Discrepancy in perception of symptoms among patients and medical staff after lung cancer surgery

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Abstract

Context:
Patients undergoing surgery for lung cancer experience a variety of symptoms such as pain and coughing, which interfere patients’ daily function after surgery. However, there may be some differences between the perception of symptoms by medical staff and the actual situation of patients.

Objectives
This study aimed to investigate patient’s experiences after lung cancer surgery and analyze whether the perception of postoperative symptoms by the medical staff differed from that reported by patients.

Methods
Semi-structured qualitative interviews concerning in-hospital experiences were conducted from June 2018 to October 2019 in 39 patients undergoing lung cancer surgery at the Sichuan Cancer Hospital. Moreover, 22 thoracic medical staff were instructed to answer open questions about their perception of symptoms related to the lung cancer surgery. Types and frequencies of symptoms from patients and medical staff were compared.

Results
Thirty-nine patients were interviewed, and 22 medical staff from the Department of Thoracic Surgery were investigated. The most frequent patient-reported symptoms were pain (967 times, 39 patients, 100%), coughing (904 times, 37 patients, 94.87%), shortness of breath (491 times, 35 patients, 89.74%), disturbed sleep (412 times, 34 patients, 87.18%), and interference with walking (347 times, 36 patients, 92.31%). Of the above symptoms, four were perceived by medical staff, whereas interference with walking was replaced by fatigue.

Conclusion
Although the medical staff and patients had a certain consensus on main symptoms, differences in perception still exist. Medical staff need to pay more attention to postoperative interference with walking.

Introduction
Lung cancer is a malignant tumor with the highest morbidity and mortality globally. The incidence rate and mortality rate of lung cancer ranked the first in 2015, with 610,000 deaths reported, accounting for 37.5% of the total deaths worldwide. The overall 5-year survival rate of lung cancer is only 18.1% [1]. Globally, a major problem concerning lung cancer is the development of viable solutions to improve the survival rate of patients with lung cancer. Surgery is the most common treatment for lung cancer, and more than 100,000 patients with lung cancer undergo surgical treatment annually in China [2]. The survival rate of patients with lung cancer is significantly associated with the speed and quality of postoperative rehabilitation and whether adjuvant treatment (return to intended oncologic therapy) can be initiated and completed on time [3, 4]. Severe symptom burdens lead to increased emergency department visits for patients with lung cancer [5] and have a negative impact on patient outcomes, including survival [6].

Perioperative recovery management based on traditional “treatment” usually evaluates the effect of medical programs with indicators such as length of stay, postoperative complications, and readmission rate. It does not cover the expectation of patients for “rehabilitation” and cannot be used to monitor the whole process of postoperative rehabilitation of modern tumor
surgery [7, 8]. Clinicians are often unaware of patients’ symptoms [9, 10, 11, 12], and a previous study has indicated that ward nurses fail to identify 80% of these symptoms [13]. Even when symptoms are recognized, they may be under-documented and under-treated, and medical staff may underestimate patient experiences [14]. The discrepancy in symptom perception between patients and medical staff leads to poor symptom control [15, 16].

When compared with biological and other clinical outcome indicators, symptoms and function status reported by patients were more accurate [17]. Patient-reported outcome (PRO) is directly derived from patients’ subjective evaluation of their own health status and treatment results without explanation from medical professionals [18]. As one of the new clinical outcome assessments recommended by US FDA [19], PRO has been used in clinical research, drug approval, and medical service quality evaluation in Europe [20] and America because of its reliability, sensitivity, and feasibility in measuring patients’ symptoms and daily functions [21]. The latest large-scale clinical trials show that the application of PRO symptom monitoring and early warning in patients with advanced cancer can not only improve the quality of life (QOL) but also significantly prolong the survival of patients [22]. At present, the domestic and foreign cancer perioperative rehabilitation management is still based on the traditional “treatment” theory. Although some PRO indicators such as QOL are introduced, there is no systematic method to standardize the evaluation of “comprehensive rehabilitation” combined with patients’ expectation.

Our study aimed to demonstrate the experiences of patients with lung cancer during the perioperative hospital stay and to investigate if the medical staff’s perception was different from that of patients. Simultaneously, the study aimed to reduce the differences concerning symptom perception between the patients and the medical staff to enable the medical staff to manage symptoms more accurately and to ensure that patients achieve better perioperative medical experience and a better prognosis.

**Methods**

**Participants**

The study was approved by the Ethics Committee of Sichuan Cancer Hospital (No. SCCHEC-02-2018-043) prior to its initiation. The inclusion criteria for patients were as follows: patients aged ≥ 18 years, patients who were pathologically diagnosed with lung cancer, patients undergoing either video-assisted thoracic surgery (VATS) or thoracotomy surgery, and patients who can understand the content of the study. Before being recruited, each participant was informed of the purpose, method, and content of the study and could voluntarily participate in the study. Each recruited patient signed the paper version of the informed consent before being interviewed.

