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Effects of a SARS prevention programme in Taiwan on nursing staff's anxiety, depression and sleep quality: A longitudinal survey

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Abstract

The aim of this research is to determine the levels of anxiety, depression, and sleep quality a severe acute respiratory syndrome (SARS) nursing staff experienced before and after a SARS prevention program. The 116 subjects were recruited from nursing staff in the largest obligatory SARS designated treatment hospital in Taiwan. Using general estimating equations (GEE) statistical analysis to control possible for affecting factors, we found that the nursing staff's anxiety and depression along with sleep quality started to improve 2 weeks after the initiation of SARS prevention controls. From this research, we determined that nursing staff members were anxious, depressed, and they could not sleep well at the SARS outbreak. However, the systematic SARS prevention program improved these factors. When faced with these types of diseases, related international medical organizations should establish a comprehensive program to help medical professionals cope better.
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Keywords: Severe acute respiratory syndrome; Anxiety; Depression; Sleep quality; Longitudinal study

1. Introduction

Severe acute respiratory syndrome (SARS) was a rare, infectious disease that grew rapidly into an epidemic. Not only were lay people alarmed, but medical personnel were also frightened. SARS differs from other infectious diseases in that it manifests as an intra-hospital infection and not as a mass community infection. Taiwan hospitals were overwhelmed by the number of cases. The medical staff was anxious and fearful, and some chose to leave their jobs. Their mental health seemed to be affected more than that of the patients due to caring for the patients as well as facing concerns of becoming infected themselves. This rapidly emerging infectious disease has not been well investigated throughout the world. Most research reports focused on the treatment of the disease. They rarely discussed the mental state of health professionals caring for SARS patients.

The government of Taiwan recognized the severity of this disease and in May 2003 designated a community

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hospital as an obligatory SARS center to prevent further spread of the disease. The hospital staff were honored by the designation but also concerned. They were anxious and restless because they did not know how to care for these patients, and they worried about themselves and their families becoming infected. This research is to describe the anxiety level, depression level, and sleep quality of nursing staff who cared for SARS patients during a sweeping epidemic and the effects of a SARS prevention program.

2. Literature review

2.1. SARS

Previously known as atypical pneumonia, the World Health Organization (WHO) began using the term SARS on March 15, 2003 (http://www.who.int/ors/sars). In April 2003, WHO declared a new coronavirus as the pathogen causing SARS, it was probably a new mutant virus. As a new mutant, it can infect people with preexisting immunity, spread rapidly, and has great virulence. Those who are infected can develop pulmonary fibrosis, which is characterized by disseminated pneumonitis and respiratory failure.

SARS became the first zoonosis of the 21st century. It originated in Canton, Mainland China at the end of 2002. Then, it was transported to Vietnam, Hong Kong, Singapore, and the rest of the world. Initially, the Chinese government refused to acknowledge the existence of SARS thereby increasing the transmission of SARS. When WHO issued a warning in March 2003, many lay people and medical professionals worldwide had already been infected (Lee and Lin, 2003). By July 2003, the number of cases reached 8437, resulting in 813 deaths (WHO, 2003). The mortality rate was highest in Mainland China, followed by Hong Kong and Taiwan. The mortality rate for medical personnel was highest in Taiwan. From the data, we can see the immediate and great impact of the virus on global health systems, disease prevention, education, and the economy within a short period.

2.2. Influence of a new infection on nursing staff

When faced with a newly emerging infectious disease, health care professionals grow alert and fearful, especially when the mode of transmission is unknown. This posture was evident during the early days of AIDS, probably the greatest challenge to nursing in the 20th century. Research showed that more than half of the nurses in Taiwan preferred to care for AIDS patients. About 33–50% would resign rather than care for them (Yeh et al., 1990; Su et al., 1992). Nurses were frightened that they or their family members could become infected through frequent contact with body fluids (Ko et al., 2002). International studies demonstrated that lack of knowledge about AIDS led to exaggerated reports of infection risks and reduced nurses' volition to care for AIDS patients. In contrast to the present, due to the increased knowledge of AIDS and its transmission, nursing staff show a more positive attitude and willingness to care for AIDS patients (Yeh et al., 1990; McCann, 1997; Valimaki et al., 1998).

Another example comes from the unwillingness of nursing staff in the thoracic department to care for patients with tuberculosis (Lo et al., 1999). Although the transmission and treatment of tuberculosis are well understood, tuberculosis patients have a more negative image thus decreasing the volition of the thoracic nursing staff to care for them.

