

How our Company Contributes to Radiation Protection
Fujifilm Italia

Radiation dose monitoring as part of a regional PACS in Italy

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In the north-west of Tuscany, Fujifilm established a regional PACS system that serves more than 1.2 million people with about one million radiological exams per year. Eighteen hospitals are connected to a wide area network with a fibre optic connectivity of 100 Mbps (Fig. 1).

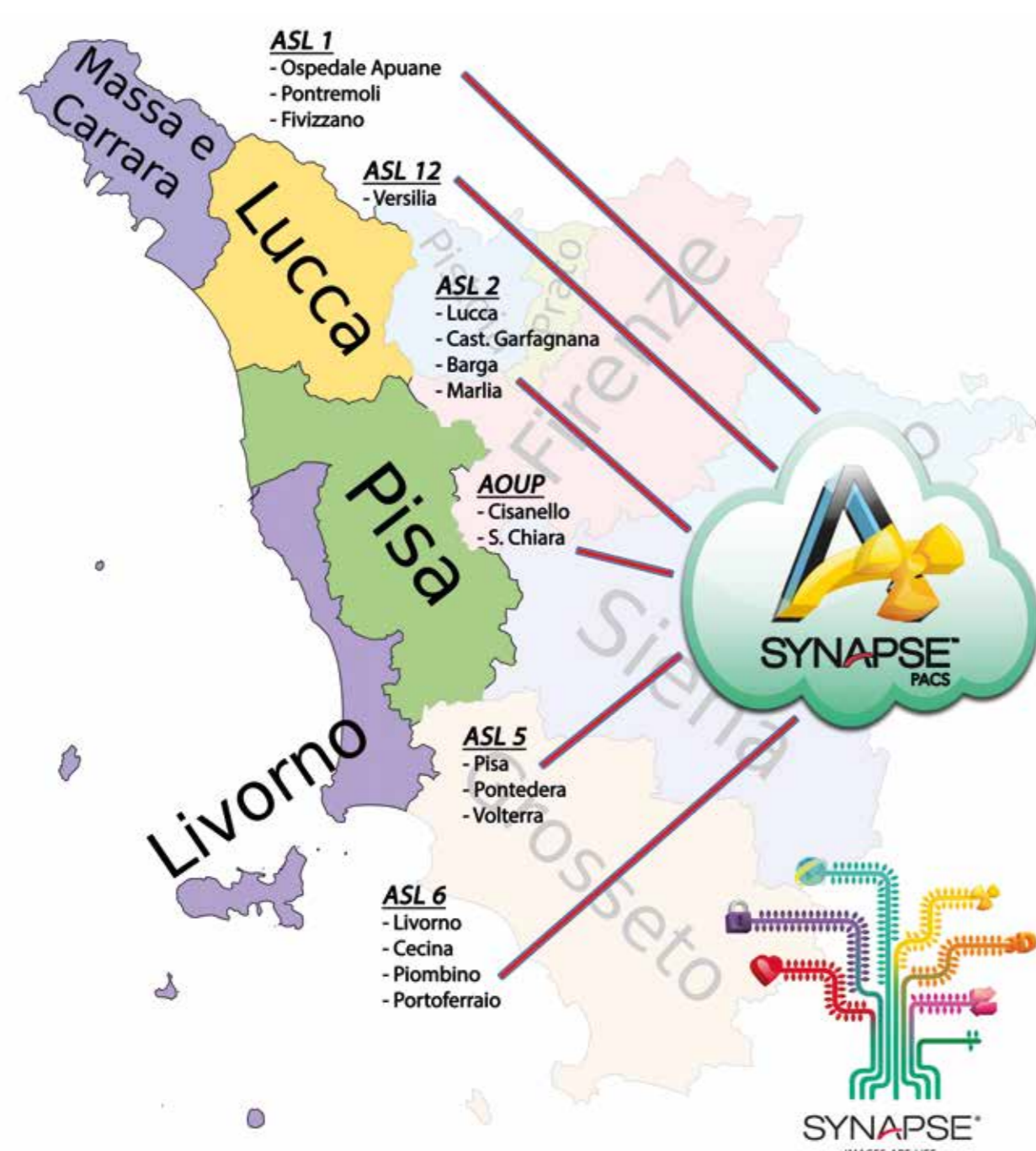


Fig. 1

All the radiological workflow is comprehensively managed, starting from the booking phase and ending with reporting and legal consolidation of images and reports. The onsite support is provided by a pool of 12 specialised technicians, who help streamline the daily radiological activity.

The regional PACS system went live in 2008 and after six years the storage consists of about five million radiological reports and about 180TB of DICOM images, with an average productivity of about 30TB per year.

The PACS can be accessed from any of the radiological departments through about 150 PACS reporting workstations equipped with Barco Corosis diagnostic monitors (Fig. 2) and is fully integrated within a unified RIS system and the various HIS systems.



