Evaluating the Outcome of Online Ethics Training for Researchers during the COVID-19 Pandemic

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Abstract

Due to aerosol/airborne transmission of the highly contagious COVID-19 disease, teaching and training cannot be done face-to-face. Online learning has shown significant growth worldwide. This study sought to determine the effectiveness of ethics training for researchers during the COVID-19 pandemic and to determine the factors influencing the effectiveness of training. A total of 684 participants underwent 8 hours of online ethics training. Similar pre- and post-test questions were given to participants to assess knowledge change. Attitude and satisfaction questionnaires were also used. The number of participants who attended varied with time and sessions. Mean (SD) age was 40.7 (9.0) years, 27 (16.7%) were male, and 80 (49.4%) had a bachelor's degree. Most of the participants were satisfied with the content, the organizers, and the lecturers. The participants' attitudes were changed after training and favored the online training. For knowledge testing, 330 participants did both pre- and post-tests. The mean (SD) of the pre-test score was 17.1 (4.81), and the post-test score was 24.9 (3.66), for an improvement of 7.7 (7.1 to 8.4; $p < 0.001$). Significantly more participants achieved the pass score (≥80% or ≥24/30) than before the training ($p < 0.001$). Female gender ($p = 0.03$) and participants who never received Good Clinical Practice training ($p = 0.02$) or ethics training ($p = 0.04$) were associated with a higher post-test score. This study demonstrated that online training was effective, and that females tend to have a higher post-test score.

1. Introduction

COVID-19 is a disease caused by infection with the SARS-CoV-2 virus. It causes multiple organ failure [1] and originated in the central province of Hubei in China in December 2019 [2]. COVID-19 has rapidly transmitted from human to human and has disrupted public health systems, economies, and eventually nearly every sector across the world. It was declared a pandemic by the World Health Organization on March 11, 2020. Despite that COVID-19 vaccines were rapidly developed and distributed around the world, mutation of the SARS-CoV-2 virus is able to reduce vaccine efficacy [3]; indeed, COVID-19 remains a major problem worldwide in 2022. The education sector has been affected because of aerosol/airborne transmission [4] of highly contagious COVID-19; therefore, social distancing is required for prevention of transmission. Teaching and training cannot be performed face-to-face, forcing educators to develop effective distance learning tools. The challenges of online learning (e.g., engagement, effectiveness, and technical issues) have had to be overcome.

Objectives

- To determine the effectiveness of ethics training online versus in-person for researchers during the COVID-19 pandemic by assessing knowledge, as determined by pre- and post-test scores, and attitude and satisfaction of participants.
- To determine the factors influencing the effectiveness of the ethics training.

2. Methods

Eight hours of online training were completed on November 26, 2021, by researchers. There were five sessions in various topics on research ethics. Each session period was 1-2 hours. This certificate ethics training program was conducted regularly once a year with basic and advanced research ethics topics at the Bangkok Hospital Headquarters and Bangkok Dusit Medical Services' Hospital Network. The electronic application for this "Ethics Training 2021" was sent to healthcare personnel of the Bangkok Dusit Medical Services' hospital network, and researchers/ some ethics committees all over Thailand. The participants were any healthcare personnel or researchers from hospitals or clinics who sought certificate training to conduct research in Thailand. However, there are a number of participants who attend this training without the need of certificate. The study protocol was approved by the Institutional Review Board, Bangkok Hospital

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Headquarters. Electronic informed consent was obtained from each participant. The sample size was calculated by testing two dependent proportions formula (below) that determine a level of significance of 5% and an 80% power of the test. We assumed that the proportion of participants who will pass the knowledge testing: the pre-test score (score >80% = 24 or more questions correctly answered out of 30) will be 50%, and that 80% would pass the post-test (i.e., a 30% improvement). The number of participants was calculated to be 111.

$$n = \left[\frac{z_{1-\frac{\alpha}{2}}\sqrt{p_{01}+p_{10}} + z_{1-\beta}\sqrt{p_{01}+p_{10}-(p_{01}-p_{10})^2}}{\Delta}\right]^2$$

$$n = \left[\frac{z_{1-\frac{0.05}{2}}\sqrt{0.80+0.50} + z_{1-0.20}\sqrt{0.80+0.50-(0.80-0.50)^2}}{0.80-0.50}\right]^2$$

Similar pre and post-test questions composed of 30 multiple-choice questions were given to participants before and after the course to assess knowledge change.

