focused on volume definition to be held before dose-planning. To improve quality thresholds can be tightened and a goal for next year is to reduce the time for curative patients to 12 days and to palliative patients to 3.

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Data mining applied to a radiotherapy department: developing quality assurance tools for risk management

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\textbf{Purpose/Objective:} The aim of the study is to develop proper quality indexes to increase the control on the workflow in radiotherapy by a quantitative analysis of data extracted from the R&V system database of our radiotherapy department.

\textbf{Materials and Methods:} Several technical parameters related to delivery modality (3D CRT or VMAT), use of flattened (FF) or unflattened (FFF) beams, pre treatment imaging and other planning details were extracted for each patient by proper SQL querying of the database. These features were analyzed to derive indicators for radiotherapy treatment quality and workflow monitoring. Introduction of new clinical protocols of hypofractionated treatments was quantified by considering the incidence of standard fraction doses up to 3 Gy per fraction against higher fractionation schemes. Couch shifts between laser-based patient positioning and IGRT setup were evaluated for all IMRT/VMAT hypofractionated breast treatments as a tool to systematically take isocenter accuracy under control.

\textbf{Results:} Data since 2003 show an increasing average trend in the number of new patients treated per year at our centre (up to 2500 in 2013). Data show a significant increment of technological innovation starting from 2010 when IMRT (mostly rapidarc) have been introduced. The fraction of rapidarc treatments was about 20\% in 2010 up to a proportion of about 75\% at the end of 2013. Since 2010, average treatment Beam On Time (BOT) resulted in a significant decrease for high fraction doses up to a value of about 2 minutes found in 2013 for every treatment, regardless the adopted fractionation and technique (Fig 1A). This result was achieved due to the availability of FFF high dose rate beams in linear accelerators (presently used in about 90\% of cases for fraction doses above 4Gy) coupled with use of the VMAT technique available since 2010 in our centre. In the last 5 years, use of hypofractionation has grown from 16\% to about 40\% of treatments (Fig 1B). The incidence of pre treatment imaging was evaluated as a workflow indicator for treatments on all machines and patients: data for 2013 showed that IGRT was applied to more than 80\% of treatments in all therapy sessions and always performed in the first fraction for all patients. Evaluation of couch shifts for complex breast treatments was found to be on average below 5 mm as vector modulus.

\textbf{Conclusions:} The evolution of technology in a radiotherapy department was quantified and evaluated by means of a data mining of treatment records since 2003. The introduction of new protocols coupled to a growing complexity of treatments led to higher doses per fraction without increasing BOT for a better patient overall comfort. The evaluation of patient positioning and IGRT monitoring using our indicators was found to be suitable to obtain high quality standards in essential parts of the radiotherapy workflow in our center.

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Nano-X: a cost-effective solution for a global problem

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\textbf{Purpose/Objective:} Radiotherapy is indicated in at least 48\% of cancer treatments\textsuperscript{1,2} and is recognised as an extremely cost-effective treatment option for low and middle income countries\textsuperscript{4}. And yet of 139 LMIC countries 55 have no access to RT at all, and 80 have only minimal treatment facilities available\textsuperscript{5}. It has been recognised by the IAEA\textsuperscript{6} that the high capital cost and complex technological delivery of conventional X-ray radiotherapy systems is a major barrier preventing an estimated 4 million cancer sufferers worldwide