The medical staff involved in the study included doctors and nurses from the Department of Thoracic Surgery. Prior to conducting the study, all participating medical staff were informed about the study and signed the written informed consent form.

**Data collection of patients**

Patients were recruited and interviewed from November 2018 to October 2019. Each patient was interviewed by a medical staff who was trained with qualitative interviewing methods. Before the interview, patients’ basic clinical characteristics such as age, sex, body mass index, educational level, medical insurance type, smoking status, drinking history, American Society of Anesthesiologists classification score, and surgical history were collected by asking patients and consulting patients’ medical records. Qualitative one-to-one or one-to-many (including families) interviews were conducted by the trained medical staff in the doctor’s private office. The duration of the interview was 20–30 minutes per patient, and it was conducted while following semi-structured interview guidelines, mostly a day before the patients were discharged from the hospital. Interviewers used the interview outline (Appendix 1 details the questions for qualitative semi-structured interviews) to ask patients to describe their perioperative experience, including their symptoms, interference of daily function, worries, and anything else they want to share. The interviewers may ask additional probe questions as needed to elicit clear descriptions of the patient experience. At the end of the interview, patients were offered the opportunity to discuss any symptoms they have forgotten to mention. All qualitative interviews were recorded in an audio form for further analysis.
Investigation of medical staff

From February 2020 to March 2020, participating medical staff who had more than 1-year work experience were investigated to list the symptoms of lung cancer surgery based on their own experience and perception. There was no overlap between the investigated medical staff and the medical staff who interviewed the patients, to ensure the results are not affected by bias.

The investigated medical staff signed the informed consent form, and their interviews comprised two parts. Part I included a basic information survey of the medical staff's sex, age, occupation, highest educational level, number of years of thoracic surgery experience (from the date of internship), and professional title. Part II of the interview involved symptom investigation, wherein the interviewees were instructed to write down in order by severity what they thought were the five most frequently observed symptoms in patients undergoing surgery for lung cancer during postoperative hospitalization and within 3 months after discharge, respectively.

Data analysis

The audiotaped patient interviews were professionally transcribed into text by a third-party transcription vendor, and the transcripts were verified by manual verbatim with two researchers. The transcript text were then coded by two researchers independently. A and B coded the same transcripts (two transcripts in all) using the developed codebook. Inter-rater reliability tests were performed using NVivo 12 (QSR International. 2020. http://www.qsrinternational.com), and the established Cohen's $\kappa$ coefficient among the three coders ranged from 0.74 to 0.78. The two authors then coded the remaining transcripts independently. If the codes from two researchers were inconsistent, they discussed with a third researcher and reached a consensus. The frequency and numbers of occurred items and number of covered patients were extracted from the text information. Finally, a comprehensive list of items obtained by qualitative interviews related to designated patients was generated. Qualitative data were analyzed using qualitative software, NVivo 12. We used the grounded theory approach to analyze the data [23]. We chose this approach to generate a theoretical framework of the perceived impact of mindful leadership in clinical practice. The grounded theory approach uses machines and manual coding (judgment, labeling, and categorizing). Clinician's perceptions of the top five symptoms were described using the frequencies (%) for categorical variables. All data analyses were performed using the statistical software Statistical Analysis System (version 9.4).

Results

Baseline demographic

All patients received surgical treatment and were pathologically diagnosed with lung cancer. Among them, 34 (87.18%) patients underwent VATS, three (7.7%) underwent thoracotomy surgery, and two (5.1%) underwent VATS converted to thoracotomy. There were eight (20.5%) and six patients who underwent segmentectomy and sleeve resection, respectively. After lung cancer surgery, 39 patients, including 24 (61.5%) females and 15 (38.5%) males, aged between 42 and 82 years underwent semi-structured interviews about their experience and related events in the hospital. A total of 22 medical staff (10 [45.5%] male surgeons and 12 [54.5%] female nurses) aged between 21 and 50 years with $\geq 1$ year of experience in the Department of Thoracic Surgery filled out the survey forms based on their daily observations and perception of lung cancer surgery-related symptoms. Table 1 details the baseline demographic of interviewed patients and the investigated medical staff.
### Table 1
#### Sample demographic characteristics