As a newly emerging disease, the transmission and treatment modalities for SARS are still being determined. When a disease causes deaths among health care workers, it is understandable that they become terrified. From a survey of Canadian medical staff, the SARS epidemic provoked several reactions. They were discouraged from face-to-face contact with people outside the hospital. Since masks were removed while eating, they usually ate alone. Those who had possible contact with SARS patients were isolated voluntarily for 10 days as they were concerned about themselves or family members becoming infected. Staff members who did not have direct contact with SARS patients were on call at all times. Some workers avoided letting others people know where they worked. Thus, it is evident that medical staff would have strong emotional reactions like restlessness, fear, anger, or frustration. They were working under extremely stressful conditions unlike the world outside the hospital. Except for pregnancy, staff members assigned to SARS patients could not refuse their assignments. These workers experienced fatigue, insomnia, irritability, and anorexia. Lastly, their feelings were further complicated when they had to care for infected colleagues (Maunder et al., 2003).

In summary, nursing staff caring for SARS patients experienced tremendous physical and mental stresses because so little was known about the disease transmission and effective treatment regimens. Nursing staff did not know how to care for these patients or how to adapt to the stresses the epidemic created. Nevertheless, despite their own fears about the disease, they had to care for these patients immediately.

3. Methods

This research records the mental state of the nursing staff toward a new infectious disease and the changes after a prevention plan had been conducted by the hospital. Research subjects are nursing staff of the

largest obligatory SARS designated treatment hospital in Taiwan. After researchers explained the study purposes, 116 volunteers answered the questionnaires completely. The questionnaires were administered before caring for SARS patients, 2 weeks after caring for SARS patients under the prevention program, 1 month after the program began, and 1 month after the hospital returned to normal functions. The staff cared for SARS patients for 3 months in total.

4. Research tools

Tools used to gather information include basic personal data, Zung's self-rating anxiety scale, Zung's self-rating depression scale, Pittsburgh sleep quality index, and the SARS prevention program.

4.1. Basic demographics

Information include age, sex, education level, marital status, current professional title, amount of family support, and if they volunteered to care for SARS patients.

4.2. Zung's self-rating anxiety scale (SAS)

The scale was published in 1971 by Zung. In addition to being used in the US, it has been translated into 10 different languages for cross-cultural research. This is a self-rating questionnaire totaling 20 questions. Questions 1–5 represent the emotional symptoms of anxiety while questions 6–20 represent the physical symptoms of anxiety. Scores range from 1to 4 points per question. If the score is $\geqslant 50$, it indicates "psychological anxiety" with 50–59 indicating mild anxiety, 60–69 moderate anxiety, and, $\geqslant 70$ severe anxiety. The scale was translated into Chinese in 1982 in Taiwan, and the test-retest reliability is 0.70, criterion-related validity (0.60) is measured with anxiety scale in "physical and mental health score". Thus, the scale is reliable and feasible to use (Zung, 1971).

4.3. Zung's self-rating depression scale (SDS)

Developed in 1965 by Zung, this scale has been translated into 19 different languages. This questionnaire is a self-rating totaling 20 questions, among the four main sections: emotional imbalance, physiological imbalance, psychomotor imbalance, and psychological imbalance. Scoring range of each question is between 1and 4 points. If the score is $\geqslant 50$, it indicates "psychologically depressed", 50–59 indicates mildly depressed, 60–69 moderate depression, and, $\geqslant 70$ severe depression. The split-half reliability of the original scale is 0.73, and concurrent validity with the Hamilton anxiety scale (HAS) is 0.75. In 1982, the scale was translated into Chinese. The stability number of test-retest reliability is 0.73, and the criterion-related validity (0.37) is measured with depression scale in "physical and mental health score. It is also a stable and feasible scale to use.

4.4. Pittsburgh sleep quality index (PSQI)

This index was developed by Buysse et al.(1989); it is a self-rating questionnaire. Participants are asked to review the previous month's sleep patterns in terms of sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Each factor has its own scoring standard ranging from 0 to 3 points with total points ranging from 0 to 21 points. The higher the score, the poorer the sleep quality was. The original index research used 5 points as a cut off point with $\leqslant 5$ points indicating good sleep quality and >5 points indicating poor sleep quality. For reliability and validity, Cronbach α is 0.83. Its test-retest reliability (2 weeks apart) is $r = 0.80$, reaching 0.01 standards.

5. Epidemic prevention plans

This plan was based on information provided by WHO and Centers for Disease Control (CDC) was adjusted to conform to the hospital's environment and equipment. In-service training, manpower allocation, gathering sufficient protective equipment, and establishment of a mental health team were included. In order to guard against cross-infection in the hospital, several measures were taken with regard to handling procedure for SARS cases in general isolation room that included space, staff preparation, and environment.

