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Letter to the Editor

Validation of electronic hand hygiene monitoring systems: the IPC community must agree on four essentials

Sir,

Digitalization provides opportunities to mitigate the increasing pressure on healthcare resources and infrastructure. One example is electronic hand hygiene monitoring systems (EHHMS). Still, clear validation guidance must be agreed upon and shared by the global infection prevention and control (IPC) community to help colleagues make informed decisions about which EHHMS to invest in.

The coronavirus disease 2019 pandemic has demonstrated practical IPC challenges that impact the safety of patients and healthcare workers [1]. Monitoring hand hygiene compliance (HHC) can be particularly challenging because IPC teams do not have the resources to perform audits. There is a need to build resilient HHC monitoring processes and infrastructure that will persist post-pandemic.

The World Health Organization (WHO) strongly recommends hand hygiene (HH) as a key performance indicator and a minimum requirement for IPC programmes in all countries [2]. Also, many healthcare organizations are starting to use EHHMS as part of WHO's multi-modal strategy for HH improvement to achieve sustainable results [3]. Furthermore, healthcare organizations face increasing pressure from accreditation bodies to measure and document HHC as part of quality assurance [4].

The IPC community, together with industry representatives, must agree on the following four essentials related to EHHMS validation to help colleagues make informed decisions about their use:

- **EHHMS classification system.** Several EHHMS are commercially available and differ in function, making it difficult to compare functionality and results [5]. Gould *et al.* suggested classifying EHHMS into five different types, from the simplest systems measuring consumption as a proxy for HHC to more advanced systems using flexible zones and continuous detection [6]. There is a need to establish a uniform classification system to create transparency and help IPC professionals decide which validation method to use.
- **Validation methods.** Guidance of the validation approach within each type of EHHMS is needed. A method used to assess an advanced EHHMS will not necessarily work for other systems. Limper *et al.* suggested a three-phase validation approach [7], feasible for the more advanced EHHMS. However, all phases cannot be completed with the simplest systems, and the approach needs modification to include more practical guidance. For example, should we use two direct observers to adjust for interobserver variability, minimizing the risk of classifying the events incorrectly? We also need to create a standardized checklist with technical considerations to avoid validation errors, such as systematic registrations that badges are worn correctly. Other considerations include the alignment of time registered by the direct observers and the EHHMS to identify the same events in the database, including guidance on identifying events for the systems using an anonymous approach.
- **Accuracy measures.** The IPC community must also agree on the definition of true and false HH events and which statistics to use when evaluating accuracy. Limper *et al.* suggested using sensitivity and positive predictive value as fundamental epidemiological statistics, which makes sense considering the practical difficulties of identifying true-negative events [8]. Furthermore, guidance on appropriate sample size calculations, statistical comparison analyses and reporting are needed. A relevant example is the independent-event approach suggested by Limper *et al.* [7]. Each registered event is considered equally important and grouped as one accuracy number. However, it might make sense to report the accuracy of HH events and opportunities separately, and to distinguish between HH opportunities concerning patient contact and HH opportunities registered in medication rooms, rinsing rooms and toilets.
- **Extrapolation and generalization.** A good validation set-up requires time and resources – time that most healthcare organizations do not have and the reason why they want to implement an EHHMS in the first place. A thorough validation set-up in each healthcare organization is not a scalable way of implementing new technology. However, a guidance piece from the IPC community on available and validated EHHMS, including their accuracy measures, will help colleagues to identify a relevant system for their organization. Guidance on how to perform quick and pragmatic validation tests that can be adapted to the requirements of a given healthcare organization and the resources available would also be useful, as would

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guidance on the need for separate validation studies in hospitals, long-term care facilities, ambulatory centres, etc.

The number of publications with EHHMS is increasing, and the clinical need is there. Now is the time to build a resilient validation tool to ensure sustainable EHHMS implementation. Uniform agreement and guidance on the abovementioned areas will make the process easier for IPC teams.

Conflict of interest statement

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M.B. Hansen*

Medical & Science, Konduto ApS, Copenhagen, Denmark

* Address: Konduto ApS, Mikkell Bryggers Gade 4, DK-1460, Copenhagen, Denmark. Tel.: +45 27250022.
E-mail address: marcobhansen@gmail.com

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