Original Article

Effect of integrated nursing care in treatment of lung cancer patients

Yu Fu, Hailan Lu, Shaomin Wu

Department of Respiratory Medicine, Hainan General Hospital, Haikou, Hainan Province, China

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Abstract: Objective: To explore the effect of integrated nursing interventions in the management of patients with lung cancer (LC). Methods: A total of 110 LC patients were enrolled as subjects, and relevant data were collected from the patients and retrospectively investigated. The patients were assigned either to the observation group (n=55) or to the control group (n=55) in terms of nursing care modes. Patients in the observation group received integrated nursing interventions, while those in the control group were given conventional nursing care. The quality of sleep, expression of tumor necrosis factor α (TNF-α) and superoxide dismutase (SOD) (serum inflammatory cytokines), quality of life, length of hospital stay, patient satisfaction with nursing care and negative emotions of patients were compared between the two groups. Results: At discharge, patients in the observation group had remarkably higher scores for the Pittsburgh sleep quality index (PSQI), significantly lower TNF-α levels, considerably higher SOD levels, markedly higher scores for the Quality Life Questionnaire Core 30 (QLQ-C30), but significantly lower scores of the Self-Rating Anxiety Scale (SAS) and the Self-Rating Depression Scale (SDS) than those in the control group (all P<0.001). In addition, hospital stay was significantly shortened, but patient satisfaction with nursing care was substantially increased in the observation group (P<0.01). Conclusion: Integrated nursing interventions significantly improved quality of sleep and life and patient satisfaction with nursing care, reduced the expression levels of serum inflammatory cytokines and presence of negative emotions, shortened hospital stay, and enhanced the therapeutic effects in LC patients.

Keywords: Lung cancer, integrated nursing care, therapeutic effect

Introduction

Clinically, lung cancer (LC) is a common malignant tumor. According to the statistics of American Cancer Society (ACS), the global incidence of LC was 11.6% in 2018, with a mortality rate of 18.4% [1]. With the worsening of air pollution, increase in social pressure and changes in lifestyle, lung cancer is increasingly prevalent, with a trend of patients being younger; this seriously threatens physical and mental health of patients [2]. Due to complicated etiology, insidious onset and rapid progress of lung cancer, most patients have missed the optimal timing of operation when they are diagnosed. It is reported that only approximately 20% of patients can be cured by surgical resection alone; however, to maximally improve their survival, most patients have to receive chemotherapy and other treatments [3, 4]. Factors including adverse reactions to chemotherapy during the treatment, lung cancer itself and resultant pains are inclined to affect quality of sleep and life in the patients to varying degrees, leading to presence of negative emotions (such as severe psychological stress, anxiety, and depression) in patients and affecting their compliance [5-7]. Additionally, long-term chemotherapy impacts the immune function of patients, and it especially causes changes in tumor necrosis factor α (TNF-α) and superoxide dismutase (SOD) expression [8, 9]. All this ultimately affects the therapeutic effects of LC patients. In order to find ways to improve the therapeutic effects of LC patients effectively, some trials were conducted, in which LC patients received nursing interventions; the trials have confirmed that nursing interventions do improve the clinical efficacy in such patients. However, the problem whether nursing interventions can effectively improve quality of sleep and life, anxiety, depression and immune func-
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tions, and ultimately promote the clinical efficacy in LC patients has attracted special attention from clinical scholars.

In fact, most of conventional nursing programs are unsatisfactory in LC patients. The common problems include inadequate health guidance, lack of detailed knowledge of chemotherapy, untimely treatment of adverse drug reactions, ignorance to patients’ negative emotions, nutritional imbalance, and low enthusiasm in activity participation [10]. Integrated nursing care, a comprehensive nursing mode, is primarily based on high-quality nursing care. Implementation of integrated nursing care starts as soon as the patients are admitted to the hospital. The patients were assessed for their physical and psychological functions and self-care ability, focused on their mood, nutritional status, and adverse reactions. The superior physicians get feedback on the results of the assessment, and deal with the results in a timely manner. They invite the patients and their family members to take active part in developing care programs, with a purpose to improve the trust between doctors and patients [11]. In this study, integrated nursing interventions were performed in LC patients in the course of treatment. Such research has never been reported in China and abroad. In this study, the effects of integrated nursing care on quality of sleep and life, and negative emotions of LC patients were observed, and the impacts of the interventions on the levels of serum-related cytokines and nursing care satisfaction in such patients were also explored. The study is of significance to provide experimental evidence for developing clinical nursing measures.