Fig. 2



Fig. 3



Fig. 4

Synapse PACS fundamentally contributed to the digitalisation of radiological departments in north-west Tuscany, which are now operating in a fully filmless and paperless environment. In all the connected hospitals, the production of radiological films was interrupted for surgical and orthopedic applications, thanks to the widespread installation of dedicated PACS workstations for operating rooms and presurgical planning (Fig 3-4).

Recently, the regional PACS has been implemented with the installation of dose-tracking software that allows users to continuously monitor the radiation dose delivered to patients during daily radiological examinations, in order to reduce the dose in every examination without impairing its diagnostic quality, according to the ALARA (as low as reasonably achievable) principle. Dose monitoring can lead to performance control, protocol optimisation and rapid correction of incorrect practices.

At the University of Pisa, a dedicated dose team, composed of radiologists, radiology technicians, physicists and engineers systematically uses this software in order to improve radiological quality management by monitoring dose performance, thus contributing to the reduction of incorrect practices and supporting protocol optimisation.

In the last months, the University of Pisa dose team retrospectively analysed more than 123,600 CT scans, 7,980 mammography procedures and 140,650 conventional radiography exams.

The first dataset that was analysed concerned pediatric procedures, since it is commonly known that children are more sensitive to radiation damage than adults. Because of that, it is crucial to tailor the dose to the particular anatomical and physiological characteristics, following the recommendations issued by international awareness campaigns.

Thanks to the dose-monitoring software, the University of Pisa dose team was able to gather data related to pediatric CT examinations performed from 2008 up to now. In the scatter plot it is possible to observe a decrease in the DLP value starting from January 2012, due to the changes made possible through auditing, training and protocol optimisation (Fig 5).

