Knee osteoarthritis (KOA) is a chronic, progressive, and recurrent joint disorder that leads to joint instability and physical disability [1]. KOA is multifactorial in origin, and both inflammatory and biomechanical whole-organ disease processes play an important role in disease progression [2–4] that is affected by several factors, including family history, age, obesity, diabetes, and synovitis [5]. KOA has a prevalence rate of up to 8.1% with a higher frequency among women than among men at any given age more than 50 years old [5]. For patients who are at the end stage of...
The present study was conducted after approval by the Research Ethics Committee of Shandong Provincial Hospital affiliated to Shandong First Medical University (no. 2017-055) and was reported in accordance with the CONSORT 2010 statement. Written consent was obtained from each participant in the study.

2. Materials and Methods

2.1. Ethics. The present study was conducted after approval by the Research Ethics Committee of Shandong Provincial Hospital affiliated to Shandong First Medical University (no. 2017-055) and was reported in accordance with the CONSORT 2010 statement. Written consent was obtained from each participant who participated in the study.

2.2. Participants and Baseline Information. The present study was a noncontemporaneous control study. A convenience sampling method was used for the recruitment of subjects from January 2018 to October 2019. Subjects who met the following inclusion criteria were included: (1) 18 years of age or older and (2) subjects who were diagnosed as having degenerative osteoarthritis and underwent primary TKA. The exclusion criteria were as follows: (1) having any diagnosed hip or ankle disorders, (2) having any balance disorders or ligament instability, (3) severe osteoporosis or severe cardiopulmonary diseases, or (4) ankylosing spondylitis, hemophilic arthritis, and severe deformities of the knee joint due to diseases other than KOA that could affect the results. Subjects who underwent TKA from January 2018 to December 2018 were assigned to the control group, and the patients from January 2019 to October 2019 who underwent TKA were assigned to the intervention group.

Baseline information including age, gender, marital status, and education level, comorbidities, and osteoarthritis history were obtained on the day of admission. The Numerical Rating Scale (NRS) was used to evaluate pain, and the Barthel index (BI) was used to evaluate the ability of daily living.

2.3. Intervention. A standardized exercise plan for TKA patients was developed by the rehabilitation team in our hospital. The content of the exercise plan included ankle pump, isometric contraction, straight leg raising, and flexion knee exercises (Table 1). A 3-minute video that showed the exercise plan was made, and a bedside interactive system was established for playing the video.

The patients in the control group were provided with oral education by the trained nurses about the exercise plan shown in Table 1. The patients in the intervention group were provided with a demonstration of the exercises (Table 1) and then were shown the video by the bedside interactive system. The patients were quizzed to test their level of comprehension regarding the exercise plan, and tutorial was provided as needed.

2.4. Postoperative Recovery. The time to achieve first ambulation, straight leg elevation, and knee flexion to 90 degrees was evaluated at 8:00 am, 12:00 pm, 16:00 pm, and 22:00 pm every day. Occurrence of the following postoperative complications was recorded if they were diagnosed following the criteria reported elsewhere [17–19]: (1) deep venous thrombosis (DVT), (2) postoperative orthostatic intolerance, and (3) constipation. Venous blood samples were collected by trained nurses. Red blood cell count, white blood cell count, absolute number of lymphocytes, and absolute number of neutrophils were measured using Sysmex XN9000 (Sysmex, Japan). C-reactive protein level was evaluated by the nephelometry immunoassay using the BN ProSpec System (Siemens, Germany).

2.5. Job Burnout and Job Stress. Job burnout in nurses was assessed using the Maslach Burnout Inventory (MBI) before and after the intervention. MBI was compiled by Maslach and Jackson in 1986 [20, 21] and translated in 2000 by Li. MBI has been shown to have good reliability and validity in the Chinese population [22]. Briefly, the MBI consists of 22 items in three dimensions: emotional exhaustion (nine items), depersonalization (five items), and reduced personal accomplishment (eight items). The nurses responded to each item using a 7-point Likert scale. The higher the score, the higher the degree of emotional exhaustion and depersonalization and the lower the degree of reduced personal accomplishments.

