The Skill Training of Resident Anesthesiologists During the Outbreak Of COVID-19

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Research article

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Abstract

Background: With the spread of the coronavirus disease 19 (COVID-19), Sichuan provincial people's hospital, at the frontline fighting this public health crisis, took a lead in the reception, diagnosis and treatment of patients with COVID – 19 in the greater Sichuan area. As an effort to prevent nosocomial infections among the medical staff, we switched from the traditional face-to-face instruction to a web-based multimodal teaching model in our resident training program. Specifically, we explored ways to provide remote training in the proper procedure of donning and doffing of personal protective equipment (PPE). The purpose of the study was to evaluate the effectiveness of various teaching methods in teaching clinical skills of our residents during the epidemic period.

Methods: 72 resident anesthesiologists (1st to 3rd year) were recruited to receive remote skill training on donning and doffing of PPE. In this study, all participants received instructional videos/text for the proper protocol, in addition to watching a live-stream instructional video that simulated the procedure of donning and doffing of PPE. We matched the residents by year and divided them into two groups through a WeChat Draw Program. The video feedback (VF) group recorded and submitted videos of simulated donning and removing PPE followed by a debriefing session through a collaborative WeChat learning group. The independent learning (IL) group did not record videos, but were encouraged to consult with their instructors by WeChat or phone if they had any questions. Then the two groups completed questionnaire as well as theory tests and skill assessment.

Results: The VF group responded positively to the additional video-recording/debriefing approach. We did not observe any significant difference between the two groups in theoretical test scores. However, the VF group had significantly higher performance than the IL group in skill assessment.

Conclusion: The web-based teaching, simulation teaching and video feedback model is an effective alternative to the conventional face-to-face instruction as part of an adapted resident training curriculum involving donning and doffing of protective equipment during an epidemic outbreak.

Background

At the end of 2019, Wuhan, China, witnessed an outbreak of pneumonia caused by the novel coronavirus (SARS-CoV-2) infection, which quickly spread to other Chinese regions and later to the rest of the world by March of 2020 [1]. Due to the initial lack of knowledge regarding the nature of those cases, there was high occurrence of cross-infection in hospitals affecting the medical staff during the processes of diagnosis and treatment [2]. Among them, the most vulnerable were the residents in training who often lacked experience in the proper procedures of prevention and control of infectious diseases. Therefore, it is necessary to implement/strengthen proper training in infectious disease response protocols to ensure appropriate care and safety of healthcare staff and patients. Currently, with ~29 million cumulative positive cases globally, many training programs shifted to distance education. Under current circumstances, web-based teaching might be a better alternative to the conventional face-to-face

instruction because of its benefits of safety and flexibility [3, 4]. The latter includes flexible time, location and potential for repeated instruction [5, 6].

Web-based teaching, whether delivered synchronously or asynchronously, usually focuses on content delivery, but emerges as a valid approach for clinical skill training as well with some successes [7]. We need more work to evaluate the effectiveness of such remote pedagogy with the goal to compile a list of best practices and teaching modules for web-based clinical skill training. For instance, we can introduce clinical skills to students through live or recorded demonstration in addition to written instructions. Students can practice and reinforce newly learned skills to the level of mastery through simulation-based training combined with a feedback mechanism [8, 9]. Compared to clinical training with real patients, simulation training is safer and allows for the acquisition of clinical skills through deliberate repeated practices [10, 11]. During the pandemic period, students lacked access to PPE, which was in high demand. Therefore, we may substitute medical-grade PPE with household items as simulation tools. In our study, we explored how effective this new training module is to provide residents necessary training for the proper procedure of donning and doffing PPE.

Methods

Our study protocol was reviewed by the Ethics Committee of Sichuan Provincial People's Hospital with the written informed consent obtained from all participants.

1. Research object: 72 medical residents ranging from the first to the third year in training in the department of anesthesiology participated in the study (Figure 1). Initially, residents in each year were encouraged to volunteer to participate in the video feedback intervention. However, nobody wanted to participate. In the end, we randomly assigned half of the participants to the VF group and the other half to the IL group matched by year through WeChat Draw Program.