5.1. Space

(1) Patient should be in a solitary isolation room with negative pressure, and the doors should be closed at all times; and (2) Examination and treatment should be performed inside the room and the patient should not leave the room unless necessary. If the patient is required to leave the room for related examinations or treatment, please inform the infection control team for a decision, and notify all associated units to provide necessary preventative measures.

5.2. Staff

(1) Strict preventative measures must be employed, and hands should be washed before and after entering the room; (2) Procedures for putting on and taking off protective wear. Before entering the room, put on two

layers of protective wear. The size of the N95 mask worn should be appropriate to the face. The seal is assessed every time and the mask is put on by measuring inspiratory and expiratory pressures (see Appendix A). Before leaving the room, remove gloves and wash hands with antiseptic solution. Take off the protective clothing and the surgical mask and wash hands with antiseptic solution. Use alcohol wipes to disinfect door knob before opening the door. Remove shoe cover at the corridor outside the preparation room and step into a chlorine water dish. Enter the preparation room and put on the surgical mask, protective clothing, gloves, and shoe covers before returning to nursing station (see Appendix B). Treatment should be coordinated to minimize the amount and frequency of staff entering the room. Staff should not enter the room unless necessary; (3) SpO2 of the patient should be monitored continuously. When SpO2 $<95\%$, the doctor should be notified. The doctor should enter the room at least once per shift to assess the patient's progress; and (4) record the name and time of the staff entering the room every day in order to follow up if required.

5.3. Environment

(1) Minimize the amount of equipment and medical instruments taken into the room. Use disposable equipment if available; (2) before taking equipment out of the room, the handles should be sprayed with chlorine water. The equipment is to be wiped thoroughly with chlorine water at the corridor, including any areas in contact with the patient or patient's bed, the plug, and electric cord. The equipment is then placed in a sunroom with UV lights for 2 h of disinfection before it can be used again; (3) disposable medical instruments should be used whenever possible (including ventilator tubes). If the instruments need to be recycled, they should be placed in two layers of bags marked infectious wastes, or placed in 0.05% chlorine water for 10 min (performed in the corridor) and then placed in the infectious waste bag. The instrument should then be taken back to the supplier by a specified staff; (4) the stethoscope, sphygmomanometer, and thermometer (given to patient on discharge) should be used only for that patient (wipe thoroughly with alcohol after patient is discharged); (5) use a closed suctioning system and a disposable fluid wastage collection bag; (6) the examination specimen should not be poured out and should be sealed tightly. Avoid contamination when opening the specimen vial that may contaminate working benches in the laboratory. The specimens should be in a double layer of plastic bags and taken to the laboratory by specified staff; (7) during every shift, 0.05% chlorine water should be used to clean the environment, the working benches at the nursing station, and the telephone.

In-service training consisted of 53 classes: intensive SARS protection training basic knowledge (11); patient care and protection (6); removal and disinfection process of P100 masks (5); nursing care for SARS patients (8); respiratory care and protection of SARS patients (5); SARS survival guide for medical personnel (4); procedures for entering rooms with SARS patient—use of protective gear (5); promotion of SARS protection and isolation (3); procedures for wearing protective equipment (3); hospital SARS infection control (3).

Information and knowledge were updated daily. To allocate manpower efficiently, unit-based assignments were made weekly with 3–4 units responsible for SARS patients while units rested. Daily working hours were limited to 8 h to avoid fatigue. Adjustments were made according to the number of SARS patients admitted to avoid under- and overstaffing. Nutritional supplements were available for the nursing staff to boost their immune systems.

The staff had the latest protective gear including scrub suits, isolating dresses, surgical caps, sterilized gloves, foot wraps, N95 masks, surgical masks, P100 masks, and safety glasses. A mental health team consisting of psychiatrists, social workers, psychological counselors, and psychiatric nurses were available to both patients and medical staff. Nursing staff identified patients for the mental health team who called the patients daily. A mental health clinic was opened for healthcare workers who needed some help.

6. Data analysis

SAS version 8.0 was used for data and statistical analysis. Data analysis is mainly divided into descriptive statistics and the inferential statistics by GEE.

7. Results

7.1. Demographic information

Of 120 staff members surveyed, 116 completed all four questionnaires for a dropout rate of 3.3%. Descriptive statistical analysis is mainly used to understand the distribution of demographic variables, anxiety level, depression level, and sleep quality.

