Influencing factors of lung cancer patients' participation in shared decision-making: a cross-sectional study

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Abstract

Purpose The purpose of this study was to investigate and analyze the level of actual participation and perceived importance of shared decision-making on treatment and care of lung cancer patients, to compare their differences and to explore their influencing factors.

Methods A total of 290 lung cancer patients were collected from oncology and thoracic surgery departments of a comprehensive medical center in Qingdao from October 2018 to December 2019. Participants completed a cross-sectional questionnaire to assess their actual participation and perceived importance in shared decision-making on treatment and care. Descriptive analysis and non-parametric tests were carried out to assess the status quo of patients' shared decision-making on treatment and care. Binary logistic regression analysis with a stepwise back-wards was applied to predict factors that affected patients' participation in shared decision-making.

Results The results showed that patients with lung cancer had a low degree of participation in shared decision-making. There were significant differences between actual participation and perceived importance of shared decision-making on treatment and care. Education level, age, gender, income, marital status, personality, the course of the disease (> 6 months), and the pathological TNM staging (III) affected patient's level of participation in shared decision-making.

Conclusion Actual participation in shared decision-making on the treatment and care of lung cancer patients was low and considered unimportant. We could train oncology nurses to use patient decision aids to help patients and families participate in shared decision-making on patients' value, preferences and needs.

Keywords Lung cancer · Patient decision aids · Shared decision-making · Nursing
Introduction

World Health Organization reported that the number of new cases and deaths of lung cancer ranked first in 2018 (World Health Organization 2021a, b). The common treatment methods including surgery, chemotherapy, immunotherapy, and targeted therapy have been selected to prolong lifespan (Duma et al. 2019), which increases the risks of side effect, such as distant metastasis, chemotherapy reaction and so on. During the terminal phase of lung cancer patients may also choose palliative care, a way to improve the quality of life of patients (adults and children) and their families who are facing issues associated with life-threatening illness (World Health Organization 2021a, b).

It prevents and alleviates pain through early identification, correct assessment and treatment of pain and other physical, psychological or mental problems (World Health Organization 2021a, b). Consequently, patients need to weigh the uncertain risks and benefits of supportive treatments focusing on prolonging survival and quality of life (Schmidt et al. 2016). In this sense, an appropriate decision-making process is needed to ensure patients select treatments and care methods that are consistent with their concerns, goals, values, preference, and circumstances.

With the transformation of medical models, “shared decision-making (SDM)” has become the best way to exchange information between clinicians, nurses and patients, it is a more inclusive and participatory process of dialogue (Kunneman et al. 2016; Montori et al. 2017). During the dialogue, both healthcare practitioners and patients decide how to address patient’s co-occurring conditions based on relevant evidence and patients’ values, preference, and needs (Fullford and Handa 2021). In contrast to previous “paternalistic approach” where the health care providers are solely responsible for patients, the paternalistic shared decision-making is based on patients’ understanding of their conditions, and encourages patients to ask health care providers to choose the most appropriate treatment care methods for them. Elwyn et al. (2017) have proposed and revised the three-talk model to guide SDM (Elwyn et al. 2017), which divided SDM process into three stages: (1) team talk: patients, families, and physicians form a team to understand patient’s goals, describe options and offer support; (2) option talk: various options are discussed using risk communication principles; and (3) decision talk: informed preferences are obtained and informed choices are made. The three-talk model is more concise to help clinicians better understand the core of SDM and implement these processes.