2. Teaching methods: We developed all instructional materials and rubrics based on the donning and doffing of PPE protocol as established in the Sichuan provincial people's hospital. We adopted multimodal teaching approaches to accommodate different learning preferences by our students. For the sake of transparency, all residents in the VF and IL groups received training videos, the standard procedure in the text format, as well as the rubrics for assessing their skills [12]. In the meanwhile, all residents in the VF and IL groups watched a live streaming demonstration where instructors simulated the donning and doffing of PPE protocol using household items including hooded zipper coats, hats, plastic bags, swimming goggles or regular glasses. During the demonstration, instructors explained in detail how to put on and remove PPE properly with emphasis on the key points to ensure safety and avoid contamination in the procedure.

For the VF group, the residents recorded videos of themselves repeating the newly taught procedure using household items and shared those videos to a WeChat group jointly set up by a consultation team of specialists in clinical skills (Figure 2AB). For residents in each year, 3 or 4 select videos were uploaded to the WeChat group at a fixed time for 4 consecutive days. The specialist team comprised of 1 instructor

from the clinical skill training center and 5 nurses with previous experience in handling PPE from the fever outpatient and isolation ward. Collaboratively, they conducted many-to-one evaluation and gave custom feedback to each submitted video. Two instructors from the anesthesia-teaching group served as moderators of the evaluation process and provided a summary of all comments to help students understand and resolve their mistakes (Figure 2CD). Residents in the VF group as part of the WeChat group were encouraged to discuss with any instructor about details about how to dress and remove PPE in clinical practices. The instructor team was responsible for answering questions and sharing their own professional experiences from clinical work. Residents in the IL group did not join the WeChat group but instead, carried out learning independently with provided instructional resources and encouraged to consult with the same specialist team by WeChat or phone if they had questions.

After the learning phase, all residents in both groups completed a questionnaire and a theory test online. After 2 weeks when the COVID-19 was under control in the Sichuan province, the instructors performed in-person skill assessment in batches (Figure 2EF). At the end of the assessment, instructors reinforced the development of those skills and ensured their mastery through targeted training on all residents once again.

3. Evaluation methods:

3.1 Resident evaluation questionnaire. All recruited participants were required to answer the following questions: the reasons why residents were reluctant to participate in the video feedback teaching initially; the membership in the video feedback or the independent group; the duration of their video recording.

In addition, the residents in the VF group gave scores that reflected their level of satisfaction in the areas of teaching format, learning gain and the quality of instruction, along with suggestions for improvement.

3.2 Theory tests. Residents conducted theory tests on the donning and doffing of PPE. The test comprised of 18 multiple-choice questions and 2 fill-in-the-blank questions, all of which were part of the standardized test database from the Sichuan provincial people's hospital.

3.3 Skill assessment of donning and doffing PPE. Residents demonstrated the process of putting on and removing PPE in person. Instructors assessed their levels of mastering key techniques in batches using the same rubric.

4. Quality control: We timed all online tests to ensure integrity. Residents completed the questionnaires anonymously. The same instructors conducted in-person skill assessment of all residents to ensure consistency in the evaluation process.

5. Statistical methods: The statistical software SPSS20.0 was used for statistical analysis of the data. The one-way ANOVA test was employed for comparison between groups followed by the Fisher's Least Significant Difference (*LSD*) post hoc test with $P < 0.05$ considered statistically significant.

Results

Questionnaire survey analysis of residents in the two groups.

The initial call for volunteering failed with no residents signing up to be in the VF group, which suggested some level of hesitation and resistance to new web-based pedagogy. To understand the roots of their hesitation, we inquired into their reasons for not signing up and found out that the majority of students felt unprepared for such exercises because of lack of props (56.94%) or inexperience in video recording (40.28%) (Table 1). Other factors indicated signs of emotional unpreparedness. In order to recruit enough participants for each group, we adopted a lottery system and randomly assigned ~ 50% of residents in each year to the VF group and the other 50% to the control group where they conducted independent study. After the lottery placement, 50% of residents in the IL group felt relieved whereas only 30.55% were disappointed, consistent with the notion that residents felt ill prepared for this new approach.