| Characteristics | Patients (n = 39) | Medical staff who filled out the questionnaires (n = 22) |
|-----------------|------------------|-------------------------------------------------------|
| Age (years), median (IQR) | 57.03 (42.29–82.26) | |
| Sex | 24 (61.5%) | |
| Male | 15 (38.5%) | |
| Female | | |
| BMI (kg/m²), median (IQR) | 22.60 (18.20–34.10) | |
| Educational level | | |
| Middle school graduate or below | 16 (41.2%) | |
| Above middle school graduate | 3 (7.7%) | |
| Unknown | 20 (51.3%) | |
| Medical insurance type | | |
| Employee medical insurance | 9 (23.1%) | |
| Resident medical insurance | 7 (17.9%) | |
| Rural medical insurance | 3 (7.7%) | |
| Unknown | 20 (51.3%) | |
| Smoking status | | |
| Never smoker | 13 (33.3%) | |
| Current smoker | 5 (12.8%) | |
| Former smoker | 21 (53.8%) | |
| Drinking history | | |
| No | 12 (30.8%) | |
| Yes | 27 (69.2%) | |
| ASA classification | | |
| I | 25 (65.8%) | |
| II | 2 (5.3%) | |
| III | | |
| Surgical history | | |
| No | 2 (5.1%) | |
| Yes | 37 (94.9%) | |
| Medical staff who filled out the questionnaires (n = 22) | | |

BMI, body mass index
ASA, American Society of Anesthesiologists
| Characteristics            |       |
|---------------------------|-------|
| Sex                       |       |
| Male                      | 10 (45.5%) |
| Female                    | 12 (54.5%) |
| Age                       |       |
| 18 ~ 25                   | 10 (45.5%) |
| 26 ~ 30                   | 3 (13.6%) |
| 31 ~ 40                   | 4 (18.2%) |
| 40 ~ 50                   | 0 (0%) |
| 50                        | 5 (22.7%) |
| Occupation                |       |
| Surgeon                   | 10 (45.5%) |
| Nurse                     | 12 (54.5%) |
| Highest educational level |       |
| College                   | 3 (13.6%) |
| Master                    | 5 (22.7%) |
| Doctor                    | 1 (4.5%) |
| Missing                   | 13 (59.1%) |
| Years of work experience  |       |
| 1~5                       | 4 (18.2%) |
| 5~8                       | 6 (27.3%) |
| 8~10                      | 3 (13.6%) |
| 10~15                     | 3 (13.6%) |
| Over 15                   | 6 (27.3%) |
| Professional titles       |       |
| Senior                    | 2 (9.1%) |
| Deputy senior             | 11 (50.0%) |
| Intermediate              | 7 (31.8%) |
| Primary                   | 1 (4.5%) |
| None                      |       |
| BMI, body mass index      |       |
| ASA, American Society of Anesthesiologists |     |

**Symptoms reported by the patient**

Twenty-seven types of postoperative lung cancer-related symptoms were reported by patients in semi-structured interviews, of which 10 (10/27, 37.04%) were mentioned by more than half of the patients. The top five most frequently mentioned symptoms included pain (967 times, 39 patients, 100%), coughing (904 times, 37 patients, 94.87%), shortness of breath (491 times, 21 patients, 88.78%), fever (467 times, 21 patients, 88.78%), and nausea (437 times, 21 patients, 88.78%).
times, 35 patients, 89.74%), disturbed sleep (412 times, 34 patients, 87.18%), and interference with walking (347 times, 36 patients, 92.31%). Table 2 and Fig. 1 present the symptoms experienced by interviewed patients.

| Symptoms              | Frequency (times) | Mentioned patients (n) | Mentioned patients (%) |
|-----------------------|-------------------|------------------------|------------------------|
| Pain                  | 967               | 39                     | 100.00                 |
| Coughing              | 904               | 37                     | 94.87                  |
| Shortness of breath   | 491               | 35                     | 89.74                  |
| Disturbed sleep       | 412               | 34                     | 87.18                  |
| Walking               | 347               | 36                     | 92.31                  |
| Lack of appetite      | 310               | 31                     | 79.49                  |
| Constipation          | 306               | 29                     | 74.36                  |
| Anxiety               | 199               | 24                     | 61.54                  |
| Fatigue               | 177               | 30                     | 76.92                  |
| Dry mouth             | 135               | 16                     | 41.03                  |
| Fever                 | 104               | 12                     | 30.77                  |
| Drowsiness            | 86                | 20                     | 51.28                  |
| Night sweating        | 75                | 12                     | 30.77                  |
| Hoarseness            | 69                | 10                     | 25.64                  |
| Dizziness             | 62                | 10                     | 25.64                  |
| Distress              | 61                | 15                     | 38.46                  |
| Abdominal distention  | 56                | 13                     | 33.33                  |
| Swollen wound         | 39                | 2                      | 5.13                   |
| Hemoptysis            | 38                | 6                      | 15.38                  |
| Diarrhea              | 35                | 3                      | 7.69                   |
| Dyspnea               | 23                | 7                      | 17.95                  |
| Nausea                | 18                | 5                      | 12.82                  |
| Itchy throat          | 17                | 9                      | 23.08                  |
| Vomiting              | 12                | 3                      | 7.69                   |
| Air leakage           | 10                | 3                      | 7.69                   |
| Atrial fibrillation   | 10                | 2                      | 5.13                   |
| Remembering things    | 7                 | 4                      | 10.26                  |