SDM is a disruptive idea and cornerstone of patient-centered care (Friesen-Storms et al. 2015). Compared with informed consent, it pays more attention to needs, expectations and moral values orientation of patients and is representative of the type of clinical interactive decision-making. Friesen-Storms et al. (2015) has agreed that SDM is the best process whereby health care providers and their patients make information exchange and treatment decisions jointly (Friesen-Storms et al. 2015). Nakayama et al. (2020) have found that more prostate cancer patients are willing to actively participate in SDM, with only a minority preferring paternalistic decision-making (Nakayama et al. 2020). A nurse-led study of shared decision-making aids for breast cancer patients showed that this increased patient knowledge of breast cancer treatment and care risks (Berger-Höger et al. 2019), suggesting that shared decision aids are effective. SDM primarily focuses on lung cancer screening when it is applied in lung cancer field (Brenner et al. 2018; Lowenstein et al. 2019). Lung cancer screening is very important for high-risk groups (smoking, patients with chronic lung disease), and is convenient for early treatment of patients (Hall et al. 2021). Similarly, SDM in the field of lung cancer treatment and care is also involved. There is evidence that some lung cancer patients prefer treatment and care options that improve quality of life but the pros and cons of different approaches are not explain in detail when they make decisions (Sullivan et al. 2019).

Patient decision aids are tools that help patients understand options, consider possible hazards and benefits, and encourage them to make best choices for specific problems prudently and wisely (O’Connor et al. 2003). The International Patient Decision Aid Standards (IPDAS) (Elwyn et al. 2006) and The Ottawa Decision Support Framework (ODSF) (Hoefel and Lewis 2020) are two criteria for evaluating the development process and quality of patient decision assistance tools. IPDAS has developed a checklist to help researchers develop patient decision aids (http://ipdas.ohri.ca/using.html). ODSF can guide the development of patient decision aids from three aspects: decisional needs, decision support and decisional outcome (https://decision-aid.ohri.ca/odsf.html).

SDM increases the exchange of information between patients and health care providers. Health care providers determine the information that needs to be told to patients according to patients’ needs. But some factors affect the communication between patients and medical staff (Coulter 2017). These factors influence the level and attitude of lung cancer patients to participating in SDM. Some studies have also explored the subjective factors that influence cancer patients’ participation in SDM, such as education level (Loh et al. 2020). However, there is a gap in research exploring factors that influence Chinese lung cancer patients’ participation in SDM.

To make a thorough inquiry of actual participation and perceived importance of lung cancer patients’ involvement
in SDM in terms of treatment and care, we conducted this cross-sectional survey. The purposes of the current study are to: (1) assess the current status of lung cancer patients’ attitudes and actual participation in SDM on treatment and care; (2) explore whether there is a statistical difference between actual participation and perceived importance of lung cancer patients in SDM on treatment and care; and (3) predict factors affecting lung cancer patients’ participation in SDM on treatment and care.

Methods

Design, participants and recruitment

This study adopted a cross-sectional study design. We collected lung cancer patients in the thoracic surgery and oncology department of a comprehensive medical center in Qingdao, China from October 2018 to December 2019. Participants were eligible for inclusion if they: (1) were 18 years older; (2) met the diagnostic criteria for lung cancer and were aware of the condition (Deterbeck et al. 2017); and (3) had written informed consent and were voluntary to participate in this research. Exclusion criteria included: patients suffered: (1) severe damage to other organs (such as heart, brain, liver, kidney, etc.) or other severe malignant tumors; (2) cognitive impairment or mental illness; and (3) disputes between themselves or their family and the medical institutions. A total of 300 patients with lung cancer were enrolled, eventually. Among them, seven patients gave up answering, and three patients stopped answering because of unstable condition. Finally, a total of 290 lung cancer patients participated in this research (response rate = 96.7%).

The data were collected by the researchers on-spot at the bedside of patient. Participants received an information sheet and informed consent form before participating in the study. Data were collected by paper questionnaires. And researchers explained the queries to the patients without eliciting language. If patients were encountered to be agitated or unstable during the study, responses were terminated and reassurance was provided. After the subjects finished their answers, researchers retrieved the questionnaires and checked for omissions. If any, they were made up on the spot.