Despite the initial resistance, residents who participated in video feedback demonstrated engagement in the process and reported satisfactory outcomes. Specifically, 50% of students spent 30 to 60 minutes on recording their own practice videos whereas 29% spent longer time (Table 1). After custom feedback from instructors, residents reported high levels of satisfaction with 8.57out of 10 points for learning gain, 8.69 points for the teaching format and 9.30 points for instructor performance (Table 1).

Theoretical and operational assessment of donning and doffing of PPE.

Comparison between the two groups matched by year showed that there was no statistically significant difference in their performance in the theory tests ($p > 0.05$, Table 2). However, when assessed for practical skills, the video feedback group out-performed the control group by a large margin ($p < 0.001$, Table 2). Despite their high scores in the theory tests, the independent group scored an average of ~ 15% lower across three years in their practical skills, suggesting the importance of personalized feedback intervention in training clinical skills. Furthermore, we did not see any significant difference ($p > 0.05$) between VF or IL residents across different years in both theory tests and skill assessment, suggesting that neither prior knowledge nor existing skills was a significant factor to affect learning.

Common mistakes seen during skill assessment.

In order to understand how the VF group out-performed the IL group in their final skill assessment, we summarized the common mistakes seen during the donning and doffing phase, respectively, in both groups and compared their occurrence frequencies (Table 3). In general, students from both groups made fewer mistakes in the donning phase (Category 1–4) with fewer students making them (0-5.88% in VF, 5.26–13.15% in IL) compared to those (5.88–41.88% in VF, 18.42–78.95% in IL) in the doffing phase (Category 5–10). The one category everyone seemed to have difficulty with was rolling the protective gown with 78.95% of the IL group vs 41.18% of the VF group failing in this category. Across all but one category (2–10), the VF group has fewer students making the same mistakes compared to the IL group. We attribute this difference to the error correction through the video feedback mechanism since the VF

group had higher occurrence for most mistakes during the learning phase (* in Table 3). Interestingly, the VF group seemed to have done better for some categories in the learning phase already (marked with ¸*), suggesting possible difference at the baseline level between the two groups. Nevertheless, we conclude that the simulated teaching followed by video feedback is an effective practice to identify and close gaps between student performance and skill mastery.

The Independent Learning Group

The IL group served as the control in our study. They received the same multimodal instruction and were encouraged to practice the skills at home and consult with instructors for assistance. However, they were not required to provide any evidence of practice. Out of 38 students, only two residents sought help with some details of how to put on goggles and roll the protective gown properly, for which they received detailed and targeted explanation from the instructor.

Discussion

With the transition from traditional lecture-based instruction to active learning, many educators have explored ways to motivate students and maximize student-instructor or student-student interaction. When balanced with clear learning outcomes and the appropriate level of organization, active learning motivates and engages all students, stimulates in-depth discussion and fosters collaborative learning. The digital age has revolutionized the ways people receive and learn new information and skills, which presented challenges and opportunities. Superior to the conventional in-person instruction, web-based teaching can be asynchronous, multi-modal and more accessible and sharable [13]. With the development of new information technology and increasingly open access to the internet, we have more digital tools to explore creative ways to replicate the face-to-face active learning environment [14]. With the increasing popularity of online teaching, such pedagogical innovations are necessary in hospitals with resident training programs. Previous studies proposed that the keys to improving web-based instruction quality and enhancing student learning are student motivation and timely feedback [15, 16]. Simulation modules have been developed and widely used in clinical skill trainings in medical schools, including for patient communication, emergency airway management and basic life support [8,17~23]. In our model, we explored ways to incorporate these evidence-based pedagogical principles and practices into our remote instruction and yielded satisfactory results in the acquisition of key skills in the donning and doffing of PPE.