**Postoperative pain**

Pain was a symptom mentioned by all interviewed patients and had the highest frequency among all the symptoms. As shown in indicative quotations in Table S1, according to the patients, the pain they experienced was related to surgical wounds. Pain
was among the most influential symptom experienced by patients after operation. Although we performed more individualized pain management based on routine intervention, there were significant differences in the severity of pain reported by different patients.

Some patients did not feel much pain after the operation (e.g., patient nos. 22, 31, 39 in Table S1), whereas others (e.g., patient nos. 6, 16 in Table S1) reported that the pain was significantly severe that it was unbearable even with the administration of analgesic pumps and painkillers. Some patients reported that pain was significantly relieved after the removal of the thoracic drainage tube (e.g., patient no. 22 in Table S1), but others reported that there was no significant difference in the degree of pain before and after the removal of the chest drainage tube (e.g., patient no. 31 in Table S1). The severity of patients’ pain was also related to the time during the day. Some patients stated that the pain they experienced was more evident in the afternoon until nighttime (e.g., patient no. 22 in Table S1), and some patients reported that it was most evident during the fourth or fifth day after the operation (e.g., patient no. 39 in Table S1).

Coughing

Postoperative coughing was also one of the most common postoperative symptoms. Table S2 shows some indicative quotations about coughing. Some patients even considered coughing to be the most influential postoperative symptom during their stay in the hospital (e.g., patient no. 29 in Table S2). Some patients reported stimulating dry cough (e.g., patient nos. 1, 29 in Table S2), while others reported coughing with expectoration (e.g., patient no. 8 in Table S2).

A few patients believed that increased sputum after the operation may be related to long-term smoking (e.g., patient no. 8 in Table S2). The time period during which the patients experienced the most severe cough differed. Some patients reported that the severity of cough they experienced after the operation gradually reduced over time (e.g., patient no. 13 in Table S2), whereas other patients stated that they experienced severe cough for few days after the operation (e.g., patient no. 1, 19 in Table S2), accompanied by increased body temperature and lung infection (e.g., patient no. 19 in Table S2). Additionally, concerning the time during the day, some patients reported that their cough was particularly severe at night (e.g., patient no. 1 in Table S2), whereas others reported that they coughed mainly during the day and did not cough at all at night (e.g., patient no. 29 in Table S2). More than one patient mentioned the association between their cough and body posture. According to them, cough was significantly associated with a particular position. Some patients reported that coughing was more evident when they were lying down (e.g., patient no. 8 in Table S2), whereas others mentioned that coughing was more evident when they lay on their side (e.g., patient no. 29 in Table S2).

Shortness of breath

Many patients reported shortness of breath after surgery. Table S3 shows the quotations about disturbed sleep from some patients. Shortness of breath was the third most mentioned symptom after pain and coughing. According to the patients, shortness of breath began to appear in different situations. Some patients had shortness of breath while lying in bed after surgery (e.g., patient nos. 2, 18, 26 in Table S3), whereas others did not feel shortness of breath until they walked around (e.g., patient nos. 13, 34 in Table S3). Some patients reported that raising their upper body could help relieve shortness of breath (e.g., patient no. 2 in Table S3), whereas others stated that effective expectoration relieved shortness of breath (e.g., patient no. 18 in Table S3). Shortness of breath significantly affected patient's performance after surgery, and some patients considered shortness of breath to be the most serious symptom during their postoperative recovery (e.g., patient no. 26 in Table S3). According to the patients, shortness of breath was particularly disruptive during sleeping (e.g., patient nos. 2, 18 in Table S3) and walking after surgery (e.g., patient no. 13 in Table S3, patient no. 36 in Table S5).

