Effects of simulation training on COVID-19 control ability and psychological states of nurses in a children's hospital

D.-F. LI, C.-X. SHI, F.-Z. SHI, L. ZHAO, R. ZHAO, W.-Q. KANG

Children's Hospital Affiliated to Zhengzhou University, Zhengzhou University, Zhengzhou, China

Abstract. – **OBJECTIVE:** This study aims to discuss the effects of simulation training on improving the pre-examination, triage, prevention, and control of coronavirus disease 2019 (COVID-19), explain the psychological states of pre-examination and triage staff in general hospitals during the COVID-19 epidemic, and analyze relevant influencing factors. This study may serve as a reference of psychological consultation services to medical staff.

SUBJECTS AND METHODS: This study included 60 nurses assigned in the pre-examination department, fever clinics, and isolation wards of a general hospital from January 26th to February 1st, 2020. Before assuming the posts, the nurses received simulation training on the clinical reception of suspected patients with COVID-19. Operation skills of the nurses before and after the training were assessed.

RESULTS: The percent of passing significantly increased from 65% before the training to 98.33% after training ($p<0.05$). Training also significantly relieved the anxiety and depression of the nurses ($p<0.05$).

CONCLUSIONS: Scenario-simulation training can increase the emergency abilities of pediatric nurses in the prevention and control of the COVID-19 epidemic and relieve the anxiety of nurses.

Key Words:
  Simulation training, Epidemic control, Psychology, Effect.

Introduction

Virus outbursts, including the Influenza A H1N1 in 2009, the Middle East respiratory syndrome (MERS) in Saudi Arabia, the Ebola Outbreak in West Africa, and the "Seka" epidemic in America, have occurred continuously in recent years and have seriously threatened human survival and development[1]. On December 31st, 2019, the Health Commission of Hubei Province announced 27 cases of pneumonia with unknown causes for the first time[2]. The disease developed quickly. The Announcement of National Health Commission of the People's Republic of China (No.1 of 2020) enlisted pneumonia caused by infection of the novel coronavirus into the Category B infectious disease regulated by the *Law of the People's Republic of China on the Prevention and Treatment of Infectious Diseases* and suggested to adopt prevention and control measures for Category A infectious diseases[3]. COVID-19 is characterized by strong infectivity, high susceptibility of the public, and long incubation period. Medical staff serve in the frontline of epidemic control, and any careless performance increases their risk to occupational exposure. Previous studies reported that a limited number of nurses help cope with disaster events, and some even lack the experience and preparation needed for emergency events. When faced with disaster events, nurses easily suffer a psychological disorder. The National Health Commission issued the *Guideline for Emergency Psychological Crisis Intervention for COVID-19* on January 27th, 2020, which offers relevant guidance and intervention to possible psychological problems during the COVID-19 epidemic. During the COVID-19 epidemic, frontline medical staff suffer increased risks of infection and high workloads, and staff of management, logistics, and other departments of hospitals prepare emergency measures. A good psychological state is important to ensure satisfactory job performance. Thus, the psychological stress of medical staff during the epidemic warrants attention.

Subjects and Methods

General Information

Sixty pediatric nurses in our hospital were included in this study as respondents. All re-

spondents were females aged between 23 and 44 years, with an average of 32.5 years. Among the 60 respondents, 41 had postgraduate education background and 19 had junior college education background. In addition, 20 were nurses-in-charge, 26 were senior nurses, and 14 were nurses. The working years ranged from 5 to 24 years. Simulation trainings on wearing and taking off personal protective devices were organized from January 26th, 2020 to February 1st, 2020. All respondents participated in uniform assessment in the department after finishing the training. They were required to participate in simulation training once every day, 30-40 min each time, for 1 week.

