

Video based learning vs instructor led training for optimizing personal protective equipment use to prevent Covid-19 infection — a comparative study

Asma Ansari,¹ Uzma Urooj,² Mustafa Waseem,³ Alveera Ihtasham⁴

Abstract

Objective: To evaluate two different types of education and training aids to improve compliance with guidelines related to personal protective equipment in healthcare workers.

Methods: The quasi-experimental study was conducted at the Department of Gynaecology and Obstetrics, Combined Military Hospital, Rawalpindi, from July 1 to December 31, 2020, and comprised healthcare personnel who were divided into two equal groups. Group A received weekly instructor-led training session of donning and doffing for two hours. Group B was assigned to watch 30-min training videos weekly. After one month, an independent instructor evaluated both the groups using validated checklists, with maximum score 8 for donning and 14 for doffing. Data was analysed using SPSS 22.

Results: Of the 60 subjects, 34(56.6%) were females and 26(43.3%) were males. There were 30(50%) subjects in group A with a mean age of 35.35±5.67years, and the remaining 30(50%) were in group B with a mean age of 33.12±4.13 years. There was no significant difference in donning and doffing scores between the groups (p>0.05).

Conclusion: Both types of education and training aids could be used to improve compliance with guidelines related to personal protective equipment in healthcare workers.

Keywords: Covid-19, Donning, Doffing, Personal protective equipment. (JPMA 72: 807; 2022)

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Introduction

Personal protective equipment (PPE) is specialised gear, clothing or equipment worn and used for protection against infectious and hazardous material.¹ The world was jolted by the emergence of coronavirus diseases-2019 (COVID-19) pandemic, and the importance and applicability of PPE became known to not only the healthcare workers (HCWs), but to the general public also. This was an unprecedented situation and overwhelmed the healthcare community, too. The availability as well as use of PPE in these taxing times was a challenge. The concept of using personal protection to limit the spread of infections, however, is not new. In 1987, the use of universal precautions was recommended in hospitals to limit the spread of blood-borne infections.² In 1996, standard precautions were introduced. This now covered prevention of infection to not only HCWs, but patients as well as visitors.³ This led to the concept of safety in healthcare. This required involvement from all stakeholders. Administrators' role is training and controlling isolation policies, ensuring good work-based practices, like proper needle and waste disposal. Administrators and policymakers must ensure control and

alignment of infrastructure to cater to isolation and infection control, including creation of negative pressure rooms. With all these in place, finally there comes the use of PPE for the prevention of disease transmission.⁴

In hospital settings it should be assumed that all patients are a source of spreading infection and protocols are made accordingly. In exceptional circumstances, like the COVID-19 pandemic and Ebola outbreak, expanded precaution strategies, including contact, droplet and airborne infection prevention protocols, need to be implemented. The Centre of Disease Control and Prevention (CDC) regularly issues and updates guidelines for PPE usages according to clinical situation and the potential for spread of infection.⁵ There is also guidance for donning, doffing, reusing and disposing of PPEs. Although PPE is not a substitute for safe practices of working, the principle of PPE is of risk assessment which is to protect patients and self by assessing risk of exposure and selecting appropriate equipment and clothing. Types of PPE are gloves, aprons, gowns, masks, respirators, goggles, face shields and footwear.⁶ Guidelines for donning and doffing sequence are available and are intended to limit chances of self-contamination and exposure to others. Adherence to the steps has shown safety in many studies and training sessions improve compliance and safety. Many studies were done in the past to evaluate the effectiveness of training sessions to increase compliance with PPE use. The training methods

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^{1,2}National University of Health Sciences, Rawalpindi, ³4th Year MBBS Student, Shifa Medical College, Islamabad, ⁴City School, Capital Campus, Islamabad, Pakistan.

Correspondence: Uzma Urooj. Email: druzmaurooj@yahoo.com

included courses, practice drills, written information like leaflets, guidelines and posters.⁷ Some studies measured effectiveness of interventions by using materials to visualise contamination after training sessions, actual number of patients getting infection despite using PPE, or compliance with guidance by comparing against a checklist.⁸ PPE use and uptake can be improved by personal supervision and directed feedback. Auditing the performance against validated checklists and continuous education, training and evaluation can increase adherence to protocols in short and long terms.⁹

The current study was planned to compare improvement in personal safety in healthcare environment by regular training sessions and to increase compliance with PPE protocols by using different teaching aides.

Subjects and Methods

The quasi-experimental study was conducted at the Department of Gynaecology and Obstetrics, Combined Military Hospital (CMH), Rawalpindi, from July 1 to December 31, 2020. After approval from the institutional ethics review board, the sample size was calculated by using open Epi calculator.¹⁰ The sample was raised using convenience purposive sampling. Those included were HCWs, including doctors, nurses and medical assistants. Those who refused to volunteer were excluded.

Formal training session was organised at the CMH under guidance of National Institute of Health (NIH), and one individual was trained as the master trainer using an oral presentation of 2 hours, followed by practice sessions of 2 hours every day for 5 consecutive days and a post-training assessment. The certified master trainer then led the study groups through the training. After taking informed consent from the participants, they were divided into two equal groups and demographic data, including age, gender, and type of HCW. Group A received weekly instructor-led training session of two hours. Demonstration of donning and doffing by the instructor was followed by observation of the participants with feedback. In between the weekly training sessions, the participants were given 30 minutes daily to self-practise without instructors' observation. Group B was assigned to watch weekly 30-minute training videos 11 demonstrating the procedures. The

participants were encouraged to watch videos at home daily and were instructed to note the time they spent watching the videos.

