connectivity by design.

LIFE SCIENCES & HEALTH

CORE COMPETENCIES

1. In-depth knowledge of the medical process, procedures and protocols
2. Interoperability opens the gate to inclusion of predictive maintenance strategies in system software
3. These strategies have huge cost saving potential
4. Medical protocols complicate the embedding of such strategies

Preventive maintenance is vital in radiotherapy to reduce costs, optimize machine performance and provide optimal care. It is enabled by 'connectivity by design'. This ensures clinical and technological compatibility and information exchange within and between devices.

Software as a solution

Radiotherapy ranks among the most computerized and technologically advanced medical disciplines. This field deploys highly complex radiation equipment for high precision

DEMCON

treatment of patient malignancies. Optimal treatment requires many components and devices to work in concert, such as the beam production system, the dose delivery system, motion systems, a safety system and a patient positioning system.

As a consequence of this complexity, especially in proton or light-ion therapy, a large and highly skilled staff has to be available 24/7 to monitor the system and prevent machine downtime. However, despite this labor intensive operation, a proton beam system still has typically a 3 to 5% downtime. These machine 'interrupts' result in treatment delays with all the stress for patient and staff that comes with it. They also lead to workload problems through the necessity of rescheduling.

Connectivity by design and smart software can minimize this by storing, sharing analyzing and predicting the system's performance, asking for novel algorithms and data analytics fed with accurate and high-quality data in the device context.

Finding the sweet spot

It may thus be worthwhile to include a preventive maintenance strategy in the software. A machine performance check during daily initialization might prevent breakdown and analysis of the data could hint at long term specification issues building up. Deep learning of wear and tear patterns could support and refine this insight in the system's condition. Advanced and future software capabilities include real-time performance checking and cloud based (big) data collection for breakdown detection in a global installed base.

All of these options start with the detection of deviations that give rise to maintenance scheduling. This shouldn't be done too early, as in that case costly components will be replaced unnecessarily. The challenge is to find the sweet spot that reduces costs and downtime and simultaneously offers logistics benefits. If carried out well, considerable savings in for instance support staff cost might be attained.

Complex protocols are hard choices

The risk management components of identification, classification and mitigation offer important guidelines for including predictive maintenance principles in a complex medical system. But embedding these is difficult. In the software architecture you have to choose the best option: more sensors or more data? And everything in the software has to comply with the medical protocols guarding safety as well as privacy.

> "predicting machine breakdown"