Disturbed sleep

According to our interviews with patients before discharge, most patients experienced disturbed sleep to varying degrees post-surgery. According to the patients, postoperative pain (e.g., patient no. 6 in Table S1, patient no. 3 in Table S4), coughing (e.g., patient no. 8 in Table S2, patient nos. 3, 20 in Table S4), shortness of breath (e.g., patient no. 18 in Table S3), worries about their own condition (e.g., patient no. 33 in Table S4), and other worries (e.g., patient no. 3 in Table S4) all disturbed sleep to varying degrees, among which pain, coughing, and shortness of breath were most commonly mentioned. Simultaneously,
some patients (e.g., patient no. 20 in Table S4) suspected that anesthesia during surgery was a factor affecting poor sleep management after surgery. Moreover, it is worth mentioning that a small number of patients (e.g., patient no. 33 in Table S4) believed that the surgery treated their disease, removed their worries, and reduced their psychological burden, so they actually slept better after the surgery. Table S4 shows the quotations from some patients about disturbed sleep.

**Interference with walking**

During the interview, patients frequently mentioned the effects of thoracic drainage tubes on walking and mentioned that removal of the tubes increased their pace while walking and helped them cover longer distances (e.g., patient nos. 36, 37 in Table S5). Patients reported that chest drainage tubes often affected their convenience of moving around (e.g., patient no. 37 in Table S5). Additionally, pain was another factor that affected walking. Patients were reluctant to move or walk slowly because of pain (e.g., patient no. 27 in Table S5). Shortness of breath was also a factor leading to interference while walking; some patients stopped to rest because they felt shortness of breath during walking (e.g., patient no. 34 in Table S3). Table S5 shows some of the quotations from patients concerning interferences while walking.

**Symptoms mentioned by 22 interviewed medical staff**

Table 3 shows the frequency of symptoms mentioned by 22 medical staff and the corresponding number of medical staff. During hospitalization, the top five commonly mentioned symptoms were pain (22 times), shortness of breath (17 times), coughing (18 times), chest tightness (11 times), and fatigue (8 times), similar with disturbed sleep (8 times). Within 3 months after discharge, the top five symptoms were shortness of breath (18 times), coughing (17 times), fatigue (17 times), pain (16 times), and disturbed sleep (14 times). In the survey of medical staff, interference with walking was not mentioned once during the hospital stay and was mentioned only twice within 3 months after discharge (Table 3, Fig. 2, Fig. 3).
Table 3
Symptom frequencies of the 22 medical staff who were investigated

| Symptoms               | Frequency (times) | Number of involved medical staff |
|------------------------|-------------------|----------------------------------|
|                        | Hospitalization   | Within 3 months after discharge | Overall | Hospitalization | Within 3 months after discharge | Overall |
| Pain                   | 22                | 16                               | 38      | 22             | 16                              | 22      |
| Shortness of breath    | 17                | 18                               | 35      | 17             | 17                              | 19      |
| Coughing               | 18                | 17                               | 35      | 18             | 17                              | 20      |
| Fatigue                | 8                 | 17                               | 25      | 8              | 17                              | 19      |
| Disturbed sleep        | 8                 | 14                               | 22      | 8              | 14                              | 14      |
| Chest tightness        | 11                | 9                                | 20      | 11             | 9                               | 14      |
| Anxiety                | 3                 | 9                                | 12      | 3              | 9                               | 9       |
| Lack of appetite       | 3                 | 5                                | 8       | 3              | 5                               | 7       |
| Constipation           | 4                 | 1                                | 5       | 4              | 1                               | 4       |
| Hemoptysis             | 4                 | 0                                | 4       | 4              | 0                               | 4       |
| Dyspnea                | 3                 | 0                                | 3       | 3              | 0                               | 3       |
| Abdominal distention   | 3                 | 0                                | 3       | 3              | 0                               | 3       |
| Walking                | 0                 | 2                                | 2       | 0              | 2                               | 2       |
| Dry mouth              | 2                 | 0                                | 2       | 2              | 0                               | 2       |
| Sore throat            | 1                 | 0                                | 1       | 1              | 0                               | 1       |
| Palpitations           | 1                 | 1                                | 2       | 1              | 1                               | 2       |
| Fever                  | 1                 | 0                                | 1       | 1              | 0                               | 1       |
| Diarrhea               | 1                 | 0                                | 1       | 1              | 0                               | 1       |

Discussion

In this study, 27 items of symptom burden and interference during daily functions of patients after lung cancer surgery were generated through a semi-structured qualitative interview. The study interviewed doctors and nurses on their perception of patients’ symptoms through interviews. Among the top five symptoms reported by the patients in the hospital, four were perceived by medical staff. The result of the present study is inconsistent with those of previous studies demonstrating that medical staff were often unaware of patients’ symptoms [9, 10, 11, 12] and ward nurses failed to identify 80% of these symptoms [18]. This study may indicate that the perception difference between medical staff and patients is reduced. However, the discrepancy on “ability to walk” suggested that clinicians should pay more attention to patients’ returning to normal life after surgery for a better QOL as survival time of patients with cancer has been significantly improved [24].

