SmartCare™ – Optimizing Workflow Processes in Critical Care through Automation

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Introduction. Improving the quality and efficiency of health care delivery are important objectives in critical care. Process engineering approaches to identify, organize and standardize health care workflows have been employed to meet these goals. Evidence-based clinical guidelines (CGs) for critical care are among these approaches. Their impact on outcome measures have been investigated and quantified in several clinical studies, e.g. [1]. Outcome measures that were studied include the reduction of hospital stay, mortality, human errors, medical device induced complications and workload of clinical staff. A logical next step is now the implementation of standardized health care processes into medical technology by allowing CGs to be executed by medical devices. This could provide automated standardized workflow process support. Dräger Medical's SmartCare™ technology is a platform that allows the implementation and automatic execution of various CGs within a wide range of medical devices. The SmartCare™ expert system comprises a universal engine and a set of executable knowledge bases that each reflects a certain critical care process, as described by a CG. An expert system construction suite (Solvatio, iisy AG, Rimpar, Germany) is used to facilitate efficient, visual-oriented knowledge modeling as well as the transition to the runtime environment. It seamlessly combines process-, knowledge- and software-engineering tasks. The core paradigm is that if a medical device allows for reading access to its measurements, settings, and contextual information as well as for writing access to its settings, then every clinical guideline for that medical device is potentially automatable [2].

Currently the automation of a specific process for weaning patients from mechanical ventilation has been implemented in a commercial product. SmartCare™/PS as an add-on for EvitaXL (Dräger Medical, Germany) provides automated control in pressure support ventilation. It implements a weaning CG clinically developed by Dojat and Brochard [3].

Methods. A multi-center, randomized controlled study was carried out in five university hospitals. 144 medico-surgical ICU patients were enrolled in this study. Approximately half of the patients (n=70) were randomized to be weaned following the conventional weaning protocol used in the respective hospital, the other half were weaned using the automated SmartCare™ approach (n=74).

Results. In comparison with manual implementation of conventional weaning CGs used in these intensive care units, SmartCare™/PS reduced weaning duration by 50%, total duration of mechanical ventilation by more than 30% and the ICU length of stay by almost 30 % [4].

Conclusion. The automated execution of CGs by medical devices is a logical and beneficial progression of workflow support in health care. The implementation of additional CGs is expected to demonstrate the efficiency of SmartCare™ technology throughout the complex development process from knowledge acquisition to knowledge execution.

References.

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