Training Methods

(1) Watching video: the respondents were organized in a WeChat group to watch a video prepared by the training teacher about wearing and taking off personal protective devices. The video was played for infinite times, and all respondents were required to watch the video for 1 week. (2) The respondents watched the video first every day and then participated in the field simulation training. The same teacher was invited to demonstrate how to wear and take off personal protective devices. (3) The order of wearing personal protective devices is as follows: hand hygiene – medical protective mask – disposal round cap – one-piece protective clothing – eye patch – double gloves. The order of taking off personal protective devices is as follows: taking off the first layer of gloves in the contaminated area – hand hygiene – entering the buffer zone – taking off the eye patch – hand hygiene – taking off the one-piece protective clothing – hand hygiene – taking off the disposable round cap – hand hygiene – taking off one glove – taking off medical protective mask – wrap the medical protective mask with gloves – hand hygiene – entering the cleaning zone and washing hands with flowing water. After medical staff wear personal protective devices, the assessment teacher coats fluorescent powder at two sleeves of the protective clothing, neck, hat, and front chest. The coating scope is a circle with 6 cm in diameter[4].

Observation Indexes

The observation indexes were as follows: (1) whether the order of wearing is correct, (2) whether the skin is exposed, (3) whether the order of taking off is correct, (4) whether clothing or skin is contaminated by fluorescent powder, and (5) Self-rating Anxiety Scale (SAS): Manual of Mental Health Rating Scale compiled. The SAS is composed of 20 items and evaluated by a 4-level scoring method. The evaluation standards were as follows: 1=no or few times, 2= small proportion of time, 3= quite a lot, and 4= most or all the time. General score*1.25 is the standard score. In terms of anxiety, patients with a score less than 50 had no anxiety, those with 50-59 had mild anxiety, those with 60-69 had moderate anxiety, those with >70 had severe anxiety, and those with >80 had extremely severe anxiety. (6) Self-rating Depression Scale (SDS): Manual of Mental Health Rating Scale compiled. This scale is composed of 20 items and evaluated from levels 1-4. The total score of 20 items is the general score. The general score is multiplied with 1.25, and the integer part is used as the standard score. Patients with a standard score ≤49 had no depression, those with 50-59 had mild depression, those with 60-69 had moderate depression, those with ≥70 had serious depression. Higher score corresponded to more serious depression.

Statistical Analysis

Statistical analysis was implemented using SPSS 20.0 (IBM, Armonk, NY, USA). Measurement data were subjected to parameter (or calibrated t-test) or non-parameter tests. Statistical significance was considered at $p<0.05$.

Results

Stepwise Assessment

Operation skills of nurses in wearing and taking off personal protective devices were assed. The percent of passing significantly increased from 65.00% before the training to 98.33% after the training ($p<0.05$). Results are shown in Table I.

Table I. Stepwise assessment results of nurses.

Group	Number of respondent	Number of passed	Percent of pass
Before	60	39	65.00%
After	60	59	98.33%

Comparison of SAS and SDS Scores

Anxiety and depression of nurses are relieved significantly after training compared with those before training ($p<0.05$). Results are shown in Table II.

Discussion

Negative emotions increasingly occur among medical staff because of the decreased confidence on the effectiveness of protective measures and increased concern about protective material shortage. Good self-protection training to all medical staff is important to prevent and control COVID-19. A high percent of passing in implementing standard personal protection is an important premise to realize "zero infection" among medical staff. Therefore, strengthening the protection training of medical staff and increasing the percent of pass are crucial. After simulation training, details and key problems in using personal protective devices are further emphasized. It also deepens understanding on personal protection, field sterilization, and isolation and safety protection during the COVID-19 epidemic and improves the cooperative performances of nurses. Simulation training was performed to improve the working enthusiasm, sense of success, and sense of responsibility of nurses. Such assessment method is different from the traditional trainings, and it makes nurses feel zero fatigue. Simulation training reproduces the working scenario in epidemic control.