The unexpected outbreak of novel coronavirus pneumonia led to social distancing and quarantine practices and posed unprecedented challenges, which we resolved by web-based pedagogical advancement. To begin with, we adopted a multimodal approach to accommodate different preferences for learning modality, which include visual (instructional video), auditory (audio explanation), read (protocol in text) and kinetics (simulation teaching). Following the live-streaming demonstration of simulated donning and doffing of PPE techniques, our department designed an intervention phase where

students recorded videos of themselves practicing the procedure and uploaded them to the WeChat platform for feedback [24, 25]. The WeChat platform is the most widely used social media in China with multiple functions such as hosting meetings, broadcasting and file sharing. Therefore, it serves as the best accessible digital option. In countries outside China, similar softwares such as Microsoft Team and OneNote can serve as an alternative platform. Compared to the independent study group, residents who participated in the video feedback demonstrated significantly higher competency in proper handling of PPE. We attribute this success to several competency based active learning practices. 1. In the effort to record a successful video, the trainees had to practice repeatedly, which in effect resulted in the meaningful connection between the theoretical knowledge and the practical operation and eventually increased proficiency among trainees [26]. 2. We evaluated their newly acquired skills in details and then reinforced through instructor and peer feedback in a collaborative environment, which eventually led to mastery of those techniques. 3. The repeated asynchronous video feedback mechanism mimics the real-time intervention and guidance students receive in face-to-face training sessions where instructors closely monitor student progress and provide targeted feedback. 4. The independent learning group may have not done the necessary practices as instructed due to the lack of a supervision mechanism. Coincidently, the IL group had higher prevalence of common mistakes compared to the VF group. It is possible that our student were not accustomed to web-based teaching modules and needed more practice in self-directed learning (SDL), which is a learned skill and depends on past learning experiences [27]. Some of best practices in current SDL models employed directed studies, followed by a debriefing phase where students receive feedback and targeted instruction [24]. While we could not rule out the possibility that the VF group may have had higher SDL skills because they made fewer mistakes in the learning phase (Table 3), they still showed further improvement during the final skill assessment, validating the benefits of the video feedback intervention.

Taken together, these active learning strategies led to specific improvement in practical skills but made no difference in gains in conceptual knowledge. For trainees who did not participate in the video feedback intervention, they missed the benefits of applying key concepts to practices and custom feedback to correct mistakes. Therefore, a live streaming demonstration of practical skills followed by self-practices subject to asynchronous but frequent instructor and peer feedbacks serves as a good model to improve students' mastery of clinical skills in online learning. In the meanwhile, we did not observe any difference in the theory and operational scores among the residents across three years, suggesting that prior experience or knowledge provided no advantage. It is likely that handling of PPE is a new skill and therefore its acquisition does not depend on prior clinical skills.

In our questionnaire, we found that most residents who participated in the video feedback intervention felt that the teaching format was friendly and pleasant with enough flexibility. This contrasts with the initial resistance to participate in the video feedback intervention from all participants, suggesting a shift in student’s attitude toward web-based learning as the additional positive outcome from the study. It is also possible that in the initial recruiting process, we did not explicit expectations from participants, which led to confusion or anxiety among them. For instance, we were surprised to learn that the top reason for not participating was the lack of props at home. In retrospect, we should have provided more

explanation on how to choose props from household items. Due to the lack of volunteers, we switched to a lottery system while giving participants options to opt-out when their names were drawn. Two first-year residents won the lottery but later refused to participate in the video feedback intervention for fear of performance. Another 11 students were disappointed for not being selected to participate in the video feedback teaching. We feel that the lottery system may have served as a better way to ensure the same baseline of motivation between the two groups because students did not self-select themselves for the experimental group. In order to probe further into student's experience, we collected written comments from the video feedback groups from whom we received 41 valid suggestions as summarized in the following points.

1. The preparation time of recording video is long, which is only suitable for the current severe epidemic period when workload is relatively light.
2. The whole process is too long with delayed feedback. Instructors should watch all videos and prepare comments in advance to avoid delaying the training time by typing and sending comments.
3. Even though using household items was a creative training method, it does not substitute working with real PPE.

We conclude that in order to achieve desired learning outcomes and ensure quality online learning, especially in mastering clinical skills, the training plan must incorporate practices that simulate the interactive and collaborative learning environment in the face-to-face setting. To do so, we have to implement a mechanism where students take initiatives in their own learning and have the opportunities to practice while receiving immediate feedbacks to guide their learning process. It is also necessary that students reflect on their own learning and provide feedback to instructors, which can be challenging to achieve in the common one-way online teaching methods. However, this pedagogical approach might not benefit students who are uncomfortable for sharing videos of themselves on social media. Lastly, occasional distortions in video recording and web-based demonstration also affect the quality of instruction [28].