The subjects' mean age is 31 years (SD = 10.8 years). Most are female (98.3%) with an education level of junior college (68.1%). Seventy percent are unmarried. Before the SARS epidemic, 31.9% perceived themselves as having severe work stress while 60.3% perceived average stress. Before the SARS epidemic, 56.9% of respondents had supportive family members, which decreased to 38.8% when they began caring for SARS patients (Table 1). In addition, the anxiety level,

Table 1
Distribution of demographic variables

Variables	*N*	Percentage (%)	Anxiety depression sleep (*p*-value)		
Sex			0.55	0.93	0.68
Male	2	1.7			
Female	114	98.3			
Education level			0.23	0.24	0.24
Vocational school	9	7.8			
Junior college	79	68.1			
University	24	20.9			
Graduate school and above	4	3.5			
Perception of work stress before SARS epidemic	5	4.2	**0.006***	**0.04***	0.52
Tremendous	37	31.9			
Severe	70	60.3			
Average	2	1.7			
Mild	2	1.7			
Very mild					
Level of family support before SARS epidemic			0.09	**0.003****	**<0.0001*****
Extremely unsupportive	0	0			
Unsupportive	4	3.4			
No comment	27	23.3			
Extremely supportive	19	16.4			
Supportive	66	56.9			
Level of family support after SARS patient care			**0.003****	**0.06**	**0.014***
Extremely unsupportive	11	9.5			
Unsupportive	27	23.3			
No comment	23	19.8			
Extremely supportive	10	8.6			
Supportive	45	38.8			
Volunteered for SARS patient care			**<0.0001*****	**0.013***	0.06
Yes	25	21.6			
No	91	78.4			
Believed that current protective equipment is sufficient			0.23	**0.012***	0.24
Yes	10	8.6			
No	106	91.4			

depression level, and sleep quality of the nursing staff were not affected by gender, education level, marital status, and religious affiliation.

To determine which possible factors affected their anxiety level, ANOVA was performed. Greater family support was associated with lower anxiety levels ($F = 4.64; p = 0.003$). A lower perception of work stress before SARS was associated with a higher anxiety level ($F = 4.62; p = 0.006$). Those who did not volunteer to care for SARS patients had a higher anxiety level ($F = 14.52; p < 0.0001$).

When possible factors that may affect the level of depression were analyzed, similar results as for anxiety were found. Those who had a perception of low work stress before SARS displayed a higher level of depression ($F = 2.83; p = 0.04$). Nursing staff with a higher level of family support before SARS displayed a lower level of depression ($F = 14.52; p = 0.003$). Those who did not volunteer to care for SARS patients had a higher depression level ($F = 6.48; p = 0.013$). In the analysis of possible factors affecting the nursing staff's sleep quality, the factors were the same as for increased anxiety and depression levels (Table 1).

8. Inferential statistics

We used GEE analysis to control for changes in time and possible confounding factors such as perceived work stress before the SARS epidemic, level of family support while performing SARS patient care. Tables 2 and 3 show the effects of the SARS prevention program on nursing staff through their self-reported levels of anxiety and depression as well as sleep quality.

Table 2
Anxiety level, depression level, and sleep quality mean scores

Type of analysis (Times tested)	Mean score (SD)	Level
SAS (anxiety level at time point 1)	60 (9.28)	Moderate anxiety
SAS (anxiety level at time point 2)	51 (10.32)	Mild anxiety
SAS (anxiety level at time point 3)	50 (9.84)	Mild anxiety
SAS (anxiety level at time point 4)	46 (7.48)	No anxiety
SDS (depression level at time point 1)	61 (12.62)	Moderate depression
SDS (depression level at time point 2)	51 (11.94)	Mild depression
SDS (depression level at time point 3)	50 (10.60)	Mild depression
SDS (depression level at time point 4)	48 (10.76)	No depression
PSQI (sleep quality at time point 1)	12 (3.83)	Poor sleep quality
PSQI (sleep quality at time point 2)	10 (3.43)	Poor sleep quality
PSQI (sleep quality at time point 3)	10 (3.77)	Poor sleep quality
PSQI (sleep quality at time point 4)	8 (2.75)	Poor sleep quality

SAS: self-rating anxiety scale; SDS: self-rating depression scale.PSQI: Pittsburgh sleep quality index; Time point 1: before caring for SARS patients; Time point 2: 2 weeks after the SARS prevention program was initiated ; Time point 3: 1 month after program initiation; Time point 4: 1 month after the hospital was no longer a designated SARS center which was 3 months after caring for SARS patients.