This study discusses a safe, simple, and effective training method for the prevention and control of the COVID-19 epidemic. All 60 new nurses were trained by watching videos and honing their operation skills. They were all assessed at the end of training. The percent of pass significantly increased from 65.00% before the training and to 98.33% after the training ($p<0.05$). The anxiety and depression of the nurses were significantly relieved after the training ($p<0.05$). Simulation training improves the psychological quality of nurses. Despite having sufficient experience, some nurses still panic when facing the COVID-19 epidemic alone. Several trainings are administered to nurses to improve their, psychological qualities and first-aid capabilities. Under emergency conditions, nurses can make fast assessment and judgment, take effective measures, observe disease conditions closely, and implement doctor's advices accurately and timely. Their comprehensive first-aid capabilities are improved significantly[5-7]. Simulation training confers pediatric nurses with team collaboration ability and communication ability[8,9]. After intense training, nurses and even different departments can cooperate closely to prevent and control the epidemic successfully. This training also increases team cooperation ability and prevents infections in the hospital.

During comprehensive fights against the COVID-19 epidemic, medical institutions must improve the psychological prevention and consciousness of intervention strategies. Given the characteristics of COVID-19, hospitals must establish a strong emergency management system and psychological intervention system, strengthen professional training to improve the business level and emergency capacity of employees, and provide effective social supports in time. Early effective interventions to different groups are crucial in the fight against COVID-19 and in the practical psychological care of medical staff[10-22]. As a result, training is conducive to increase the knowledge level of unaccompanied ward nurses of newborns in preventing and controlling COVID-19.

Conclusions

Strengthening the protection training and improving the passing rate of the protection training are highly important. Increased emphasis must be given on the use of personal protective equipment, personal protection and field disinfection, isolation and safety protection, and co-

Table II. Comparison of SAS and SDS scores.

Project	Number of respondents	Before	After
SAS	60	57.9 ± 1.4	40.41 ± 1.2
SDS	60	58.7 ± 2.22	41.15 ± 2.3
t		31.329	22.531
p		0.688	0.007

ordination among nurses during the COVID-19 epidemic. Training enhances the nurses' psychological quality to improve their first-aid ability, rapid assessment and judgment in emergency, effective measures, close observation of the condition, and accurate and timely execution of doctors' orders.

Conflict of Interest

The Authors declare that they have no conflict of interests.

References

1) Metcalf CJE, Lessler J. Opportunities and challenges in modeling emerging infectious diseases. Science 2017; 357: 149-152.

2) Hui DS, I Azhar E, Madani TA, Ntoumi F, Kock R, Dar O, Ippolito G, Mchugh TD, Memish ZA, Drosten C, Zumla A, Petersen E. The continuing 2019-nCoV epidemic threat of novel coronaviruses to global health - The latest 2019 novel coronavirus outbreak in Wuhan, China. Int J Infect Dis 2020; 91: 264-266.

3) Jin YH, Cai L, Cheng ZS, et al. Novel Coronavirus (2019-NCOV) Rapid Recommended Guideline for diagnosis and treatment of pneumonia infected by Novel Coronavirus (2019-NCOV). Chinese People's Liberation Army Medical Journal 2020; 45.

4) Qiu YX, Ye BL, Dong QF, Gu Q, Liao Q. Research on effective training Form of PERSONAL Protection for COVID-19. Chinese Journal of Infection Control 2020; 19: 513-517.

5) Khalaila R. Simulation in nursing education: an evaluation of students' outcomes at their first clinical practice combined with simulations. Nurse Educ Today 2014: 34: 252-258

6) Lamontagne C, McColgan J, Fugiel L, Woshinsky D, Hanrahan P. What do we do now that we have Sim Man out of the box using a template to develop simulation scenarios. Clin Simul Nurs Educ 2008; 4: 35-41.

7) The Use of Simulation in Nursing Education. Guidance document 2013; 3: 20-24.

8) Lachman S, Minneboo M, Snaterse M, Jorstad HT, Ter Riet G, Scholte ORW, Boekholdt SM, Peters RJ. Community-based comprehensive lifestyle programs in patients with coronary artery disease: Objectives, design and expected results of Randomized Evaluation of Secondary Prevention by Outpatient Nurse SpEcialists 2 trial (RESPONSE 2). AM HEART J 2015; 170: 216-222.