Job stress in nurses was evaluated using the China Nurses’ Job Stressors Scale (CNSS) before and after intervention, which was compiled by Li in 1999 [22]. Briefly, the CNSS consists of 35 items in five dimensions: nursing
Table 1: Training after total knee arthroplasty.

| Content                                    | Method                                                                 | Time                  |
|--------------------------------------------|------------------------------------------------------------------------|-----------------------|
| Ankle pump exercise                        | (i) Take supine position (ii) Actively flex and extend the ankle joint (iii) Relax the thigh (iv) Slowly and forcefully extend the ankle joint back as far as possible within the limit of no pain or only slight pain for 10 seconds (v) Plantar flexion for 10 seconds | 5-10 minutes per hour |
| Intramuscular quadriceps isometric contraction exercise | (i) Take supine position with the knees straight (ii) Strain the thigh muscles for 5-10 seconds (iii) Relax and repeat | 3-5 times per set, 10-20 sets per day |
| Hamstrings isometric contraction exercise   | (i) Take supine position (ii) Press muscles in the posterior upper leg by extending the upper leg against pillows (iii) Relax and repeat |                       |
| Straight leg raising exercise               | (i) Take supine position (ii) Hook up the toe of the affected limb (iii) Straighten and raise the leg to an angle of 30-40 degrees from the bed (iv) Maintain the position as long as possible (v) Relax and repeat | 5-10 times per set, 3-5 sets per day |
| Flexion knee exercise in the supine position | (i) Take supine position (ii) The lower leg is relaxed and sagging naturally | 5 minutes per set, 2-3 sets a day |
| Flexion knee exercise in the prone position  | (i) Take prone position (ii) Flex the affected knee joint               |                       |

specialty and work (seven items), workload and time allocation (five items), working environment and resources (three items), patient care (11 items), management, and interpersonal relationship (nine items). The nurses responded to each item using a 4-point Likert scale. The total score was between 35 and 140 with higher scores indicating higher levels of job stressors.

2.6. Statistical Analyses. G*Power 3.1 software was used for sample size estimation. Based on our pilot results, a minimal sample size of 82 was suggested to reach a power of 0.80% and a significance of 0.05. Statistical analysis was performed using IBM SPSS Statistics software (version 22.0, IBM Corporation, USA). Numerical variables are expressed as the means and standard deviations (SDs) if data were normally distributed. Discrete data were expressed as frequencies or percentages. Differences between two groups were tested using the independent t-test and chi-squared test for continuous data and discrete data, respectively. Fisher’s exact test was used in the analysis of contingency tables. A P value less than 0.05 was considered statistically significant.

3. Results

3.1. Baseline Information. A total of 185 patients participated in the study. Six patients were transferred to the intensive care unit due to severe postoperative cardiopulmonary disease and thus were excluded. The mean age of the participants was 63.6 years (SD = 7.3 years, range = 45–82 years). The ratio for female and for married was 76.5% and 96.6%, respectively. Demographic and disease-related data of the participants are summarized in Table 2. Difference in these demographic and disease-related variables between two groups was not statistically significant (Table 2).

3.2. Postoperative Recovery and Complications. The hospitalization time and time to first ambulation, straight leg raising, and knee flexion to 90 degrees after the intervention in the video-assisted health education group were significantly shortened compared to those in the oral education group with data summarized in Table 3.

After the intervention, constipation and postoperative orthostatic intolerance were significantly reduced. Comparisons of postoperative complications are summarized in Table 4. The difference in the DVT rate between two groups was not statistically significant (P = 0.243).

3.3. Biomarkers. Levels of biomarkers are summarized in Table 5. CRP levels were significantly lower, and red blood cell counts were significantly higher in the intervention group when compared with the control group (P = 0.004 and P = 0.016, respectively).