We found out that there was a difference in the perception of postoperative symptoms between the medical staff and patients. Patients frequently mentioned disturbed sleep and interference with walking in the interview, but the investigated medical staff did not pay sufficient attention to interference with walking. This suggests that the medical staff may have underestimated the recovery of patients’ daily functions, whereas from the patient’s perspective, recovery was defined as the return to normal life [25].
Additionally, interference with patients’ daily functioning is associated with symptom burden, and severe symptom burdens can lead to impaired daily functioning. Simultaneously, the disturbance of symptom burden and daily function of patients is intense and rapid and is associated with several factors such as surgical approaches [26, 27].

Based on the interviews, it can be concluded that the time, severity, and influencing factors of postoperative pain are highly different among patients. Bendixen et al. have suggested that VATS is associated with less postoperative pain and better QOL than anterolateral thoracotomy for the first year after surgery [27], whereas another study has reported postoperative pain scores did not differ between the two different modalities in surgery for non-small cell lung cancer (NSCLC) [28]. The management and intervention of postoperative pain should also be more individualized, so that the process of postoperative recovery of patients is more stable. Although almost 90% of patients were satisfied with their painkiller treatment, nearly 25% of patients experienced adverse reactions [29].

In addition to pain, cough is another common pain reported by patients after lung cancer surgery. Frequent and persistent cough will not only cause wound pain and affect sleep but also further aggravate patients’ psychological burden. Lin's study has shown that female sex, duration of anesthesia over 164 minutes, lower paratracheal node resection, and subcarinal node resection were independent risk factors associated with cough in patients with NSCLC after VATS [30]. The surgeon's control of the patient’s procedure during operation is significantly important to reduce the burden of cough symptoms after surgery. Patients undergoing lung cancer surgery often experience a dry, hacking cough, which is usually refractory to opioid cough suppressors such as codeine. Treatment with an inhaled corticosteroid plus β2 agonist appeared to be highly effective in the treatment of persistent cough experienced after pulmonary resection and had no adverse effects [31]. Moreover, some traditional Chinese medicine such as Maekmoondong-tang are also reported to have immunomodulatory and antitussive effects and are widely used in East Asian countries to treat chronic dry cough [32].

Shortness of breath is a manifestation of impaired lung function; however, shortness of breath is not a specific symptom. Asthma, heart failure and myocardial ischemia, chronic obstructive pulmonary disease, interstitial lung disease, pneumonia, or psychogenic disorders can also cause shortness of breath [33]. For elderly patients after lung cancer surgery, when patients repeatedly experience more serious chest sulking and shortness of breath, especially when combined with chest pain, doctors should be alert and pay attention to the screening of heart-related diseases.

**Conclusion**

Medical staff and patients agreed on the core symptoms after lung cancer surgery including pain, cough, and shortness of breath. However, medical staff has not fully realized the great influence of walking in the postoperative recovery process of patients, which should be fully considered in clinic practice.

**Limitations**

First, this is a single-center study, and the patients interviewed and the doctors investigated were from Sichuan Cancer Hospital. Since medical staff and patients were from the same department, the symptoms they reported after surgery were similar. However, the results of this study may not be observed in other clinical institutions. Further studies with larger sample sizes and from different cities are required to make the results more generalizable.

Second, long-term follow-up of patients after discharge and collection of symptoms after discharge in this study were not included. The main symptoms of patients after discharge may be different from those during hospitalization.

**Implications**

This study generated some items of symptom burden and daily function interference of patients after lung cancer surgery through a qualitative interview. The study further proved the necessity for developing a specific assessment instrument for lung cancer surgery.
Declarations

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Conflicts of interest: The authors have no conflicts of interest to declare.

Availability of data and material: We are willing to share data, analytic methods, and study materials related to this article with other researchers. Provided that all of the above will not be used for commercial or profit purposes. Other researchers can contact the corresponding author of this article by email and indicate the required research materials and purpose. We will be glad to provide relevant materials for this study after approval and discussion.

Code availability: Inter-rater reliability tests and Qualitative data were analyzed using NVivo 12 (QSR International. 2020. http://www.qsrinternational.com)

Author's Contributions
Study concept and design: All authors
Acquisition, analysis, or interpretation of data: All authors
Drafting of the abstract: Xing Wei
Revising the article critically for important intellectual content: All authors
Final approval of the version to be published: All authors
Statistical analysis: Hongfan Yu
Obtained funding: Qiuling Shi
Administrative, technical, or material support: Qiang Li, Qiuling Shi
Study supervision: Qiang Li, Qiuling Shi
Xing Wei and Hongfan Yu had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Ethics approval: This study was approved by the Ethics Committee of Sichuan Cancer Hospital (approval number: SCCHEC-02-2018-043).