Materials and methods

Study subjects

In this study, 110 patients with LC admitted to Hainan General Hospital from January 2017 to March 2019 were enrolled as subjects. All patients received chemotherapy. Patients were included in this study if they met the criteria for diagnosis of LC issued by American College of Chest Physicians (ACCP) in 2007 in accordance with the clinical symptoms, findings of pathological examination, and imaging tests (such as CT, and MRI), and were confirmed as having LC; had an age of more than 18 years, and received chemotherapy for the first time [12]. Patients were excluded from this study if they had other malignant tumor, severe renal and hepatic insufficiency, cardio-and cerebrovascular disease, mental disorder, previous therapy, radiotherapy and chemotherapy for treatment of LC, incomplete medical records, or were unable to cooperate in this study. According to the inclusion and exclusion criteria, data on maintenance dialysis were collected from the patients and analyzed retrospectively. The patients were assigned to the following two groups: control group (n=55) and observation group (n=55). Patients in the control group received conventional nursing care, while those in the observation group were given integrated nursing interventions in addition to conventional nursing care. All the enrolled patients provided written informed consent and the study was approved by the Hospital Ethics Committee.

Methods

All patients underwent chemotherapy with gemcitabine (Eli Lilly and Company, USA) in combination with cisplatin (Qilu Pharmaceutical, China) following the doctor’s orders. Patients in the control group were given conventional care, including recording their vital signs, completing laboratory and imaging tests, providing medical treatment following the doctor’s orders and general health education, and informing them of drugs for chemotherapy and possible adverse reactions. Those in the observation group received integrated nursing interventions based on conventional care [13-16]. The specific procedures were as follows: (1) Health guidance: upon admission to the hospital, nurses informed patients of knowledge related to lung cancer and therapeutic regimens, tried to relieve patients and their families of fears and doubts about lung cancer, and told them cases of successful treatment of LC; they helped patients complete various tests after admission, and did real-time monitoring of patients’ abnormal indexes; they actively communicated with patients, established a good nurse-patient relationship, assisted patients to develop correct cognition concerning lung cancer, tried to meet their requirements in daily life, and enhanced their compliance to treatment; (2) Medication nursing: patients were informed of the importance of cooperation in the course of treatment and nursing interventions, and possible side effects after chemo-
therapy; they were observed if there were side effects (such as panic, dizziness, and pallor) during chemotherapy; they were also informed of knowledge related to the drugs used and possible side effects, and instructed to master simple methods of managing possible complications, take medicine regularly and protect their own privacy; (3) Psychological care: Nurses tried to understand the psychological changes of patients in the whole process from admission to discharge, gave them timely guidance, minimized their psychological discomforts, and helped to establish beliefs in overcoming the disease; patients were persuaded to actively cooperate during the treatment and nursing care, encouraged to enhance confidence in rehabilitation; patients’ families were guided to provide patients with scientific accompany and more care; (4) Diet care: Patients were supplied with diets with high-quality protein, high calorie and rich vitamins to enhance their resistibility and immunity, avoiding any hot or spicy stimulating food; (5) Environmental intervention: Nurses tried to create a quiet, healthy, warm and comfortable environment for patients in the ward, cared about their physical and mental states, and encouraged them to develop hobbies such as drawing, walking, reading newspapers and playing chess; they also provided sleep guidance, and sleep interventions like foot bath or music playing.

Outcome measures

**PSQI scores:** Patients in the control and observation groups were compared for quality of sleep [17]. The Pittsburgh sleep quality index (PSQI) was used to assess sleep quality of patients in the two groups at admission and discharge; the items of the PSQI included subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The total scores ranged from 0 to 21, with higher scores indicating worse sleep quality.

**TNF-α and SOD expression**

The expression levels of serum inflammatory cytokines were compared between the control group and the observation group. Venous blood (3 ml) was drawn from each patient at admission and discharge, respectively, and centrifuged at 3000 r/min for 15 min. Subsequently, the supernatant was isolated and stored in a tube at -20. The concentrations of TNF-α and SOD in each group were measured by radioimmunoassay and compared. The TNF-α and SOD radioimmunoassay kits were purchased from R & D science, USA. The assays were performed strictly following the operating instructions of the kits.