3.4. Job Burnout and Job Stress in Nurses. Job burnout and job stress in nurses are summarized in Table 6. There were significant differences in emotional exhaustion, reduced personal accomplishments, and job stress between the two groups (P = 0.002, P = 0.004, and P < 0.001, respectively).

4. Discussion

In this study, video-assisted health education was shown to be more useful than oral education in promoting postoperative recovery on TKA patients and reducing job burnout and job stress in nurses.
Table 2: Baseline information of the participants.

| Variables                   | Intervention group (n = 91) (Mean ± SD) | Control group (n = 88) (Mean ± SD) | t / χ²  | P value  |
|-----------------------------|----------------------------------------|-----------------------------------|---------|----------|
| Age                         | 62.87 ± 7.46                           | 64.27 ± 7.20                      | -1.28   | 0.202    |
| Gender                      |                                        |                                   |         |          |
| Male                        | 16                                     | 26                                | 3.57    | 0.059    |
| Female                      | 75                                     | 62                                |         |          |
| Marital status              |                                        |                                   |         |          |
| Single                      | 3                                      | 3                                 | 0.002   | 0.967    |
| Married                     | 88                                     | 85                                |         |          |
| Education                   |                                        |                                   |         |          |
| Primary school and below    | 47                                     | 35                                | 2.58    | 0.275    |
| Junior middle school        | 25                                     | 29                                |         |          |
| Senior high school and above| 19                                     | 24                                |         |          |
| Comorbidity                 |                                        |                                   |         |          |
| Yes                         | 58                                     | 57                                | 0.021   | 0.885    |
| No                          | 33                                     | 31                                |         |          |
| Pain score                  | 2.34 ± 0.87                            | 2.36 ± 0.94                       | -0.17   | 0.865    |
| Barthel index score         | 89.67 ± 5.47                           | 90.17 ± 5.59                      | -0.61   | 0.546    |

Table 3: Postoperative recovery of participants in the two groups.

| Variables                | Intervention group (n = 91) (Mean ± SD) | Control group (n = 88) (Mean ± SD) | t       | P value|
|--------------------------|----------------------------------------|-----------------------------------|---------|--------|
| Hospitalization time (days) | 7.51 ± 1.79                           | 8.21 ± 2.15                       | -2.37   | 0.019  |
| First ambulation (h)      | 19.91 ± 4.57                           | 50.15 ± 7.00                      | -34.34  | < 0.001|
| Straight leg raising (h)  | 26.55 ± 12.19                          | 40.38 ± 11.64                     | -7.76   | < 0.001|
| 90 degrees flexion (h)    | 21.31 ± 5.83                           | 35.72 ± 9.93                      | -11.88  | < 0.001|

Table 4: Complications in intervention and control groups.

| Complications                           | Intervention group (n = 91) | Control group (n = 88) | χ²   | P value |
|-----------------------------------------|-----------------------------|------------------------|------|---------|
| DVT                                     | 10                          | 15                     | 1.37 | 0.243   |
| Postoperative orthostatic intolerance   | 7                           | 19                     | 6.96 | 0.008   |
| Constipation                            | 10                          | 23                     | 6.83 | 0.009   |

Table 5: Count of blood cells in intervention and control groups.

| Items                        | Intervention group (n = 91) (Mean ± SD) | Control group (n = 88) (Mean ± SD) | Coefficient of variation (%) | t       | P value |
|------------------------------|----------------------------------------|-----------------------------------|-------------------------------|---------|---------|
| CRP (mg/L)                   | 84.54 ± 36.09                         | 99.45 ± 31.73                    | 42.68                         |         |         |
| WBC (10³/L)                  | 6.89 ± 1.60                           | 7.38 ± 1.82                     | 23.16                         |         |         |
| RBC (10¹²/L)                 | 3.73 ± 0.40                           | 3.57 ± 0.46                     | 10.73                         |         |         |
| LYMPH (10⁹/L)                | 1.33 ± 0.63                           | 1.25 ± 0.42                     | 47.24                         |         |         |
| NEUT (10⁹/L)                 | 4.99 ± 2.98                           | 5.40 ± 1.59                     | 59.69                         |         |         |

