Remote buddy monitoring of the donning and doffing of personal protective equipment

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Onsite "buddies" are not always available to monitor the donning and doffing of personal protective equipment (PPE) in hospitals, especially during a pandemic, potentially leading to poor PPE compliance and increased risk of health care infections.[1,2] We therefore compared monitoring of PPE donning/doffing procedures in a standard critical care setting[3,4] by remote buddies with monitoring by onsite buddies.

We designed 30 procedural scenarios (15 donning, 15 doffing) that included random errors in some procedural steps (online Supporting Information). Four buddies (two onsite, two remote), unaware of the number and type of errors in each scenario, concurrently viewed and assessed each step. The remote buddies viewed the procedures via videoconferencing on their computers. The camera of the transmitting laptop computer was positioned so that the entire body of the person donning or doffing PPE could be seen. Procedures were live-streamed to the remote buddies via the hospital Wi-Fi network. The buddies were not permitted to communicate with each other or with the person donning or doffing PPE. The study was approved by the Melbourne Health Human Research Ethics Committee (QA2020104).

Sensitivity (correctly identifying correct procedure) was 100% for both onsite and remote buddies; specificity (correctly identifying incorrect procedure) was 98.9% for onsite buddies and 94.5% for remote buddies; overall accuracy was respectively 99.7% and 98.7% (Box). Concordance between assessments by onsite and remote buddies (κ = 0.95), by the two onsite buddies (κ = 0.97), and by the two remote buddies (κ = 0.98) was very good. The most frequent error was remote buddies missing chin exposure below the mask, probably because of the two-dimensional view provided by the camera. Paying specific attention to the mask position when the donner turns side on in front of the camera might prevent this error.

Practical considerations for remote buddies include the need for reliable hospital network and internet connections, or a wired hardware system, to avoid disruption of monitoring. As the remote buddy is unable to physically intervene when they identify an error, clear verbal communication is important. The psychological effect of having an onsite buddy was not characterised, but may influence user acceptability of remote buddies.

All buddies were very experienced in providing observation feedback, but we did not assess their proficiency. Their accuracy may also have reflected greater vigilance while being observed (the Hawthorne effect). Finally, we did not weight the donning and doffing steps according to their importance for safety.

Personal protective equipment (PPE) monitoring assessment accuracy by onsite and remote buddies

Buddy outcome*	Scenario outcome* Pass	Fail	
Onsite buddies (390 tests)			
Pass	298	1	PPV, 99.7%
Fail	0	91	NPV, 100%
	Sensitivity, 100%	Specificity, 98.9%	Overall accuracy, 99.7%
Remote buddies (383 tests†)			
Pass	292	5	PPV, 98.3%
Fail	0	86	NPV, 100%
	Sensitivity, 100%	Specificity, 94.5%	Overall accuracy, 98.7%

PPV = positive predictive value; NPV = negative predictive value.
* For each step of each PPE donning/doffing procedure: pass = correctly performed; fail = not correctly performed. † Seven assessments were missing because of internet interruptions.

Having a trained observer monitor PPE compliance is important for health care safety. The high level of accuracy and the agreement between onsite and remote buddies were encouraging. Apart from identifying errors, remote buddies could also provide step-by-step instruction in donning and doffing procedures, which could improve compliance and minimise contamination.[5] Using remote buddies may help preserve PPE supplies and ensure reliable access to monitoring, even when PPE supply or onsite staff numbers are limited, while also reducing the infection exposure risk for the monitoring observers.

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[Corrections added on 20 May 2021 after first online publication: the fourth author's name has been updated.]

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Supporting Information

Additional Supporting Information is included with the online version of this article.