Limitations

The study involved 72 residents in the department of anesthesiology, which was a small sample size. The baseline levels of knowledge and skills on donning and doffing PPE were not assessed, making it impossible to conduct pre- and post- comparison. Lastly, even though a standardized scoring rubric in skill assessment was used, the assessment was conducted by the instructors, which might lead to potential bias in the scoring process.

Conclusion

The web-based teaching and video feedback model of simulated donning and doffing PPE serves as a good alternative to the in-person skill-training model during the epidemic period. Our multimodal teaching model is effective in improving the clinical skills of resident physicians in properly handling PPE,

cultivating the ability of students to learn independently and enhancing students' satisfaction with online teaching. In order to maximize the effectiveness of clinical skill trainings, we need to continue to explore creative ways to incorporate multiple instructional methods and follow their best practices to meet the learning needs of our students in online instruction.

Abbreviations

COVID-19:coronavirus disease2019 ;PPE:personal protective equipment;VF:video feedback;IL:independent learning;SARS-CoV-2:the novel coronavirus ;LSD:Fisher's Least Significant Difference ;SDL:self-directed learning

Declarations

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Authors' contributions

Min Xie helped the design and drafting the article.Qin Zhou helped the conception and revising it critically for important content.Yuanyuan Kang helped the conception and revising it critically for important content.Ping Qing helped the conception and revising it critically for important content.Yang Guo helped analysis of data.Xinchuan Wei helped the conception and final approval of the version to be published.Bing Cai helped the conception and final approval of the version to be published.Jie Zeng helped the design and revising it critically for intellectual content.Jianxin Huang helped the design and revising it critically for intellectual content.All authors read and approved the final manuscript.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available

from the corresponding author on reasonable request.

Ethics approval and consent to participate

The study was approved by the Ethics Committee of Sichuan provincial's hospital. The

residents' participation was voluntary.

Consent for publication

A written consent for publication was obtained from all medical residents involved in the study.

Competing interests

The authors declare that they have no competing interests.

References

1. WHO. Report of the WHO-China Joint Mission on Coronavirus Disease. 2019 (COVID-19), 16–24 February, 2020. Geneva: World Health Organization, 2020. https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19final-report.pdf. (accessed March 17, 2020).
2. He Y, Li W, Wang Z, et al. Nosocomial infection among patients with coronavirus disease-2019: a retrospective data analysis of 918 cases from a single center in Wuhan city, China. Infection Control & Hospital Epidemiology. http:// doi.org/10.1017/ice.2020.126.
3. Cook DA. Randomized controlled trials and meta-analysis in medical education: what role do they play? Med Teach. 2012;34(6):468–73.
4. Russell M, Viner SJ, Russell H, Croker, et al. School closure and management practices during coronavirus outbreaks including COVID-19: a rapid systematic review. Lancet Child Adolesc Health. 2020,Published Online April 6, https://doi.org/10.1016/S2352-4642(20)30095-X.
5. Renee A, Hendriks, Peter GM, de Jong WF, Admiraal MEJ. Reinders. Teaching modes and social-epistemological dimensions in medical Massive Open Online Courses: Lessons for integration in campus education. Medical Teacher. https://doi.org/10.1080/0142159X.2019.1592140.
6. Pei L. Hongbin Wu. Does online learning work better than offline learning in undergraduate medical education? A systematic review and meta-analysis. Med Educ Online. 2019;24:1666538. https://doi.org/10.1080/10872981.
7. Valerie Saint-Dizier de Almeida, Marie-France Agnoletti. Impact of online training on delivering a difficult medical diagnosis: Acquiring communication skills. Appl Ergon. 2015;50:242–50.
8. Dohms MC, Collares CF, Tibério IC. Video-based feedback using real consultations for a formative assessment in communication skills. BMC Med Educ. 2020;20:57. https://doi.org/10.1186/s12909-020-1955-6.
9. Fukkink RG, Trienekens N, Kramer LJC. Video feedback in education and training: putting learning in the picture. Educ Psychol Rev. 2011;23:45–63.
10. Clare Holdsworth, BPhysio (Hons), EH, Skinner, et al. Using simulation pedagogy to teach clinical education skills: A randomized trial. Physiotherapy Theory and Practice. 2016;32(4):284–295. http://dx.doi.org/10.3109/09593985.
11. Gozie Offiah LP, Ekpotu S, Murphy, et al. Evaluation of medical student retention of clinical skills following simulation training. BMC Med Educ. 2019;19:263. https://doi.org/10.1186/s12909-019-1663-2.