CRP, C-reactive protein; WBC, white blood cell; RBC, red blood cell; LYMPH, absolute lymphocyte count; NEUT, absolute neutrophil count.
Manpower shortage of nurses in the public healthcare system remains challenging, and thus, the registered nurses are under a heavy workload, which probably affects the quality of healthcare service. For example, in one survey, 51.6% of nurses believed that the main factor affecting nurses’ performance of health education duties was time tension [23]. Furthermore, the heavy workload and differences in interpersonal communication skills, work efficiency, and personal difficulties to achieve consistency, continuity, and standardization in patient education [24]. Therefore, an effective method by which nurses can maintain the quality of patient education in the situation of heavy workload is urgently warranted. Some clinicians suggested that using video health education has the potential to help patients memorize the information and reduce the workload of nurses at the same time [25]. The present study provided evidence for advantages of video-assisted health education over oral education in providing comprehensive, standardized, and easy-to-assimilate information, which accelerated postoperative recovery.

The condition of heavy workload increases the pressure of nurses. The application of video-assisted health education in the rehabilitation training on patients after TKA reduces repetitive explanation for questions that were commonly raised and for the inconsistent oral expressions. In this way, video-assisted health education can improve work efficiency of nurses and thus reduce their work pressure and job burnout. Besides, application of video-assisted health education can be extended to community care services, home care services, and other fields to promote rehabilitation training [26]. Health education assisted by a video could be at least a supplement to traditional teaching modes and standardize health education at relatively low cost in community.

Oxidative stress can cause oxidative damage to various macromolecules, and it has been considered to be one of the causative factors in the pathogenesis of KOA [2, 3]. TKA was demonstrated to be effective in reducing local chronic oxidative damage in OA patients [27]. Nevertheless, a level of oxidative stress continues during postoperative recovery until the peripheral tissues of the knee joint are repaired [28]. Video-assisted health education on rehabilitation training was found to be a macroscopic antistress strategy that modulated low-grade chronic inflammation and active antioxidant enzymes and stimulated the secretion of anti-inflammatory cytokines [12, 29]. Ihalainen and colleagues [30] reported a decrease in proinflammatory biomarkers, such as CRP and inhibited systemic or wound local inflammatory reactions after rehabilitation training. Chen and colleagues [31] suggested that active functional exercise after TKA improved the levels of TNF-α, IL-1β, and IL-6 and promoted the recovery of joint function. The present study enhanced the evidence for the benefits of rehabilitation training and further suggested an advantage of video-assisted health education over oral education in the training provided by nurses who had heavy workload.

This study has some limitations. First, confounding information about KOA classification and evaluation of knee function was not obtained, which may have led to bias in the results. Second, compliance of patients was not assessed, and it probably caused response bias, which may limit the generalizability of the study results. Therefore, further studies with confounding factors better controlled and with larger sample size are warranted.

5. Conclusion

Video-assisted health education may promote the recovery after total knee arthroplasty and reduce job burnout and job stress in nurses when compared with classical oral education. Video-assisted health education could be helpful in situation where manpower of nurse is in shortage.

Data Availability

Data are available from Shuang Wang (wang-shuang200803@163.com) for researchers who meet the criteria for access to confidential data.

Conflicts of Interest

Each author of this study declares that there is still no relationship with the companies or manufacturers that will benefit from the results of this study. There are no conflicts of interest involved.

Acknowledgments

The authors acknowledge the Shandong Provincial Hospital affiliated to Shandong First Medical University and the Second Affiliated Hospital of Guangzhou University of Chinese Medicine for their support and all the participating patients for their permission to conduct this study. The authors would like to thank nurses at the Department of Osteoarthritis for their contribution and support of the project. This study was supported by the Chinese Medicine Science and Technology Research Project of Guangdong
CONSORT 2010 checklist of information to include when reporting a randomised trial. (Supplementary Materials)

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