Measures

Sociodemographic and clinical variables

The module on patient characteristics included gender, age, marital status, comorbidities, medical insurance, education level, number of children, income, personality, course of disease and pathological TNM stage. Based on Jung’s theory of psychological types, we divided personality into introverted and extroverted types (John Beebe 2016). Patients who claimed themselves as quiet, eccentric, and preferring solitude to contact with others were considered introverted. Patients who self-reported being enthusiastic, lively, sociable and adaptable to their environment were considered extroverted. If the patient thinks he has two personalities at the same time, ask the patient to choose the one that best suits him.

Questionnaire of Cancer patients’ decision-making regarding treatment and care

Lung cancer patient’s SDM on treatment and care was assessed using the questionnaire compiled by Sainio and Lauri (2003). The questionnaire consists of four dimensions (actual participation of SDM on treatment and care, perceived importance of SDM on treatment and care) that are rated on a Likert scale from 1 to 3. Finally, we calculated the average value of each part of the scale to evaluate the actual participation degree and perceived importance of patients with lung cancer in SDM (≤ 1.5 means high degree of actual participation and perceived importance, > 1.5 means low degree of actual participation and perceived importance).

The Chinese version of the questionnaire has been revised and developed by Ma (2004), in which the first item “Amount of intravenous fluids” and the seventh item “Investigation scheduling” were deleted (Ma 2004) After measuring the reliability and validity of the Chinese version, it exhibited an acceptable content validity index (CVI = 0.89) and internal consistency (Cronbach’s $\alpha = 0.851$ in the perceived importance subscale, Cronbach’s $\alpha = 0.838$ in the actual participation subscale).

Data analysis

The survey data were analyzed using the statistical package IBM SPSS v25.0 (IBM. Corp, New York, USA). Descriptive analyses were applied to analyze socio-demographic variables and disease-related data. We used the Wilcoxon Matched-pairs Signed-rank test to analyze the difference between actual participation and perceived importance. Binary logistic regression analysis with a stepwise backwards was used to predict the factors that affected actual participation and perceived importance of SDM on treatment and care. A variance inflation factor (VIF) was used to test multicollinearity, and studies with a VIF of less than 10 were generally considered less likely to have multicollinearity. In the dummy variable setting of the binary logistic regression model, actual participation in SDM on treatment and care as the dependent variable was 0 for high and 1 for low because the scales were reversely scored. Similarly, for perceived importance, importance was 0 and insignificance
was 1. The Hosmer–Lemeshow test was used to assess the goodness-of-fit of the model. Statistical significance was set at \( P < 0.05 \).

**Ethical considerations**

We strictly followed the Helsinki Declaration of the World Medical Congress to conduct this research. The study was approved by the ethics committee of the university to which the investigators belonged. Written informed consent was obtained from all patients and their legal representatives.

**Results**

**Sample characteristics and situation analysis**

Participants’ ages are from 29 to 70 years (56.37 ± 9.05), and almost half of them were female (47.9%, \( n = 139 \)). Nearly 72.1% of the 290 patients had a junior high school education or higher, the vast majority had an income above 3000 RMB (96.9%, \( n = 281 \)), most were diagnosed with stage II or III (70.7%, \( n = 205 \)), and more than one-third of patients had a disease course of 3–6 months. Specific information is presented in Table 1.

Only 11% of the 290 participants’ actual participation in care SDM was higher, as well as 18.3% of the patients felt that care SDM was important. However, 26.9% of patients actually engaged in treatment SDM higher. SDM in terms of treatment was considered more important by 61% compared to SDM in terms of care (Supplementary file 1).

**Comparison of the actual participation and perceived importance of SDM on treatment and care**

To better understand the differences between patients’ actual participation and perceived importance in SDM on treatment and care, we performed Wilcoxon Matched-pairs signed-rank test (Supplementary files 2 and 3). The results showed that there was a statistical difference between lung cancer patients' actual participation in shared decision-making and their perceived importance (\( P < 0.01 \)). That is, while participants thought that shared decision-making was important, their actual participation was not as high.