Two questionnaires, namely, a satisfaction questionnaire (20 questions) and an attitude questionnaire (5 questions), were also used. Both questionnaires were reviewed by 3 educational experts from (1) faculty of nursing, (2) faculty of education, and (3) language institute. The index of consistency was more than 0.6 for all questions. The attitude questionnaire's clarity and comprehensibility was tested in 20 volunteers. Cronbach's α was 0.673. The participants answered the questionnaire (addressing attitude) at the time of training application. The trainees could choose to participate in the study, in which case they signed an electronic consent form or only join the training without participating in this research. These participants completed both the pre- and post-training questionnaires. The satisfaction questionnaire was completed after the training. All questionnaires were answered electronically.

3. Statistical Analysis

Categorical variables are reported as frequencies and percentages, and continuous variables as means and standard deviation. The Kolmogorov–Smirnov test revealed that the variables did not follow a normal distribution. Comparisons of attitude about online training between pre- and post-training were done with the Stuart–Maxwell test.

Comparisons of the proportion of participants who passed the examination between pre- and post-tests were done with dependent proportion test. The scores of pre- and post-tests were compared by paired *t*-test, and the proportion of those who passed the pre- versus post-test was compared by McNemar's test.

Age, gender, education, years of experience, previous ethics/ good clinical practice (GCP) training, and years since having completed a training program were all considered as factors by linear regression analysis to determine factors influencing effectiveness of the ethics training. The level of statistical significance was set at $p < 0.05$.

4. Findings

The total number of trainees who registered for the ethics training was 850. The number of participants who consented to join the research was 684 (80.5%). The actual number of participants who attended the training varied across time and sessions and ranged from 100–500 per session. Only 162 participants answered the satisfaction questionnaire. The mean age was 40.7 ± 9.0 years, 27 (16.7%) were male, and 80 (49.4%) had a Bachelor's degree (see Figure 1).

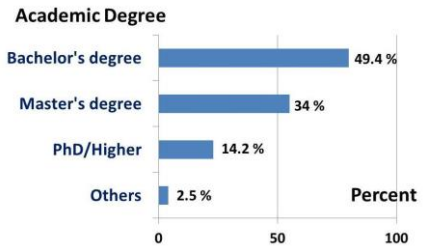

Figure 1. Education

Among these were 23 physicians (14.2%), 74 nurses (45.7%), 3 pharmacists (1.9%), and 1 medical technologist (0.6%). Thirty-one participants (19.1%) had less than 10 years of job experience. Participants who never attended good clinical practice (GCP) training or ethics training were 91 (56.2%) and 76 (46.9%), respectively. More than 40% of participants completed their last training program more than 3 years prior (see Figure 2).

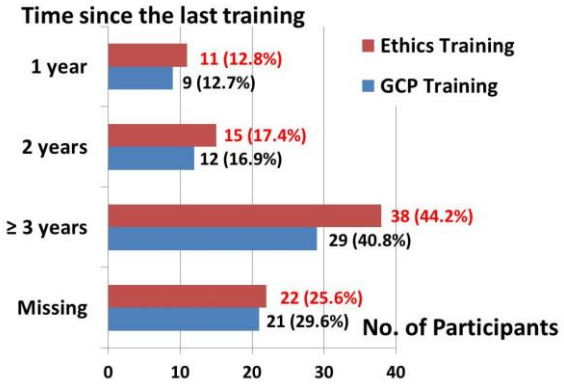

Figure 2. Time since the last good clinical practice (GCP) or ethics training

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Most of the participants were satisfied with contents, organizers/staff, and all lecturers by assessing the satisfaction questionnaire. For online training satisfaction, 188 participants answered the following topics: advertisement (91.5% satisfied), online registration process (97.8% satisfied), training duration (90.4% satisfied), training topics (93.6% satisfied), easily download teaching materials (97.9% satisfied), communication channel and coordination assistance during the training (92.5% satisfied), audio-visual system (92.6% satisfied), opportunity to express opinion during the training (87.7% satisfied), convenience of online training (95.2% satisfied), consistency of the knowledge testing questions and relevant to the content of the training (91% satisfied). For 5 lecturers, the participants were asked in 4 aspects namely

(1) knowledge transfer (93.6-98.2% satisfied),

(2) the lecturers' responses to questions (92-97% satisfied),

(3) examples of content for easy understanding (90.1-98.2% satisfied), and

(4) interactions between lecturers and trainees (90.8-96.3% satisfied).