**QLQ-C30 scores**

Patients in the two groups were compared for quality of life. The Quality Life Questionnaire Core 30 (QLQ-C30) was utilized to evaluate quality of life of LC patients at admission and discharge [18]. The scale consists of 30 questions, including 5 items of physiological function, role function, cognitive function, emotional function and social function. A higher score indicates higher quality of life.

**Patient satisfaction with nursing care**

Length of hospital stay and patient satisfaction with nursing care were compared between the two groups. Hospital stay of patients was statistically analyzed and compared. Patient satisfaction with nursing care refers to a patient’s subjective evaluation of the environment of the wards, health education, skills and working attitudes of nurses as well as outcomes of nursing care. There are a total score of 100 points, with more than 90 points indicating extreme satisfaction, 70-90 indicating satisfaction, and less than 70 indicating dissatisfaction [19]. Patient satisfaction with nursing care was calculated by the following formula: Nursing care satisfaction = (Cases of extreme satisfaction + Cases of satisfaction)/Total cases × 100%.

The negative emotions of patients were compared between the two groups. The Self-Rating Anxiety Scale (SAS) and the Self-Rating Depression Scale (SDS) were adopted to assess the negative emotions of patients at admission and discharge [20, 21]. The SAS and SDS each consist of 20 items, and take a 4-level scoring method. On the SAS scale, 50 points was used as a cut-off value, with no anxiety (less than 50) and anxiety (equal to or greater than 50). Higher scores indicated greater anxiety. On the SDS scale, 53 points was considered as a cut-off value, with no depression (less than 53) and
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**Table 1.** Comparison of basic data of patients between control group and observation group

<table>
<thead>
<tr>
<th>Group</th>
<th>Control group (n=55)</th>
<th>Observation group (n=55)</th>
<th>T or $\chi^2$</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (year)</td>
<td>64.7 ± 5.7</td>
<td>65.8 ± 6.3</td>
<td>0.96</td>
<td>0.339</td>
</tr>
<tr>
<td>Male/femle (n)</td>
<td>35/20</td>
<td>37/18</td>
<td>0.161</td>
<td>0.688</td>
</tr>
<tr>
<td>Course of disease (month)</td>
<td>21.2 ± 4.8</td>
<td>22.4 ± 5.2</td>
<td>1.258</td>
<td>0.211</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>20.7 ± 1.9</td>
<td>20.1 ± 1.4</td>
<td>1.885</td>
<td>0.062</td>
</tr>
<tr>
<td>Pathological type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Squamous carcinoma</td>
<td>28</td>
<td>26</td>
<td>0.15</td>
<td>0.928</td>
</tr>
<tr>
<td>Adenocarcinoma</td>
<td>17</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small cell carcinoma</td>
<td>10</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension (n)</td>
<td>10</td>
<td>12</td>
<td>0.227</td>
<td>0.634</td>
</tr>
<tr>
<td>Diabetes (n)</td>
<td>7</td>
<td>10</td>
<td>0.626</td>
<td>0.429</td>
</tr>
<tr>
<td>Tumor metastasis (n)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bone</td>
<td>16</td>
<td>15</td>
<td>0.357</td>
<td>0.837</td>
</tr>
<tr>
<td>Liver</td>
<td>19</td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other organs</td>
<td>20</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical stages</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>34</td>
<td>30</td>
<td>0.598</td>
<td>0.439</td>
</tr>
<tr>
<td>IV</td>
<td>21</td>
<td>25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: BMI: Body mass index.

**Figure 1.** Comparison of the scores for sleep quality of patients between control group and observation group. PSQI: Pittsburgh sleep quality index. Compared with the same group at admission, ***P<0.001; Compared with the same group at discharge, ###P<0.001.

depression (equal to or greater than 53). Higher scores indicated greater depression.

**Statistical analysis**

Experimental data were processed with the use of SPSS software (IBM, USA), version 21.0. Measurement data were expressed as mean ± standard deviation (SD); between-group comparisons were made using independent samples t-tests, while inter-group comparisons before and after intervention were conducted by paired t-tests. Count data were described as case/percentage (n (%)); between-group comparisons were performed with the use of chi square tests. A p value of less than 0.05 was considered statistically significant.

**Results**

**Basic data of patients**

Table 1 shows that there were no significant differences in age, sex, course of disease, pathological type and tumor metastasis between the observation and control groups (all P>0.05), and they were comparable.