**Prediction of factors affecting actual participation and perceived importance of SDM on treatment**

The VIF test results of this study was less than 5, so the likelihood of multicollinearity was minimal. The results of binary logistic regression with a stepwise backward showed that actual participation in SDM was higher among lung cancer patients who were male, younger, in TNM stage IV, and with disease course more than 6 months, higher education and income (Table 2). However, actual participation was lower among lung cancer patients with a disease course of 3–6 months.

We also found higher awareness of the importance of SDM on treatment among patients with other marital status (e.g., divorced, widowed), higher literacy and income (Table 3). However, patients with stage III TNM and disease course of 3–6 months had lower perceived importance of SDM on treatment (Table 3).

**Prediction of factors affecting actual participation and perceived importance of SDM on care**

We found that patients with lung cancer were more willing to participate in care decisions when they possessed higher education, higher income levels, more children, an outgoing personality, and a disease course of more than 6 months (Table 4).

We also found that patients with lung cancer perceived higher importance when they were male, in other marital status (e.g., divorced, widowed), with higher education and income level, in the disease course of more than 6 months, and TNM stage IV (Table 5). Among disease-related factors, lung cancer patients with a course of 3–6 months considered it unimportant to participate in SDM on care (Table 5).

**Discussions**

Shared decision-making based on information exchange is important. Paternalistic shared decision-making also ensures that the decision is in line with the patient’s values, preferences and beliefs. The results of this study indicated that actual participation and perceived importance of SDM on treatment and care among lung cancer patients was low. Furthermore, the actual participation of lung cancer patients in SDM on treatment and care was lower than their perceived importance. This suggested that although participants perceived that participation in SDM on treatment and care was important, their actual participation was not high.

The results of this study suggested that patients with higher education level actually participated in a greater extent and perceived importance of SDM on treatment and care (Coulter 2017; Chang et al. 2019). Similarly, Passalacqua et al. showed that patients with low level of education were unable to discern the pros and cons of medical information and were vulnerable to media messages (Passalacqua et al. 2004). They had difficulty in understanding the complexities of medical science or even communicating with healthcare professionals, making it difficult for them to make the best choices. However, Cuypers et al. found that
Table 1 Descriptive analysis of sociodemographic data and disease-related data (N = 290)