Ninety (28.2%) participants answered the attitude questionnaire twice, once pre- and once post-training. The participants' attitudes were changed after training; they significantly disagreed with the sentence "Online training will make the assessment of teaching by online exams unreliable" (p = 0.04) and significantly agreed with the sentence "Online training can be as effective as onsite training" (p = 0.04; Figure 3).

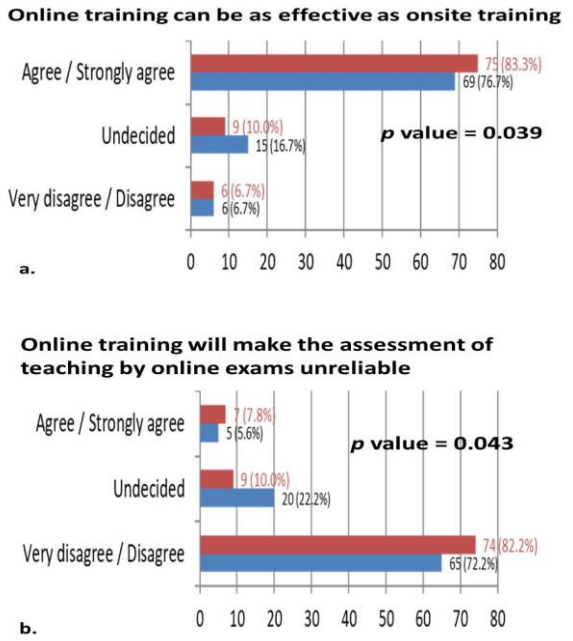

Figure 3. Comparison of pre and post training attitudes (a-e)

For knowledge testing, 330 participants completed both pre- and post-tests. The mean (SD) of the pre-test score was 17.1 (4.81) and 24.9 (3.66) for the post-test score. Score improvement was 7.7 (7.1 to 8.4; p < 0.001; Figure 4). The median marks the mid-point of the data and is shown by the line that divides the box into two parts. The middle "box" represents the middle 50% of scores for the group. The range of scores from lower to upper quartile is referred to as the inter-quartile range. The middle 50% of scores fall within the inter-quartile range. The upper and lower whiskers represent scores outside the middle 50%.

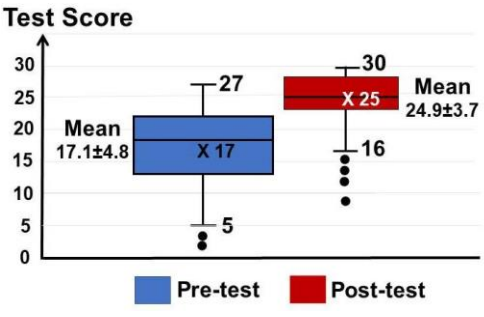

Figure 4. Boxplot of pre and post-test score

Significantly more participants achieved the pass score (≥80% or ≥24/30) than they did before the online training ($p < 0.001$; Table 1).

Table 1. Comparison of pre- and post-training pass score

		Pre-Training		*p* value
		<80%	≥80%	
Post-Training	<80%	93(30.4%)	3(12.5%)	<0.001
	≥80%	213(69.6%)	21(87.5%)	

Age, gender, education, year of experience, and previous training were all considered as factors by linear regression analysis to determine factors influencing effectiveness of the online ethics training.

Female gender ($p = 0.03$) and participants who never had GCP ($p = 0.02$) or ethics ($p = 0.04$) training were associated with a higher post-test score (see Table 2). Subgroup analysis for participants who had previous training for GCP or ethics demonstrated that post-test score was not affected by time since the last training program ($p = 0.3$ and 0.7, respectively). Most participants (145, 89.5%) indicated that they would like to participate in future training, and they 65 indicated preferring online training (40.1%), 4 preferred onsite training (2.5%), and 93 preferred hybrid training (57.4%).