Consent to participate: Written informed consent was obtained from individual participants.

Consent for publication: Not applicable.

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References

1. Chen W, Zheng R, Baade PD et al (2016) Cancer statistics in China, 2015. CA Cancer J Clin 66:115–132
2. National Health Commission of the People's Republic of China (2019) Chinese guidelines for diagnosis and treatment of primary lung cancer 2018 (English version). Chin J Cancer Res 31(1):1–28
3. Kim BJ, Caudle AS, Gottumukkala V, Aloia TA (2016) The impact of postoperative complications on a timely return to intended oncologic therapy (RIOT): the role of enhanced recovery in the cancer journey. Int Anesthesiol Clin 54:e33–e46
4. Fernandez FG, Kosinski AS, Furnary AP et al (2018) Differential effects of operative complications on survival after surgery for primary lung cancer. J Thorac Cardiovasc Surg 155:1254 e1251–1264 e1251
5. Barbera L, Atzema C, Sutradhar R et al (2013) Do patient-reported symptoms predict emergency department visits in cancer patients? A population-based analysis. Annal Emer Med 61:427–437.e5. doi:10.1016/j.annemergmed.2012.10.010
6. Efficace F, Cartoni C, Niscola P et al (2012) Predicting survival in advanced hematologic malignancies: do patient-reported symptoms matter? Eur J Haematol 89:410–416. doi:10.1111/ejh.12004
7. Neville A, Lee L, Antonescu I et al (2014) Systematic review of outcomes used to evaluate enhanced recovery after surgery. Br J Surg 101:159–170
8. Maessen JM, Dejong CH, Kessels AG, von Meyenfeldt, MF on behalf of the Enhanced Recovery After Surgery Group (2008) Length of stay: an inappropriate readout of the success of enhanced recovery programs. World J Surg 32:971–975
9. Bruera E, Sweeney C, Calder K, Palmer L, Benisch-Tolley S (2001) Patient preferences versus physician perceptions of treatment decisions in cancer care. J Clin Oncol 19:2883–2885. doi:10.1200/JCO.2001.19.11.2883
10. Butow PN, Brown RF, Cogar S, Tattersall MH, Dunn SM (2002) Oncologists’ reactions to cancer patients’ verbal cues. Psychooncology 11:47–58. https://doi.org/10.1002/pon.556
11. Chang VT, Hwang SS, Feuerman M, Kasimis BS (2000) Symptom and quality of life survey of medical oncology patients at a veterans affairs medical center: a role for symptom assessment. Cancer 88:1175–1183. doi:10.1002/(sici)1097-0142(20000301)88:5<1175::aid-cncr30>3.0.co;2-n. PMID: 10699909.
12. Newell S, Sanson-Fisher RW, Girgis A, Bonaventura A (1998) How well do medical oncologists’ perceptions reflect their patients’ reported physical and psychosocial problems? Data from a survey of five oncologists. Cancer 83:1640–1651. PMID: 9781960
13. Farrell C, Beaver K, Heaven C, Maguire P (2001) Identifying the concerns of women undergoing chemotherapy treatment for cancer. Eur J Cancer 37:S390. doi:10.1016/S0959-8049(01)81894-3
14. McIlveen P. Side effects of targeted treatments: clinicians’ perceptions, patients’ realities. Cancer World. https://bit.ly/2Hz0JpA. Accessed 1 March 2015
15. Basch E, Iasonos A, McDonough T et al (2006) Patient versus clinician symptom reporting using the National Cancer Institute Common Terminology Criteria for Adverse Events: results of a questionnaire-based study. Lancet Oncol 7:903–909
16. Petersen MA, Larsen H, Pedersen L, Sonne N, Groenvold M (2006) Assessing health-related quality of life in palliative care: comparing patient and physician assessments. Eur J Cancer 42:1159–1166. doi:10.1016/j.ejca.2006.01.032. Epub 2006 Apr 18 PMID: 16624553
17. Basch E (2017) Patient-reported outcomes - harnessing patients’ voices to improve clinical care. N Engl J Med 376:105–108
18. US FDA (2009) Guidance for industry patient-report outcome measures: use in medical product development to support labeling claims. In: Services USDoHaH, ed RMD. https://www.fda.gov/downloads/drugs/guidances/ucm193282.pdf [cited 2020 October 05]
19. US FDA (2015) Clinical outcome assessment (COA): Glossary of terms. https://www.fda.gov/Drugs/DevelopmentApprovalProcess/DrugDevelopmentToolsQualificationProgram/ucm284077.htm
20. Calvert M, Kyte D, Mercieca-Bebber R et al (2018) Guidelines for inclusion of patient-reported outcomes in clinical trial protocols: the SPIRIT-PRO extension. JAMA 319:483–494
21. Shi Q, Mendoza TR, Wang XS, Cleeland CS (2016) Using a symptom-specific instrument to measure patient-reported daily functioning in patients with cancer. Eur J Cancer 67:83–90
22. Basch E, Deal AM, Dueck AC et al (2017) Overall survival results of a trial assessing patient-reported outcomes for symptom monitoring during routine cancer treatment. JAMA 318:197–198
23. Glaser BG, Strauss AL. Discovery of grounded theory: strategies for qualitative research. Routledge, New York. https://doi.org/10.4324/9780203793206.[cited 2020 November 06]
24. Dhillon HM, Bell ML, van der Ploeg HP, Turner JD, Kabourakis M, Spencer L, Lewis C, Hui R, Blinman P, Clarke SJ, Boyer MJ, Vardy JL (2017) Impact of physical activity on fatigue and quality of life in people with advanced lung cancer: a randomized controlled trial. Ann Oncol 28:1889–1897. doi: 10.1093/annonc/mdx205. PMID: 28459989
25. Park J, Neuman HB, Bennett AV, Polskin L, Phang PT, Wong WD, Temple LK (2014) Patient expectations of functional outcomes after rectal cancer surgery: a qualitative study. Dis Colon Rectum 57:151–157
26. Shi Q, Wang XS, Vaporciyan AA et al (2016) Patient-reported symptom interference as a measure of postsurgery functional recovery in lung cancer. J Pain Symptom Manage 52:822–831. doi:10.1016/j.jpainsymman.2016.07.005. Epub 2016 Aug 10. PMID: 27521528; PMCID: PMC5154813