| Variables                      | SDM on treatment | SDM on care |
|-------------------------------|------------------|-------------|
|                               | Actual participation | Perceived importance | Actual participation | Perceived importance |
|                               | High | Low | Importance | Unimportance | High | Low | Importance | Unimportance |
| Gender                        |      |     |            |              |      |     |            |              |
| Male                          | 151  | 49  | 169.9      | 35.2         | 96   | 33.1| 55         | 19.0         |
| Female                        | 139  | 29  | 10.1       | 37.9         | 81   | 27.9| 58         | 20.0         |
| Age                           |      |     |            |              |      |     |            |              |
| ≤ 40                          | 24   | 9   | 3.1        | 4.1          | 16   | 5.5 | 5         | 1.7          |
| 41–50                         | 40   | 17  | 5.9        | 7.9          | 26   | 9.0 | 14        | 4.8          |
| 51–60                         | 120  | 36  | 12.4       | 29.0         | 78   | 26.9| 42        | 14.5         |
| > 60                          | 109  | 16  | 5.5        | 32.1         | 57   | 19.7| 52        | 17.9         |
| Marital status                |      |     |            |              |      |     |            |              |
| Married                       | 267  | 71  | 24.5       | 67.6         | 196  | 65.5| 107       | 36.9         |
| Other                         | 23   | 7   | 2.4        | 5.5          | 16   | 5.9 | 6         | 2.1          |
| Comorbidities                 |      |     |            |              |      |     |            |              |
| No                            | 215  | 60  | 20.7       | 53.4         | 155  | 44.8| 85        | 29.3         |
| Yes                           | 75   | 18  | 6.2        | 19.7         | 47   | 16.2| 28        | 9.7          |
| Medical insurance             |      |     |            |              |      |     |            |              |
| Employee health insurance     | 141  | 40  | 13.8       | 34.8         | 101  | 34.8| 49        | 16.9         |
| Resident health insurance     | 125  | 31  | 10.7       | 32.4         | 94   | 24.8| 53        | 18.3         |
| Own expense                   | 24   | 7   | 2.4        | 17.9         | 13   | 4.5 | 11        | 3.8          |
| Education level               |      |     |            |              |      |     |            |              |
| Illiteracy/primary school     | 81   | 27  | 27.9       | 25.2         | 39   | 13.4| 42        | 14.5         |
| Junior high school            | 111  | 32  | 11.0       | 27.2         | 66   | 22.8| 45        | 15.5         |
| High school                   | 49   | 16  | 6.9        | 12.1         | 37   | 12.8| 12        | 4.1          |
| Junior college                | 20   | 6   | 9.1        | 3.1          | 11   | 3.8 | 13        | 4.5          |
| Bachelor degree and above     | 29   | 10  | 10.0       | 15.2         | 14   | 4.8 | 22        | 7.6          |
| Number of children            |      |     |            |              |      |     |            |              |
| ≤ 1                           | 129  | 44  | 13.1       | 31.4         | 94   | 32.4| 35        | 12.1         |
| 2                             | 129  | 44  | 10.3       | 39.1         | 65   | 22.4| 64        | 22.1         |
| ≥ 3                           | 32   | 11  | 10.0       | 34.1         | 22   | 7.6 | 19        | 6.3          |
| Income (RMB)                  |      |     |            |              |      |     |            |              |
| < 3000                        | 9    | 3   | 3.1        | 0.0          | 9    | 3.1 | 2         | 0.7          |
| 3000–5000                     | 76   | 26  | 11.3       | 36.2         | 31   | 10.7| 45        | 15.5         |
| 5001–10,000                   | 175  | 60  | 30.3       | 18.6         | 121  | 41.7| 118       | 36.7         |
| > 10,000                      | 30   | 10  | 3.3        | 14.5         | 26   | 9.0 | 4         | 1.4          |
| Personality                   |      |     |            |              |      |     |            |              |
| Introvert                     | 200  | 69  | 27.9       | 51.0         | 127  | 43.8| 73        | 25.2         |
| Extrovert                     | 90   | 31  | 26.9       | 18.0         | 50   | 17.2| 40        | 13.8         |
| Course of disease             |      |     |            |              |      |     |            |              |
| < 3 months                    | 120  | 41  | 34.8       | 31.0         | 87   | 30.0| 33        | 11.4         |
| 3–6 months                    | 108  | 37  | 6.2        | 32.5         | 40   | 13.8| 68        | 23.4         |
| > 6 months                    | 62   | 21  | 42.4       | 45.5         | 50   | 17.3| 12        | 4.1          |
| Pathological typing           |      |     |            |              |      |     |            |              |
| I                             | 48   | 16  | 11.6       | 3.8          | 37   | 12.8| 34        | 11.7         |
| II                            | 122  | 42  | 32.3       | 31.0         | 80   | 27.6| 42        | 14.5         |
| III                           | 83   | 28  | 14.8       | 23.8         | 69   | 23.8| 47        | 16.2         |
| IV                            | 37   | 12  | 37.9       | 10.6         | 16   | 5.6 | 27        | 9.3          | 10 (3.5) | 14 (4.9) | 23 (7.9) | 19 (6.6) | 18 (6.2) |

SDM, shared decision-making
cancer patients with higher levels of education were more proactive in treatment care decisions (Cuypers et al. 2016). Patients with high level of education were more likely to receive disease-related information. Studies demonstrated that lung cancer patients would be very interested in the treatment and care process if they had access to sufficient information (Coulter 2017; Hull et al. 2020; Passalacqua et al. 2004). But, the study showed that patients with the most and least education were more inclined to have family members involved in decision-making, which reflected that these patients had rather low participation in shared decision-making, which is inconsistent with the results of this study (Hobbs et al. 2015). Therefore, medical staff should take the patient’s education level into account and choose the appropriate way to provide them with medical information.