9) Wood DA, Kotseva K, Connolly S, Jennings C, Mead A, Jones J, Holden A, De Bacquer D, Collier T, De Backer G, Faergeman O. Nurse-coordinated multidisciplinary, family-based cardiovascular disease prevention programme (EUROACTION) for patients with coronary heart disease and asymptomatic individuals at high risk of cardiovascular disease: a paired, cluster randomised controlled trial. Lancet 2008; 371: 1999-2012.

10) Cheng Y, Li Y, Yu H J. Ebola virus disease: general characteristics, thoughts, and perspectives. Biomed Environ Sci 2014; 27: 651-653.

11) Li Y, Turale S, Stone TE, Petrini M. A grounded theory study of turning into a strong nurse:earthquake experiences and perspectives on disaster nursing education. Nurse Educ Today 2015; 35: 43-49.

12) Lu R, Zhao X, Li J, Niu P, Yang B, Wu H, Wang W, Song H, Huang B, Zhu N, Bi Y, Ma X, Zhan F, Wang L, Hu T, Zhou H, Hu Z, Zhou W, Zhao L, Chen J, Meng Y, Wang J, Lin Y, Yuan J, Xie Z, Ma J, Liu WJ, Wang D, Xu W, Holmes EC, Gao GF, Wu G, Chen W, Shi W, Tan W. Genomic characterisation and epidemiology of 2019novel coronavirus: implications for virus origins and receptor binding. Lancet 2020; 395: 565-574.

13) Xiang YT, Yang Y, Li W, Zhang L, Zhang Q, Cheung T, Ng CH. Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed. Lancet Psychiat 2020; 7: 228-229.

14) Otsuka Y, Kaneita Y, Itani O, Nakagome S, Jike M, Ohida T. Relationship between stress coping and sleep disorders among the general Japanese population: a nationwide representative survey. Sleep Med 2017; 37: 38-45.

15) Liu XL, Cheng YS, Wang MY, Pan Y, Guo H, Jiang RH, Wang QM. Psychological state of nursing staff in a large scale of general hospital during COVID-19 epidemic. Chin J Nosocomiol 2020; 30: 1634-1639.

16) Cheng L, Zhen LP, Yan SY, et al. Anxiety status and related factors in patients with coronavirus disease 2019. Zhejiang Medical Journal 2020; 42: 315-317.

17) Li J, Wang X, Meng H, Zeng K, Quan F, Liu F. Systemic family therapy of comorbidity of anxiety and depression with epilepsy in adolescents. Psychiatry Investig 2016; 13: 305-310.

18) Drapeau CW, Nadorff MR. Suicidality in sleep disorders: prevalence, impact, and management strategies. Nat Sci Sleep 2017; 9: 213-226.

19) Wang C, Horby PW, Hayden FG, Gao GF. A novel coronavirus outbreak of global health concern. Lancet 2020; 395: 470-473.

20) Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, Ren R, Leung K, Lau E, Wong JY, Xing X, Xiang N, Wu Y, Li C, Chen Q, Li D, Liu T, Zhao J, Liu M, Tu W, Chen C, Jin L, Yang R, Wang Q, Zhou S, Wang R, Liu H, Luo Y, Liu Y, Shao G, Li H, Tao Z, Yang Y, Deng Z, Liu B, Ma Z, Zhang Y, Shi G, Lam T, Wu JT, Gao GF, Cowl-

ING BJ, YANG B, LEUNG GM, FENG Z. Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. N Engl J Med 2020; 382: 1199-1207.

21) WU JT, LEUNG K, LEUNG GM. Nowcasting and forecasting the potential domestic and international spread of the 2019-nCoV outbreak originating in Wuhan, China: a modelling study. Lancet 2020; 395: 689-697.

22) TIAN S, HU W, NIU L, LIU H, XU H, XIAO SY. Pulmonary pathology of early-phase 2019 novel coronavirus (COVID-19) pneumonia in two patients with lung cancer. J Thorac Oncol 2020; 15: 700-704.