**Quality of sleep**

The scores for sleep quality of patients in the control group at admission and discharge were 6.1 ± 0.8 and 10.6 ± 1.1, respectively; the corresponding scores in the observation group were 6.0 ± 0.5 and 15.2 ± 1.9, respectively. The scores at discharge were considerably higher than those at admission in both groups, and the differences were statistically significant (P<0.001). The score for sleep quality at discharge was significantly higher in the observation group than in the control group, and there was a statistically significant difference (t=15.54, P<0.001; Figure 1).
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Table 2. Comparison of serum inflammatory cytokines of patients between control group and observation group

<table>
<thead>
<tr>
<th>Group</th>
<th>Control group</th>
<th>Observation group</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>TNF-α (ng/L)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At admission</td>
<td>252.3 ± 38.9</td>
<td>255.4 ± 40.1</td>
<td>0.412</td>
<td>0.682</td>
</tr>
<tr>
<td>At discharge</td>
<td>140.5 ± 29.6***</td>
<td>98.7 ± 20.4***</td>
<td>8.623</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>SOD (μg/L)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At admission</td>
<td>91.6 ± 47.5</td>
<td>94.2 ± 50.1</td>
<td>0.279</td>
<td>0.781</td>
</tr>
<tr>
<td>At discharge</td>
<td>109.1 ± 27.1***</td>
<td>130.7 ± 33.8***</td>
<td>3.698</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Note: TNF-α: Tumor necrosis factor-α; SOD: Superoxide dismutase; Compared with at admission, ***P<0.001.

Serum inflammatory cytokines

The TNF-α levels at discharge in both the observation and control groups were significantly lower, but the SOD levels were markedly higher than those at admission (all P<0.001). At discharge, patients in the observation group had significantly low TNF-α levels but substantially higher SOD than those in the control group (P<0.001, Table 2).

Quality of life

The scores in quality of life differed insignificantly between the two groups at admission (60.7 ± 3.2 vs 61.4 ± 3.5, P>0.05); the corresponding scores in both groups at discharge were significantly higher than those at admission (all P<0.001). At discharge, the score in the observation group was considerably higher than that in the control group, and the difference was statistically significant (84.5 ± 3.1 vs 90.6 ± 38, t=9.225, P<0.001, Figure 2).

Hospital stay and patient satisfaction with nursing care

Compared with the control group, length of hospital stay in the observation group was significantly shortened (10.4 ± 2.6 days vs 16.1 ± 3.0 days, t=10.65, P<0.001). The rate of patient satisfaction with nursing care in the observation group was 94.5% (52/55), significantly higher than that of the control group [72.7% (40/55)], and they were significantly different (χ²=9.565, P=0.002, Figure 3).

SAS and SDS scores

There were no significant differences in the SAS scores (56.2 ± 4.3 vs 57.7 ± 3.9) and SDS scores (59.8 ± 3.1 vs 60.9 ± 3.7) between the observation and control groups at admission (all P>0.05). The SAS or SDS scores at discharge in both groups were significantly lower than those at admission, and the differences were statistically significant (all P<0.001). The SAS score (35.4 ± 2.7 vs 27.6 ± 2.9, t=14.60, P<0.001) and SDS score (36.8 ± 3.5 vs 29.1 ± 3.2, t=12.04, P<0.001) at discharge were markedly lower in the observation group than those in the control group, and there were statistically significant differences (Figure 4).

Discussion

LC patients suffer from cancer-induced pain, anxiety and fears, and have poor quality of life, and impaired immune functions during surgery, radiotherapy or chemotherapy. This severely affects the therapeutic effects of the patients and has a heavy blow to them and their families [22]. With the changes in concepts of clinical nursing care and the increasing renewal in the nursing care modes, the medical nursing care has played a key role in the process of improving the outcomes of patients [23]. In the present study, a new integrated nursing care program was performed in LC patients. The program mainly included health guidance, medication care, psychological care, diet management and environmental intervention for LC patients. Integrated nursing is a comprehen-
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![Graphs showing hospital stay and patient satisfaction](image)

**Figure 3.** Comparison of hospital stay and patient satisfaction with nursing care between control group and observation group. A. Hospital stay; B. Patient satisfaction with nursing care. Compared with control group, ***P<0.001, **P<0.01.

