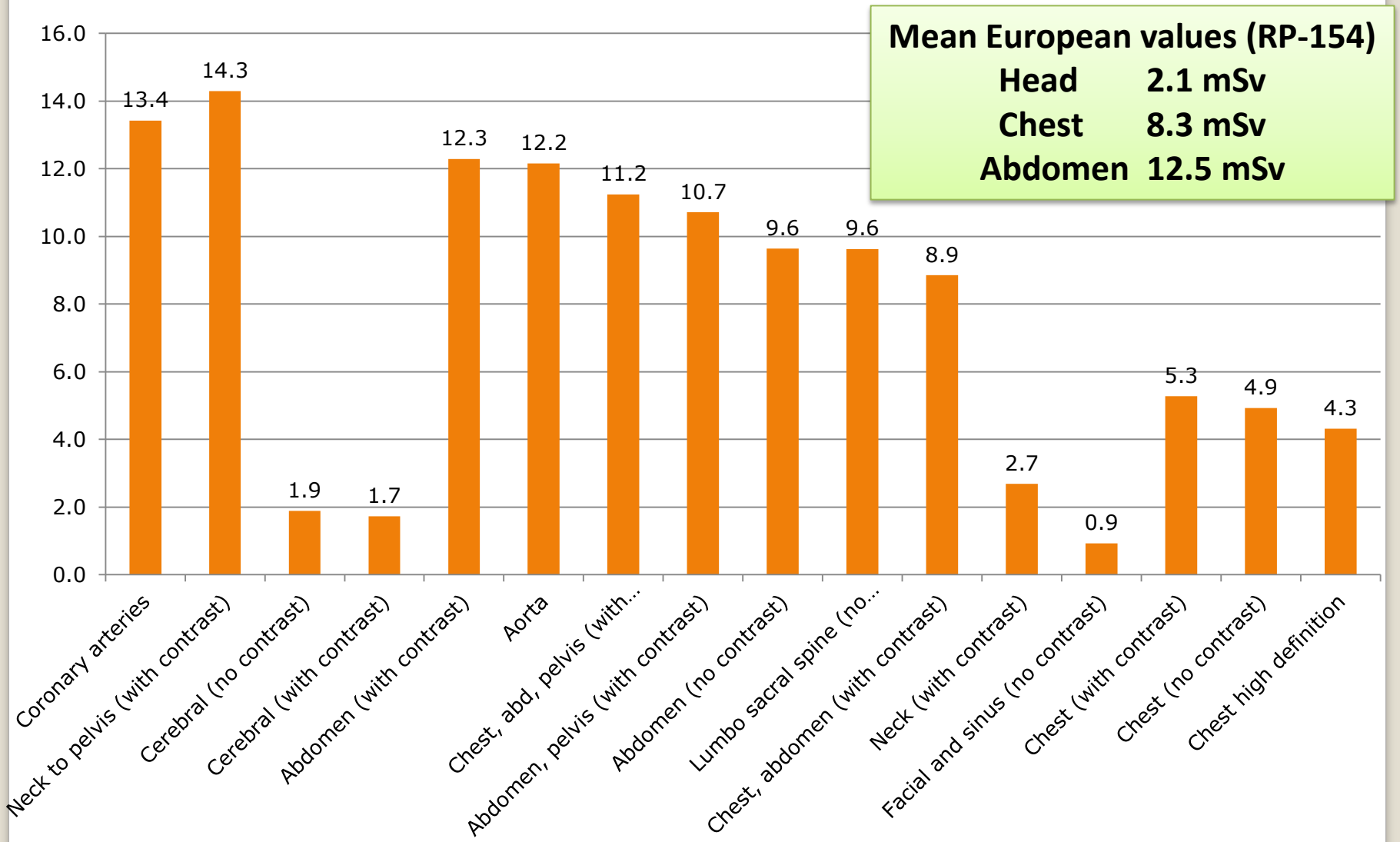
Results

- Mean and median **Dose Length Product (DLP) values for the most common CT** procedures have been obtained and compared with the existing available references to decide if optimization actions are required to **refine some clinical protocols.**
- **Effective doses have also been estimated from the DLP values**, using the conversion factors based on the current Dose Datamed European Guidelines.