27. Bendixen M, Jørgensen OD, Kronborg C, Andersen C, Licht PB (2016) Postoperative pain and quality of life after lobectomy via video-assisted thorascopic surgery or anterolateral thoracotomy for early stage lung cancer: a randomised controlled trial. Lancet Oncol 17:836–844 doi: 10.1016/S1470-2045(16)00173-X. Epub 2016 May 6. PMID: 27160473

28. Van der Ploeg APT, Ayez N, Akkersdijk GP, van Rossem CC, de Rooij PD (2020) Postoperative pain after lobectomy: robot-assisted, video-assisted and open thoracic surgery. J Robot Surg 14:131–136. doi:10.1007/s11701-019-00953-y. Epub 2019 Mar 29. PMID: 30927155

29. Apfelbaum JL, Chen C, Mehta SS, Gan TJ (2003) Postoperative pain experience: results from a national survey suggest postoperative pain continues to be undermanaged. Anesth Analg 97:534–540, table of contents. doi: 10.1213/01.ane.0000068822.10113.9e. PMID: 12873949

30. Lin R, Che G (2018) Risk factors of cough in non-small cell lung cancer patients after video-assisted thoracoscopic surgery. J Thorac Dis 10:5368–5375. doi:10.21037/jtd.2018.08.54. PMID: 30416784; PMCID: PMC6196164

31. Sawada S, Suehisa H, Yamashita M (2012) Inhalation of corticosteroid and β-agonist for persistent cough following pulmonary resection. Gen Thorac Cardiovasc Surg 60:285–288. doi:10.1007/s11748-011-0910-1. Epub 2012 Mar 28. PMID: 22453538

32. Kim KI, Shin S, Kim K, Lee J (2016) Efficacy and safety of Maekmoondong-tang for chronic dry cough: a study protocol for a randomized controlled trial. BMC Complement Altern Med 16:46. doi:10.1186/s12906-016-1028-x. PMID: 26829923; PMCID: PMC4736174

33. Wahls SA (2012) Causes and evaluation of chronic dyspnea. Am Fam Physician 86:173–182. PMID: 22962929

Appendix

Appendix 1: Leading questions for qualitative semi-structured interviews

1. Please recall your symptoms from the day of the operation to today.

If the patient is unable to describe in detail, use the following guide questions:

A. What are the symptoms you experienced after surgery?
B. Do these symptoms occur together or in sequence?
C. Do XX symptoms affect your actions?
D. When did XX’s symptoms subside?
E. Which symptom do you think is the most serious? Why is that?
F. What kind of activity limitation after surgery makes you feel most uncomfortable, such as walking, going to the bathroom, and washing?

2. Do you think your feelings during the operation and hospitalization are fully described?

3. Do you have any other feelings that you wish to tell us?

Figures
Figure 1

Symptom frequencies of the 39 interviewed patients
Figure 2

Symptom frequencies reported by the 22 surveyed medical staff
Figure 3

Symptom frequencies as reported by the medical staff during hospitalization and within 3 months after discharge

Supplementary Files

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