12. Li Shangrong Z, Zhixin Y, Yao, et al. Training programs,contents and standards for hospital staff prevention and control of 2019 novel coronavirus (2019-nCoV) infection. The New Medicine. 2020;51(2):95–102.
13. Bartley SJ, Golek JH. Evaluating the cost effectiveness of online and face-to-face instruction. J Educ Technol Soc. 2004;7(4):167–75.
14. Terrell SR, Dringus L. An investigation of the effect of learning style on student success in online learning environment. J Educ Technol Syst. 2000;28:3.
15. Yavner SD, Pusic MV, Kalet AL, et al. Twelve tips for improving the effectiveness of web-based multimedia instruction for clinical learners. Med Teach. 2015;37(3):239–44.
16. Muilenburg LY, Berge ZL. Student barriers to online learning: a factor analytic study. Distance Educ. 2005;26(1):29–48.
17. Madeleine Huei Tze Kho. Chew KS, Azhar MN, et al. Implementing blended learning in emergency airway management training: a randomized controlled trial. BMC Emergency Medicine.2018;18:1.https:// doi.org/10.1186/s12873-018-0152-y.
18. Qi Li J, Lin L-Q. Fang, et al. Learning impacts of pretraining Video-Assisted debriefing with simulated errors or trainees' errors in medical students in basic life support training: A Randomized Controlled Trial. Simulation in Healthcare. 2019;14(6):372–7.
19. Hunukumbure AD, Smith SF. Saroj Das. Holistic feedback approach with video and peer discussion under teacher supervision. BMC Med Educ. 2017; 17:179.https:// doi.org/ 10.1186/s12909-017-1017-x.
20. Fukkink RG, Trienekens N, Kramer LJ. Video feedback in education and training: Putting learning in the picture. Educ Psychol Rev. 2011;23:45–63.
21. Maloney S, Storr M, Morgan P, Ilic D. The effect of student self-video of performance on clinical skill competency: a randomised controlled trial. Adv Health Sci Educ. 2013;18:81–9.
22. Reed T, Pirotte M, McHugh M, Oh L, Lovett S, Hoyt AE, et al. Simulation based mastery learning improves medical student performance and retention of Core clinical skills. Simul Healthc. 2016;11(3):173–80.
23. Vaughn CJ, Kim E, O'Sullivan P, Huang E, Lin MYC, Wyles S, et al. Peer video review and feedback improve performance in basic surgical skills. Am J Surg. 2016;211(2):355–60.
24. Bandiera G, Lee S, Tiberius R. Creating effective learning in today's emergency departments: how accomplished teachers get it done. Ann Emerg Med. 2005;45:253Y261.
25. Elisabeth Coynea H, Randsa V, Frommoltb, et al. Investigation of blended learning video resources to teach health students clinical skills: An integrative review. Nurse Educ Today. 2018;63:101–7.
26. Savin-Baden M, Howell Major C. Qualitative Research: The essential guide to theory and practice. Oxon: Routledge; 2013. pp. 357–73.
27. Kolb DA. Experiential learning: experience as a source of learning and development. Englewood Cliffs: Prentice-Hall; 1984.

28. Lindon-Morris E, Laidlaw A. Anxiety and self-awareness in video feedback. Clin Teach. 2014;11:174–8.

Tables

Due to technical limitations, table 1 to 3 is only available as a download in the Supplemental Files section.