After one month, an independent instructor performed the evaluation of both the groups using validated checklists¹⁵ (Table-1) and each participant's score was noted. The participants were assessed for proper selection of the level of PPE according to a situation, as well as donning and doffing techniques. Time spent on training of both groups was noted. Donning and doffing score against the checklists was calculated. Maximum score was 8 for donning and 14 for doffing. Data was analysed using

Table-1: PPE competency checklist.

Sr.No	Donning PPE	Competent	
		YES	NO
1.	Perform hand hygiene		
2.	Don Gown: Fully covering torso from neck to knees, arms to end of wrist		
3.	Tie/fasten in back of neck and waist		
4.	Don mask/Respirator: Secure ties/elastic bands at middle of head & neck		
5.	Fit flexible band to nose bridge		
6.	Fit snug to face and below chin (Fit-check respirator if applicable)		
7.	Don Goggles or Face Shield Place over face and eyes: adjust to fit		
8.	Don Gloves: Extend to cover wrist of gown		
Doffing PPE			
9.	Remove Gloves: Grasp outside of glove with opposite gloved hand; peel off		
10.	Hold removed glove in gloved hand		
11.	Slide fingers of ungloved hand under remaining glove at wrist		
12.	Peel glove off over first glove		
13.	Discard gloves in waste container		
14.	Remove goggles or face shield: Handle by head band or ear pieces		
15.	Discard in designated receptacle if re-processed or in waste container		
16.	Remove Gown; Unfasten ties/fastener		
17.	Pull away from neck and shoulders, touching inside of gown only		
18.	Turn gown inside out		
19.	Fold or roll into bundle and discard		
20.	Remove mask/Respirator (respirator removed after exit room/closed door): Grasp bottom, then top ties or elastics and remove		
21.	Discard in waste container		
22.	Perform hand hygiene		
Standard Precautions & Transmission based Precautions			
23.	Staff correctly identifies the appropriate PPE for the following scenario		
	a. Standard precautions (PPE to be worn based on anticipation level of exposure)		
	b. Contact/Contact enteric precautions (gowns and gloves)		
	c. Droplet precautions (surgical mask)		
	d. Airborne precautions (fit-tested respirator if applicable)		

PPE: Personal protective equipment.

SPSS 22. Independent sample t-test was applied as appropriate. $P < 0.05$ was considered statistically significant.

Results

Of the 60 subjects, 34(56.6%) were females and 26(43.3%) were males. There were 30(50%) subjects in group A with a mean age of 35.35 ± 5.67 years, and the remaining 30(50%) were in group B with a mean age of 33.12 ± 4.13

Table-2: Demographic data.

	Percentage (Frequency) Group A	Percentage (Frequency) Group B
Male	n=9(30%)	n=17(56.6%)
Female	n=21(70%)	n=13(43.3%)
Medical Assistants	n=8(26.6%)	n=6(20%)
Consultant	n=6(20%)	n=7(23.3%)
Resident trainees	n=7(23.3%)	n=8(26.6%)
Nursing staff	n=9(30%)	n=9(30%)

Table-3: Time Duration for training.

Time	Instructor-led (Donning/ Doffing)	Video-based (Donning/Doffing)
Direct	8hr/Participant	10hr/Participant
Indirect	6.9hr/Participant	6.7hr/ Participant

years (Table-2). The average time spent in each group was also noted (Table-3).

In donning, group A score ranged 3-8, while group B score ranged 5-8 ($p=0.23$). In doffing, scores ranged 10-14 and 12-14, respectively ($p=0.16$). There was no difference in the ability of the two groups in terms of identification of PPE level ($p=0.36$).

Discussion

The current COVID 19 pandemic has highlighted gaps in healthcare systems and a case arose against training on-site considering the highly infectious nature of the virus.¹² Virtual training tools and practice sessions seemed to be the safer option keeping physical distancing in mind. Training in a clinical simulation scenario is as close to a real-life situation whereas use of training videos is a valid option in the present situation, but it needs to be tested to ensure accuracy and completeness of actions.¹³

Adherence to locally agreed infection control protocols is of prime importance to improve PPE usage. This should involve education, training, competency demonstration and ongoing assessment and audits to create an environment that ensures appropriate PPE usage.

In a Spanish study, about 57% HCWs had knowledge

about PPE, and 32% had used it previously.¹⁴ In a quasi-experimental study in Saudi Arabia assessing clinical skills and simulation centre training for PPE use had a sample composition similar to that of the current study.¹⁵

In a local study, only 40.5% HCWs had some awareness regarding PPE use and had received training.¹⁶ In a cross-sectional study to assess knowledge of medical students and the training they received for PPE use showed only 41% had received some formal training and only 39% selected the correct PPE.¹⁷ In the study in Saudi Arabia, training given to HCWs improved the post-test score from 67% to 85% ($p \leq 0.01$).¹³

The overall donning and doffing scores showed no difference in the current study and these results are in line with an earlier study.¹⁸ In contrast, a study comparing skills in donning PPE showed that computer simulation led to fewer errors, and that video lecture on donning led to better scores than a traditional lecture.¹⁹

In another study, face-to-face instruction improved compliance with donning than providing videos or written material.²⁰ Other studies using active training through computer simulation led to fewer errors amongst HCWs compared to passive training.²¹ Conflicting results from another study showed that participants who watched videos compared to a traditional lecture scored better when tested for donning and doffing.²²

The quality of evidence for most of studies cited above is low because of risk of bias, indirectness of evidence and small number of participants. More studies are required on this count.

The limitations of the current study are its small size and the fact that it was conducted at a single centre and while the pandemic was still ongoing.

Conclusion

Adherence to correct PPE use is instrumental for the safety of both the HCW and the patient. No significant difference was noted between the two training methods. Thus, both the methods can be used confidently according to the healthcare setup.

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Conflict of Interest: None.

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