Systematic literature review of automated/electronic systems for hand hygiene monitoring

Preliminary results

The evaluation and feedback of a range of indicators reflecting hand hygiene infrastructures and practices are a vital component of successful hand hygiene campaigns. Unobtrusive direct observation of practices by trained observers during health-care delivery is considered the gold standard for evaluating compliance. This allows careful identification of real opportunities for hand hygiene action according to recommended indications. The World Health Organization has developed and validated a method for direct observation of hand hygiene compliance based on the Five Moments for Hand Hygiene approach, currently adopted by many national campaigns and used in thousands of facilities worldwide. Given that hand hygiene monitoring is a crucial element of quality improvement and accreditation, researchers and industry have recently been exploiting modern technology to develop automatic monitoring systems of hand hygiene indicators. Promising innovative electronic systems are now available or being tested and can significantly facilitate data collection.

In the context of the 5 May 2013 call to action on strengthening hand hygiene monitoring and feedback, WHO has analysed the available evidence and evaluated the advantages and disadvantages of the new automated methods: what type of technology is available, how the various systems work, their feasibility, the cost issues, the association with improvement processes and outcome indicators and the correlation of these new methods compared to standardized approaches, in particular the WHO observation method of the Five Moments.
A systematic review of the literature was conducted, searching several databases and other sources, for which preliminary results and interpretation are now available. Nineteen studies were identified. Almost all studies were conducted in high-income countries, mainly in teaching hospitals. Different systems are available, however most technologies are based on automated count dispensers measuring alcohol-based handrub consumption. Some of these systems are able to link this indicator to health-care workers’ entries/exit in the patient room or to HCWs’ personal electronic badges. Few systems use more sophisticated technologies based on alcohol vapour detection, or able to locate HCWs’ movements around the patient and to correlate them with the hand hygiene action. Finally, video control represents another automated system for filming health-care practices and retrospectively assessing hand hygiene performance. Because of the way they function, most of these systems are unable to monitor compliance as usually defined [measured by dividing the number of hand hygiene actions (the numerator) by the number of opportunities (the denominator), i.e. the observed moments when hand hygiene is required]. In addition, in studies evaluating hand hygiene compliance, standard definitions of opportunities according to the Five Moments or similar approaches focused on contact with patients and environmental surfaces, were used in one study only; types of monitored opportunities were rather room entry and/or exit. A limited number of studies compared hand hygiene compliance measured by electronic monitoring with direct observation, and those that did showed controversial results.

Several advantages of automated monitoring systems are recognized: the possibility of continuous monitoring, a lower Hawthorne effect, saving in terms of human resources and the possibility of downloading and analyzing data automatically for repeated measurement. Apart from monitoring, the implementation of these systems has also been studied as an intervention to improve hand hygiene with successful results.
However, the studies reviewed do lack strong scientific evidence and reveal several limitations inherent to the technologies used. As previously mentioned, most of these systems fail to distinguish between a hand hygiene indication and opportunity and to identify standard indications. Thus, the electronic/automated systems currently available are not able to detect moments when microbial transmission most likely occurs. These systems are also usually unable to identify HCWs and individual hand hygiene opportunities and actions, and to evaluate glove use or the appropriateness of the hand hygiene technique. Finally, cost-effectiveness remains unknown and suitability for use in settings with limited resources is quite unlikely.

Beyond studies published so far, there is a growing bulk of research with the potential to accurately evaluate the validity and advantages of automated/electronic systems for hand hygiene monitoring. In addition, there are several additional systems for which data are as yet unpublished, that refer more and more to patient contact or precisely to the Five Moments as the opportunities for hand hygiene and which are able to detect HCWs movements within the patient zone. These new systems deserve appropriate evaluation but their availability is encouraging and creates positive expectations of future advances in hand hygiene compliance measurement.

In conclusion, these new technologies are promising and could be part of the future approach to hand hygiene compliance monitoring when available resources permit it and provided that they reflect the WHO Five Moments for hand hygiene indications. Additional research is needed to support their adoption as a standard. However, direct observation of hand hygiene compliance and performance technique, as well as continuing education at periodic intervals are still needed.