Table 2. Factors influencing score improvement after online ethics training

	Post-Training (n=153)		
Variables	**Mean (SD)**	**Mean Diff (95%CI)**	***p* value**
Age	24.9 (3.66)	0 (-0.1 to 0.1)	0.8
Gender			
Male (n=24)	23.6 (3.50)	Reference	
Female (n=129)	25.2 (3.37)	1.7 (0.2 to 3.2)	0.03*
Education			
Bachelor (n=77)	25.5 (3.44)	Reference	0.09
Master (n=51)	24.4 (3.56)	-1.1 (-2.3 to 0.2)	0.2
PhD/Higher(n=21)	24.3 (3.04)	-1.2 (-2.9 to 0.5)	0.9
Others (n=4)	25.8 (3.42)	0.2 (-3.3 to 3.7)	0.8
Job Experience (Years) (N=145)	25.0 (3.42)	0 (-0.1 to 0.1)	0.8
GCP Training			
Never (n=86)	25.5 (3.41)	Reference	
Ever (n=67)	24.3 (3.36)	-1.4 (-2.5 to -0.2)	0.022*
Ethics Training			
Never (n=72)	25.6 (3.22)	Reference	
Ever (n=81)	24.4 (3.53)	-1.2 (-2.3 to -0.1)	0.037*

GCP = Good Clinical Practice

* = Statistical significant

5. Discussion

Our study demonstrates the effectiveness of online training by comparing knowledge: the pre-test and post-test scores. The post-test scores significantly increased after the online training. The attitude of the participants also improved, and they supported the use of online training. The factors influencing the higher post-test score were female gender and participants who did not complete a previous training program. Most participants would prefer to have future training done either online or through a hybrid online and in-person model.

The advantages of online training are saving costs/time, the inclusion of participants from remote areas, the ability to connect with instructors remotely, the ability to interact by chat box without interruption of lecture, and the opportunity to use new technology (e.g., virtual reality setting). The participants in this study were healthcare personnel who were interested in research in Thailand. It is a requirement for those who plan to conduct medical research to have a certificate of ethics training. The advertising of this course was done through social media, networks of hospital and medical research communities. The topics of lectures varied from basic to specialized research, which may explain why participants who received previous training did not have higher scores in the post-test. The duration of the training (8 hours in a single day) seemed to be appropriate. And most of the participants were satisfied with the training session's content, organizers, and lecturers.

However, there are some limitations to free, online training. Not all registrants opted to participate in the study. Furthermore, although 81% of registrants consented to participate, not all of these attended the training session. The ones who chose to participate may have been restricted to those who needed certification for ethics training. The number who completed all questionnaires (both pre- and post-test) also varied, as participation was voluntary. It was not possible to ensure that all participants attended the course that day and completed the tests. There is a need for new developments to help improve the effectiveness of online training programs and the assessment of the effects of such programs [5–8].

The potential barriers to effective online training would be the technological skill level of the participants, engagement of participants, digital tools, and evaluation system. There is also the course evaluation that the organizers/trainers should do to improve the course. The Kirkpatrick evaluation model could be used by checking these 4 levels (1) reaction of participants during training; (2) learning: skill and knowledge; (3) behavior: the use of training in participants' work; and (4) results of training influence on performance of participants and the organization [9–11]. In this study, we evaluated participant satisfaction and attitude and their knowledge after the training. Later, we also evaluated the behavior and performed research at 6 months after the training and improvement of our organization.

Solutions to these potential barriers include (1) providing a troubleshooting guide, (2) providing knowledge of how to use digital tools before training, (3) having frequent interactions with

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participants, (4) periodically inviting trainees to contribute, (5) do quizzes that require a response, (6) using a mix of passive and active learning, (7) making learning fun, (8) using different teaching methods, (9) providing on-demand learning post-training, (10) providing post-training discussions, (11) using an honest system for evaluation, and (12) using post-training test questions with multiple random sets of questions for certified examination.

6. Conclusion

Our study demonstrated that the online ethics training was effective training in terms of knowledge improvement and participants' satisfaction. The most participants' attitude after the training changed toward favoring the online training. The knowledge assessments could be done online. Female gender and participants who never completed a formal ethics training program were associated with a higher post-test score.

Further development of online training is needed, and there is a trend towards hybrid online-onsite training.

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