![Graphs showing SAS and SDS scores](image)

**Figure 4.** Comparison of SAS and SDS scores between control group and observation group. SAS: Self-rating anxiety scale; SDS: Self-rating depression scale. Compared with the same group at admission, ***P<0.001; Compared with the same group at discharge, ###P<0.001.

Stere nursing care mode based on high-quality nursing interventions, and it has attracted increasing attention and is used in cancer patients [24]. In addition, integrated nursing interventions reduce the adverse emotions resulting from diseases, enhance the compliance of patients, and improve their symptoms, quality of life and mental health, ultimately achieving satisfactory outcomes [25]. Results of the present study show that as compared with the control group, the observation group had significantly increased scores of sleep quality, indicating that integrated nursing interventions provided patients with comprehensive and high-quality nursing care, and ultimately achieved the purpose of improving quality of nursing care and sleep in LC patients, which is consistent with the result reported by Dean et al. [26]. Hospital stay of patients in the observation group was remarkably shorter than that of patients in the control group, suggesting that LC patients got quick symptom relief and recovery after integrated nursing interventions. Quality of life is defined as an individual’s self reflection and feelings in psychological, physical and social aspects.

As the current study was aimed to improve quality of life of patients with LC, we developed a targeted integrated nursing care program to maximally promote the physical and psychological recovery of the patients and improve their quality of life. The results of this study reveal that the score of quality of life in the observation group was significantly higher than that in the control group, and the difference was statistically different. It is due to the fact that in the integrated nursing program, LC patients received health guidance and psychological nursing care. As a result, the patients had more confidence in their lives and fewer negative impacts of the treatment on their lives. Chang et al. reported that nursing interventions including rehabilitation exercise and health guidance significantly improved quality of life in esophageal cancer patients undergoing esophagectomy [27]. Thus, it can be seen that integrated nursing interventions effectively improve quality of life of patients.

In the current study, SOD and TNF-α were considered as the indexes measuring the immune functions in LC patients. SOD, an active substance, primarily acts to scavenge toxic superoxide radicals in the body. According to one study, the SOD levels were significantly higher in LC patients than in healthy volunteers; the SOD levels were significantly elevated after use of drugs for chemotherapy [28]. As a cytokine, TNF-α plays an important role in the body in the process of inflammation. The findings of the present study indicate that the implementation of the integrated nursing program resulted in elevated SOD expression, reduced TNF-α expression, quicker recovery of serum-related cytokines to normal, enhanced immune functions, and ultimate improvements in the therapeutic effects and prognosis in lung cancer patients.
Integrated nursing interventions improved life quality of patient

Depression and anxiety present in the course of treatment exert a severe impact on the outcomes of LC patients. The SAS and SDS are currently recognized as authoritative tools for objective and quantitative assessment of psychological status in patients. The current study demonstrates that the SAS and SDS scores of patients in the observation group were significantly reduced at discharge, suggesting that LC patients had obvious anxiety and depression, which is generally similar to the finding reported by Wang et al. [29]. Integrated nursing interventions play an auxiliary role in improving the conditions of patients, and enable them to achieve the best physical and psychological states. As for patient satisfaction with nursing care, integrated nursing interventions improve the professional abilities of nurses, allow them getting a more accurate understanding of the work of nursing care for LC patients, and realize more meticulous nursing [30]. In one study, Lu et al. found that good nursing interventions improve patient satisfaction with nursing care [31]. The present study also shows that patient satisfaction with nursing care in the observation group was significantly greater than that in the control group, which is basically consistent with the results reported in previous studies [32].

However, in the present study, there are still some limitations, such as a small sample size, single center, no results of long-term follow-ups, no classified comparisons, etc. In the future study, more multi-center, randomized, controlled studies with large sample size and long-term follow-ups are required for further validation.

In conclusion, in the present study, an integrated nursing program was performed in LC patients. The nursing interventions met the nursing needs of the patients, shortened hospital stay, relieved anxiety and fears, and effectively improved quality of sleep and life, and the immune functions and nursing satisfaction in the patients. Thus, the nursing interventions are worth generalizing in the clinical nursing work.

Disclosure of conflict of interest

None.

Address correspondence to: Shaomin Wu, Department of Respiratory Medicine, Hainan General Hospital, No. 19 Xiuhua Road, Haikou 570311, Hainan Province, China. Tel: +86-0898-86822047; Fax: +86-0898-868622047; E-mail: wushaomin2hn5@163.com

References


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