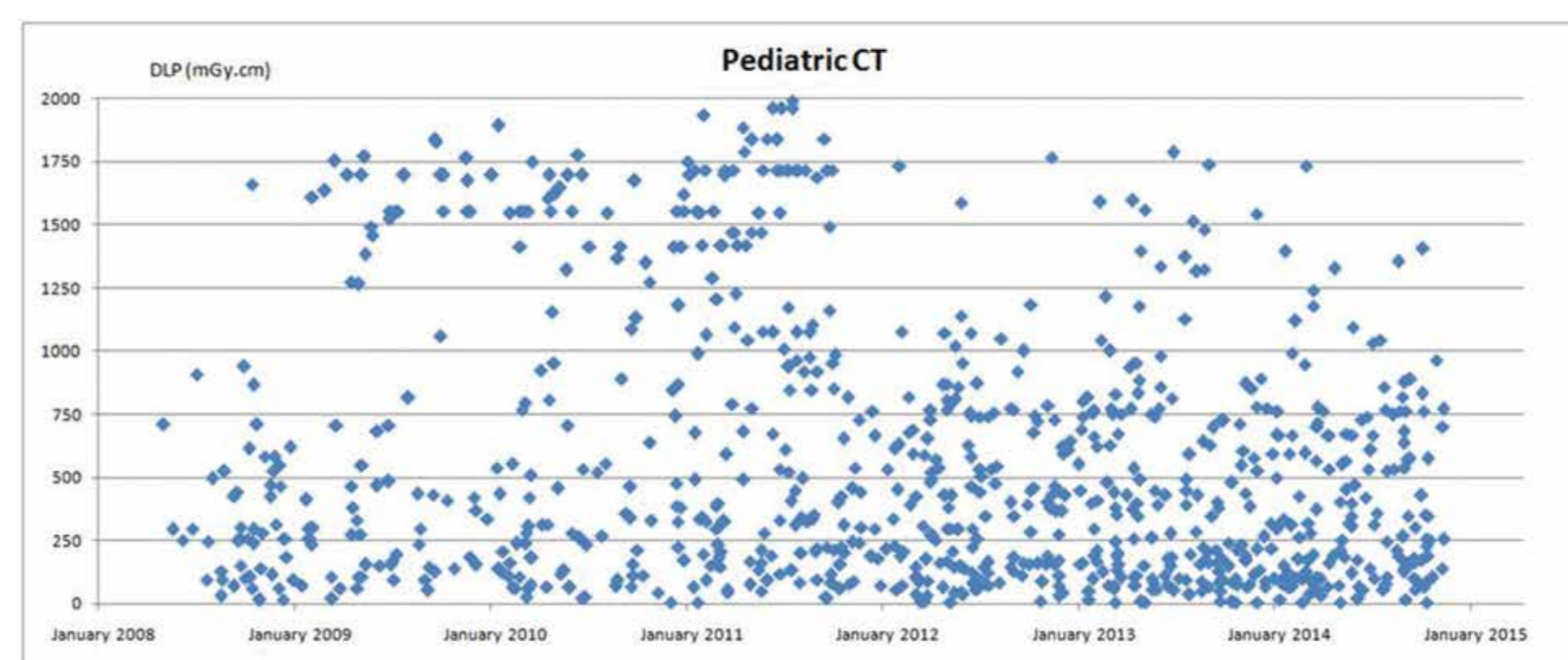


Fig. 5

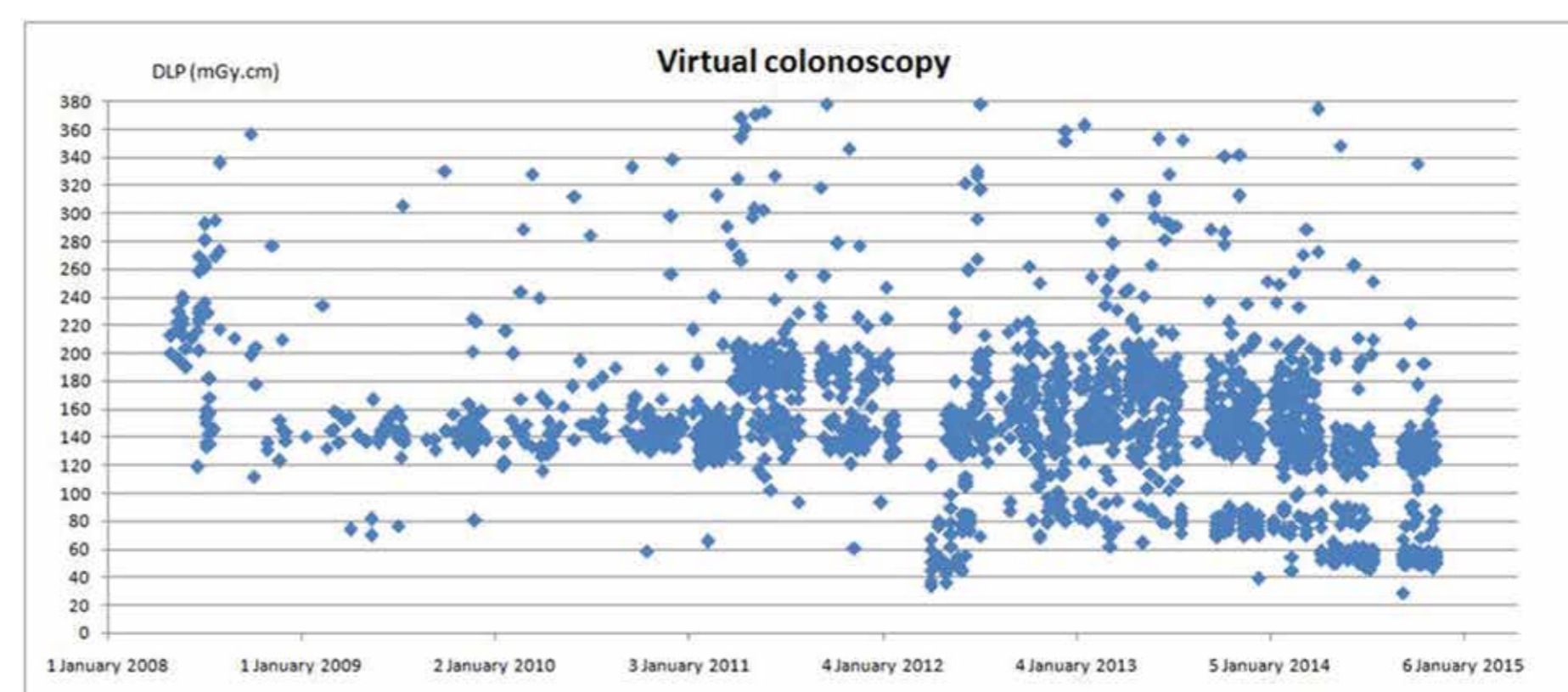


Fig. 6

Another area of interest is CT colonography or virtual colonoscopy, which is a low-dose CT procedure that can be used as a screening test for colon cancer. The University of Pisa dose team monitored the DLP values related to virtual CT colonography examinations performed on adult patients. The scatter plot shows a reduction in the DLP value starting from January 2012, following the installation of a new CT scanner equipped with iterative reconstruction data system, and a further reduction in the dose value starting from January 2014 as a consequence of a better optimisation of the scan protocol (Fig 6).

The preliminary experience of the University of Pisa dose team shows that dose monitoring system allows retrospective, as well as real-time, and multi-parametric performance evaluations, representing a useful extension of the functionalities of a regional PACS.

However, a multidisciplinary dose team is at least as important as dose monitoring software, since only expert users are able to ascertain which dose variations seen in our practices are clinically justified and help reduce those variations which are not.

Given the continued growth of regulatory oversight and public concern regarding radiation dose, radiation dose monitoring software will likely become an expected component of any PACS in the near future.

References

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