Table 3
Using GEE to analyze changes in staff's anxiety level, depression level, and sleep quality

Variable	Estimate	Standard error	95% confidence limits		Z	p value
Intercept (SAS global)	2.3036	0.0555	2.1947	2.4124	41.48	$<0.0001^{1}$
T_0 vs. T_1[a]	−0.2338	0.0874	−0.4051	−0.0625	−2.68	0.0075^{3}
T_0 vs. T_2[a]	−0.2967	0.0666	−0.4272	−0.1661	−4.45	$<0.0001^{1}$
T_0 vs. T_3[a]	−0.4135	0.0628	−0.5366	−0.2904	−6.58	$<0.0001^{1}$
Intercept (SDS global)	2.4446	0.0696	2.3082	2.5811	35.11	$<0.0001^{1}$
T_0 vs. T_1[b]	−0.4598	0.1005	−0.6567	−0.2628	−4.58	$<0.0001^{1}$
T_0 vs. T_2[b]	−0.3662	0.0763	−0.5158	−0.2166	−4.80	$<0.0001^{1}$
T_0 vs. T_3[b]	−0.4787	0.0751	−0.6260	−0.3315	−6.37	$<0.0001^{1}$
Intercept (PSQI global)	12.4348	0.5860	11.2863	13.5833	21.22	$<0.0001^{1}$
T_0 vs. T_1[c]	−2.2959	0.8239	−3.9108	−0.6810	−2.79	0.0053^{3}
T_0 vs. T_2[c]	−1.9193	0.6107	−3.1163	−0.7223	−3.14	0.0017^{2}
T_0 vs. T_3[c]	−2.0217	0.6005	−3.1986	−0.8448	−3.37	0.0008^{2}

[1] $p<0.0001$; [2] $p<0.005$; [3] $p<0.05$.
[a] Reference group, SAS global time = 0.
[b] Reference group, SDS global time = 0.
[c] PSQI global time = 0.

8.1. Anxiety level

After implementation of the SARS prevention program, the mean scores of anxiety level decreased with time. The mean score from the first questionnaire before caring for SARS patients is 60 points (SD = 9.28), indicating moderate anxiety compared to the mean scores of after the implementation of the anti-SARS program, the mean scores of 51, 50, and 46 indicating mild anxiety, mild anxiety, no anxiety, respectively, at the remaining time points. Using GEE to control for the factors described above, the results demonstrate that anxiety levels 2 weeks after the implementation of the prevention program and while caring for SARS patients were significantly lower than anxiety level before caring for SARS patients ($z=-2.68; p=0.075$). The anxiety level month after caring for SARS patients was also significantly lower than the anxiety levels before care of SARS patients ($z=-4.45; p<0.0001$). After caring for SARS patients for 3 months and 1 month after the hospital returned to normal operations, nursing personnel exhibited anxiety levels significantly lower than

that prior to caring for SARS patients ($z = -6.58$; $p < 0.0001$).

8.2. Depression level

After the implementation of the SARS prevention program, mean scores of depression level have decreased with time. At the time of the first questionnaire before care of SARS patients began, the mean score was 61 points (SD = 12.62), indicating moderate depression. After program initiation, the mean scores of 51, 50, and 48 points indicated mild depression, mild depression, and no depression, respectively. Using GEE to control for the factors described previously, the levels of depression 2 weeks after initiation of the SARS prevention program and while caring for SARS patients were significantly lower than the level before caring for SARS patients ($z = -4.58$; $p < 0.0001$). At 1 month after caring for SARS patients, the level of depression was also significantly lower than the levels of depression levels before the staff began to care for SARS patients ($z = -4.80$; $p < 0.0001$). After the hospital had returned to normal operations, the level of depression was significantly lower than that prior to taking care of SARS patients ($z = -6.37$; $p < 0.0001$).

8.3. Sleep quality

The mean score from the first questionnaire was 12 points (SD = 3.83), meaning that sleep quality was poor. Of the remaining three questionnaires, the mean scores were 10, 10, and 8 indicating poor sleep quality. When GEE was used to control for the factors described above, the mean score at 2 weeks after the SARS prevention program began when the staff was caring for SARS patients was significantly lower than the mean score before they began caring for SARS patients ($z = -2.79$; $p = 0.0053$). At 1 month after caring for SARS patients and at 1 month after the hospital resumed normal operations, the mean score ($z = -3.14$; $p = 0.0017$) was also significantly lower than the score before the nursing care began ($z = -3.37$; $p = 0.0008$).