Figures

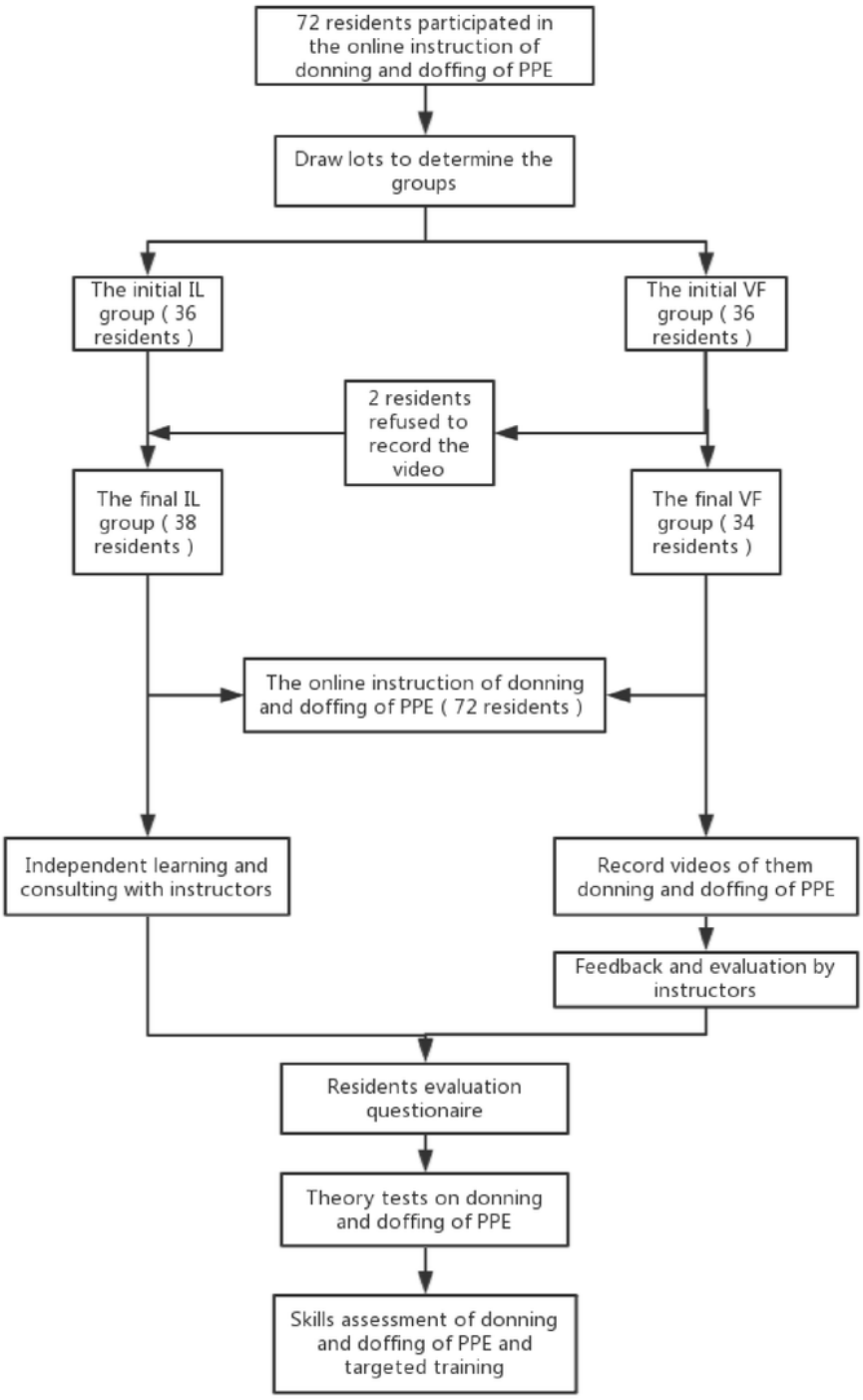

Figure 1

Teaching flowchart.

Figure 2

Images showing the comparison between simulations of the donning and doffing of PPE at home with household items (A, B) and skill assessment using real PPE (E, F). C and D show the video feedback process in the WeChat.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- table1.pdf
- table2.pdf
- Table3.pdf
- Questionnaire.docx