AUTO IDENTIFICATION TECHNOLOGIES TO IMPROVE PATIENT MEDICATION SAFETY

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Motivation: The number one failure in adverse events during blood transfusions is human error, often caused by the wrong identification of the patient and the related blood bags (1). Especially in complex and dynamic environments such as the ICU and the OR, where patients are often unable to identify themselves due to sedation and anesthesia, the correct identification and matching of patients with material (drugs, transfusion bags) is vital but error prone. Auto-mated identification technologies (AutoID), such as barcodes and radio frequencyidentifica-tion(RFID),canimprovethereadiness, workflow,andsafetyinpatienttreatmentandmedi-cation (2). In addition, AutoID technologies aim at synchronizing material and information flows, avoiding manual notation or keyboard data entry (2).

Technologies: A variety of AutoID technologies are available. For many years, barcodes have been used on wristbands, packages and documents to identify patients, drugs, lab samples and charts. Radio Frequency Identification (RFID)—prevalent in retail logistics—uses radio waves to identify objects and to communicate data with so called tags or transponders (2). In contrast to barcodes, RFID does not need a line of sight working even through tissues. RFID technology is categorized in two main types: active and passive. Passive RFID tags need an external source of energy (reader) to be activated and transmit data (3), limiting them in their communication range. Furthermore, the energy required to activate and read a tag may interfere with medical equipment (4). In contrast, active RFID tags have a built-in battery and can actively send data at much lower power, but still have to beactivatedbyanexternalreader.Sensornetworks(5)use active transponders for the unsolicited exchange information through a network of tags to reach a destination (multi-hop), thus using much less sending power than even active RFID (6). They can be combined with different types of sensors to allow monitoring of environ mental conditions.

Enablers and Barriers: Looking at the emerging wireless technologies RFID and sensor networks, four enabling functions have been identified as beneficial in healthcare applications (7): tracking, identifica-tion and authentication, automatic data collection and transfer, and sensing. They are applied in four key healthcare applications: patient safety and quality of care, management of devices and supplies, pharmaceutical application, and management and support of patients and health-care providers.
Literally hundreds of reports towards using RFID in a clinical setting clearly demonstrate the broad applicability of the technology (7). The cooling chain of blood bags can be proven by active sensors continuously monitoring the temperature and even pro-actively alarm in case of exceedance (1). RFID is also a viable alternative for the bedside matching process over bar codes, which are susceptible to dirt and wrinkles (8). Stationary RFID readers may even be built into OR tables to match the RFID-wristband of a patient with a blood bag tag (9).

Conclusion: RFID technology has started its way into the hospital market due to its superiority to bar-codes; wireless sensor networks even go beyond this by enabling pro-active services. But both are still in their infancy in clinical use with little empirical research. Hence, there is hardly any experience which could guide developers yet alone managers in developing and introducing it in the clinical daily routine besides promising case studies(7) and promises by commercial vendors. Among the barriers is the direct cost of the technology (10) while the return of investment is unclear; case reports of specific projects however indicate a three year breakeven point (7, 11). The advantages of having recent and complete data may even lead to new services and business opportunities, but the promised benefits first have to be proven on a broader base.

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