9. Discussion

The primary mode of transmission for SARS seems to be close person-to-person contact. It is believed SARS is transmitted most readily by respiratory droplets. The virus also can spread when people touch a surface or object contaminated with infectious droplets and then touch their mouth, nose, or eyes. Therefore, the chance of infection is much higher than with AIDS. Care of a SARS patient requires an isolation area with one or two patients per nurse; thus, more nursing staff is required. Nurses who were usually assigned to clinics, surgical wards, obstetrics and gynecology, and neurology were incorporated into the care roster after brief training. In addition, with the hospital becoming a designated SARS center so rapidly, setting up isolation rooms consisting of an anteroom and a clean zone was not possible due to insufficient equipment. Thus, the patient's room itself became an isolation room. The nursing staff was equipped with full-body protective gear for 6–8 h (double-layered protective gear, double layered masks, double layered gloves, isolating caps, foot wraps, and protective glasses) under high temperature and negative pressure. To avoid becoming infected when removing the protective equipment, the personnel could not eat, drink, or use the bathroom during their working hours. Many became dehydrated due to excessive sweating, and consequently, some developed cystitis and skin rashes. Working in the isolation areas required the staff to have frequent, close patient contact while turning patients, performing back percussion, sputum suction, and venipuncture. Under these dangerous exposures, the staff grew mentally and physically exhausted, and began to doubt the value and meaning of life. All this led to anxious and depressive emotional disturbances.

During that time, the Taiwan media repeatedly showed nurses who crossed the isolation restriction line in terror and refused to care for SARS patients. In the first questionnaire, the levels of anxiety and depression were moderate thereby indicating the tremendous public pressure placed on nurses. Additionally, the infection and deaths of medical staff that cared for SARS patients increased the level of fear and worry among their colleagues further. They exhibited poor sleep quality. The sleep quality score of the first questionnaire was 12 points, indicating the influence of their anxiety and depression. These results are similar to that of the investigation by Maunder et al. (2003) in Canada. The workers reported feeling tired and having insomnia, indicating the need for a comprehensive plan to help them cope.

After the hospital was designated a SARS center, the SARS prevention program was designed to overcome the medical staff's objections. Ho-Ping Hospital was forced to close due to the lack of a comprehensive plan in against cross-infection in the hospital. The plan included in-service training, manpower allocation, a sufficient supply of protective equipment, and establishment of a mental health team. Two weeks after caring for SARS patients and the initiation of the SARS prevention program, the questionnaire was answered for a second time. The third time was 1 month after the SARS prevention program began. By then moderate anxiety had decreased to mild anxiety and the level of depression lessened. With GEE analysis controlling for time variables and possible factors, coping strategies and the implementation of the SARS prevention program

were the confounding factors. Due to their nursing training, the staff would adopt coping strategies to buffer the negative impact of work stress. The coping mechanisms, which were developed by Aguilera (1990) based on Caplan's theory, refer to the usual patterns of reaction when a subject faces a problem. These reactions were repeatedly learned from the individual's daily life because they effectively decrease anxiety and nervousness. Individuals are more confident when they believe that they can effectively manage current situations. Therefore, the perceived control of certain circumstances will affect their choice and insistence on coping strategies. The more frequent coping strategies of nursing staff from previous studies are understanding a new principle, objectively analyzing current situations, reading related books, or exchanging ideas with colleagues. Therefore, coping mechanisms could decrease the anxiety and depression levels of the nursing staff. On the other hand, the implementation of the SARS prevention program is a possible intervention that also decreased anxiety and depression levels. As illustrated by Shieh (2003), in-service training and manpower allocation are important components in a disease prevention program. These plans help nursing staff to better understand the disease and preventive measures as well as provide correct and current information. Besides, working hours and holidays were scheduled to ensure that staff had sufficient rest time. At 2 weeks and at 1 month after implementation of the SARS prevention program, the sleep quality score dropped significantly from 12 to 10, indicating some improvement. However, when 5 points is the cut-off point (<5 equals good sleep quality while $\geqslant 5$ indicates poor sleep quality), the nursing staff still exhibited poor sleep quality. One possible reason could be the changing work schedule. Other research has shown that nurses' sleep quality is affected by schedule changes or working at night due the disturbance of their biological clocks. A disrupted biological clock can increase a person's sensitivity to stress. Sleep pattern adjustment requires at least 6 days. Most common sleeping problems experienced by those who work nights are difficulties in falling asleep, sleeping less than 6 h, and being unable to fall asleep after being awoken (Fraser and Filler, 1989; Harma, 1993; Tseng et al., 1995).