Dose Length Product (mGy.cm) 8500 procedures SCUH



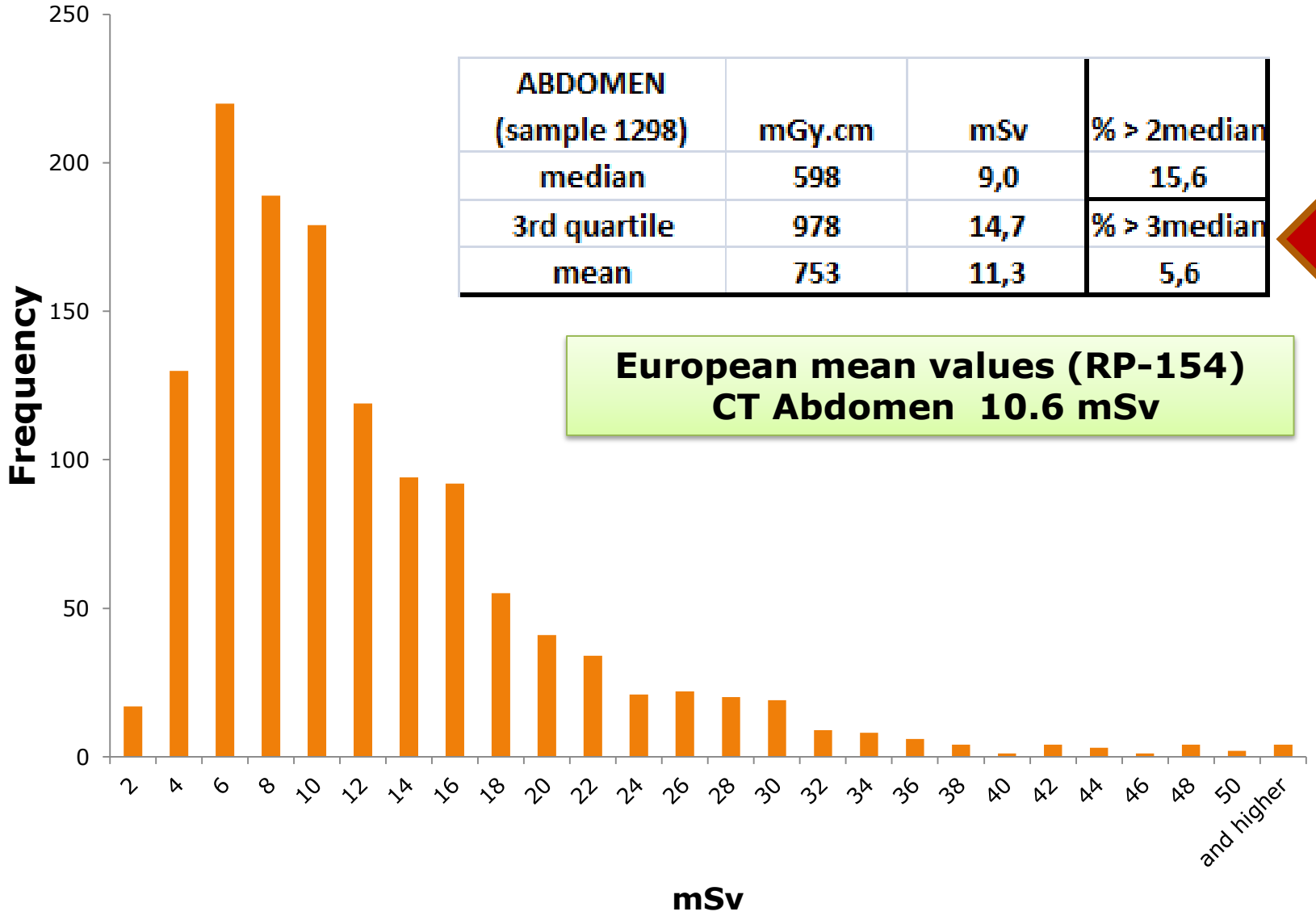
Effective dose (mSv) 8500 procedures SCHU



Mean European values (RP-154)

Head	**2.1 mSv**
Chest	**8.3 mSv**
Abdomen	**12.5 mSv**

Abdomen



ABDOMEN (sample 1298)	mGy.cm	mSv	% > 2median
median	598	9,0	15,6
3rd quartile	978	14,7	% > 3median
mean	753	11,3	5,6

European mean values (RP-154)
CT Abdomen 10.6 mSv

Conclusions

- The system allows automatic collection and export of data for **statistical analysis.**
- The system allows to optimize the practice and to **correct relevant deviations** in patient dose values.
- A **personal patient dose record** can be built, initially limited to the examinations performed at the hospital, but with the capability of further connection with other hospitals and outpatient centers using the same system.