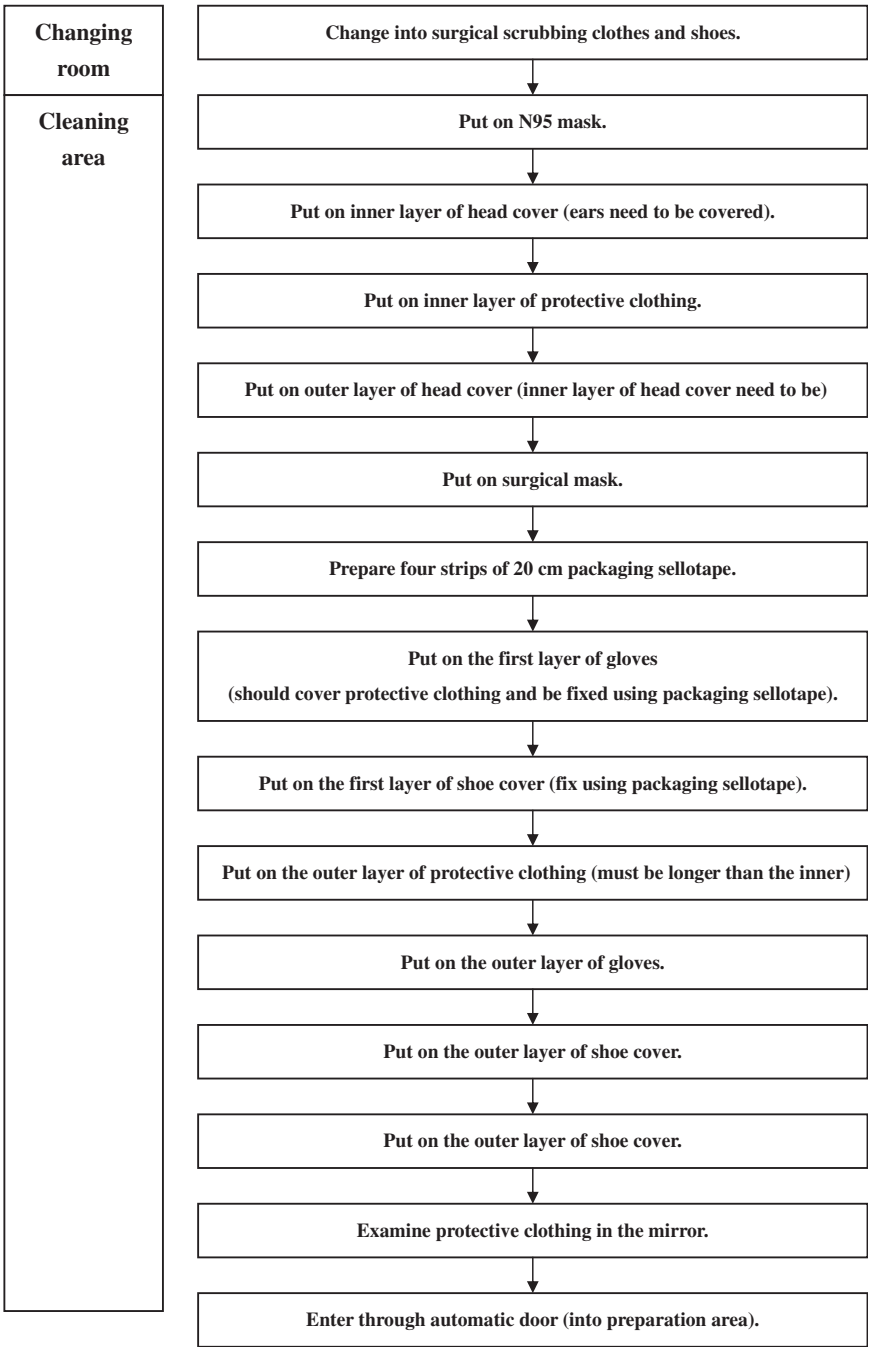
After the SARS epidemic subsided, the hospital resumed its normal operations, and the nursing staff returned to their original assignments. The fourth questionnaire was administered when 3 months of SARS patient care had been completed, which was 1 month after the hospital was no longer a designated center. Staff who had been mildly anxious and depressed became no longer anxious and depressed. Thus, when the burden of caring for SARS patients was removed, anxiety and depression ceased to exist. Although the mean sleep quality score improved from 10 to 8, sleep quality was still poor. Perhaps a longer time is required for sleep patterns to return to their usual state. In addition, working varying schedules could be another factor that affects sleep quality. Further research in this area could prove fruitful.

10. Conclusion

From the SARS epidemic, we learned that when confronted with an unknown infectious disease, the inability of health officials to deal effectively with the crisis led to nursing staff losing their emotional control and sometimes abandoning their employment. Some students in nursing schools changed their course of study (Lee and Lin, 2003). The tremendous challenges and impact on available nurses, working environment, and ethical issues were evident. The prevention programs also played a very important role in combatting the potential lethal epidemics. Rigid standard precautions were taken against cross-contamination in the hospital as well as in the city. Procedures for wearing and removal and disinfection of P100 masks, the route of the SARS wards, entering preparation room, entering buffer zone, and entering the negative pressure room were carefully planned in advance. Therefore, the outbreak of the epidemic could be controlled in a limited time. Our research demonstrated that nurses grew anxious and depressed during the SARS epidemic and did not sleep well. However, with a systematic SARS prevention program that included a series of in-service training, detailed manpower allocation, adequate protective equipment, and the availability of a mental health team, the nursing staff had decreased their anxiety and depression levels along with improving their sleep quality. The nursing staff can provide better patient care when they themselves are physically and mentally capable. In summary, the rapid deployment of a comprehensive prevention program should be a priority of governmental authorities when facing an epidemic. Isolation rooms, instruction in the proper use of safety equipment, and allocation of medical personnel will allow health care workers to care for patients without additional stresses.

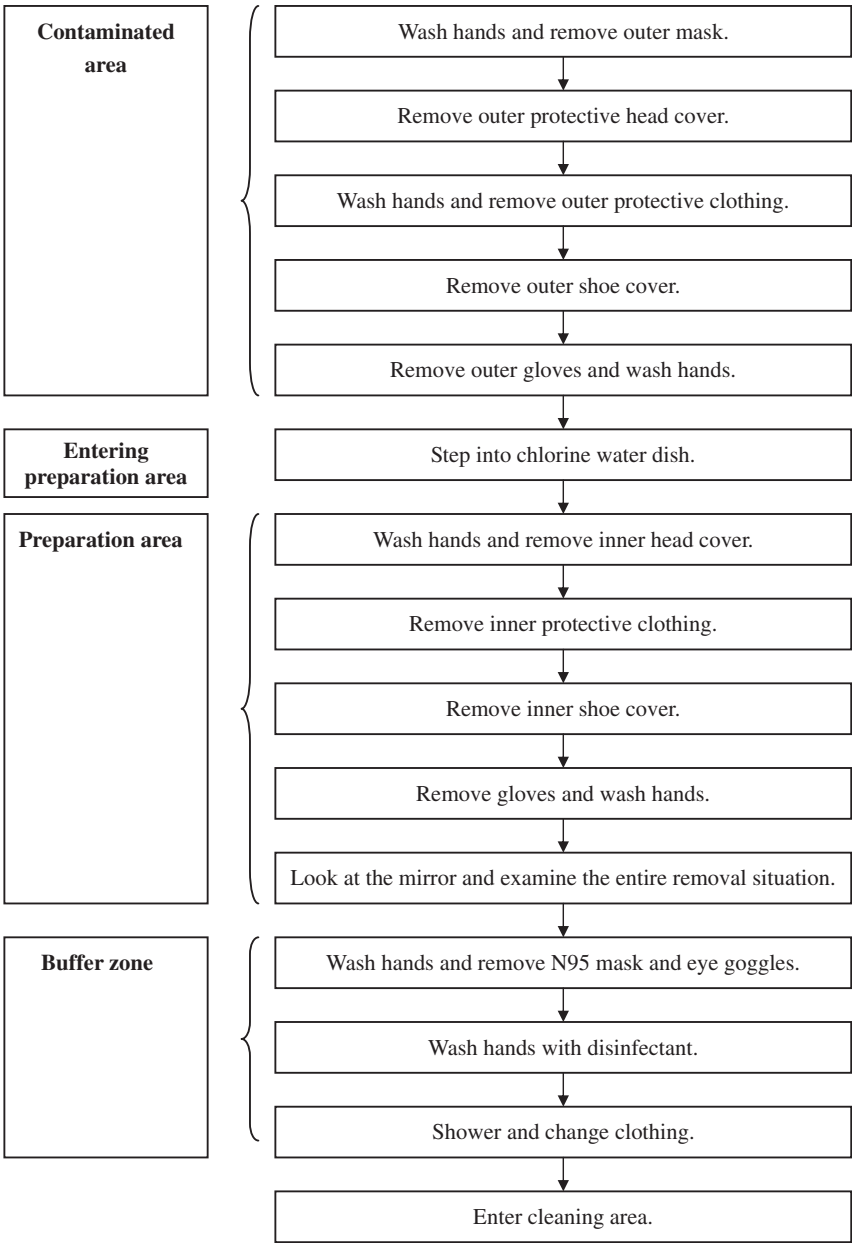
Appendix A

Entering SARS room—procedures for putting on protective wear.



Appendix B

Leaving SARS room—procedures for taking off protective wear.



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