Although Chinese existing health insurance policy has wide coverage, not all anticancer drugs are included in the healthcare system. It is still a heavy burden especially for low-income cancer patients in rural China (Leng et al. 2019). We speculated that low-income patients developed thoughts of abandoning treatment due to the high cost of treatment and care, and had difficulty in actively participating in SDM. However, it does not preclude the possibility that some of these patients may be more active in discussing cost-efficient treatment options with clinicians and have a higher level of SDM. Therefore, the impact of income level on lung cancer patients’ participation in SDM needs to be further explored.

Divorced and widowed patients considered it was important to participate in SDM on treatment and care. Some studies had shown that family involvement in SDM for cancer patients was associated with a better understanding of cancer-related information (Hobbs et al. 2015; Wolff and Roter 2011). Hobbs et al. found that different cultural backgrounds had an impact on whether family members were involved in the decision-making process of treatment/care for cancer patients (Hobbs et al. 2015). In traditional Chinese culture, family members, especially spouses, are important contacts for health care professionals to communicate with patients and are the primary decision makers in the treatment care of cancer patients. When spouses were actively involved in the decision-making of treatment/care for lung cancer patients, it weakened the level of patients’ involvement. Thus, in the absence of family support, divorced and widowed patients would engage in the three-talk model on their own and make informed decisions with clinicians. For these

Table 2: Multi-factor prediction of actual participation in SDM on treatment

| Characteristics          | OR   | 95% CI       | P      |
|--------------------------|------|--------------|--------|
| **Demographic characteristics** |      |              |        |
| Gender                   | 1.994| 1.108–3.587  | 0.021* |
| Age                      | 1.040| 1.006–1.075  | 0.019* |
| Marital status           | 0.564| 0.184–1.616  | 0.274  |
| **Medical insurance**    |      |              |        |
| Employee health insurance| Reference | 0.279 |        |
| Resident health insurance| 0.638| 0.335–1.215  | 0.171  |
| Own expense              | 0.497| 0.161–1.529  | 0.223  |
| Education level          | 0.656| 0.508–0.846  | 0.001**|
| Income (¥)               | 0.458| 0.281–0.747  | 0.002**|
| **Disease-related factors** |      |              |        |
| Course of disease        |      |              |        |
| <3 months                | Reference | <0.01** |        |
| 3–6 months               | 5.845| 2.252–15.167 | <0.01**|
| >6 months                | 0.162| 0.077–0.337  | <0.01**|
| **Pathological typing**  |      |              |        |
| I                        | Reference | 0.008** |        |
| II                       | 0.673| 0.281–1.609  | 0.373  |
| III                      | 1.521| 0.543–4.259  | 0.424  |
| IV                       | 0.244| 0.079–0.753  | 0.014* |

OR, odds ratio; CI, confidence intervals; SDM, shared decision-making
*Indicates statistical significance at P ≤ 0.01
**Indicates statistical significance at P ≤ 0.001

Table 3: Multi-factor prediction of perceived importance of SDM on treatment

| Characteristics          | OR   | 95% CI       | P      |
|--------------------------|------|--------------|--------|
| **Demographic characteristics** |      |              |        |
| Marital status           | 0.253| 0.085–0.754  | 0.014* |
| Education level          | 0.763| 0.606–0.961  | 0.021* |
| Number of children       | 1.499| 0.999–2.249  | 0.051  |
| Income                   | 0.356| 0.229–0.553  | <0.01**|
| **Disease-related factors** |      |              |        |
| Course of disease        |      |              |        |
| <3 months                | Reference | <0.01** |        |
| 3–6 months               | 3.944| 2.207–7.049  | <0.01**|
| >6 months                | 0.562| 0.256–1.233  | 0.151  |
| **Pathological typing**  |      |              |        |
| I                        | Reference | 0.020* |        |
| II                       | 1.015| 0.469–2.199  | 0.969  |
| III                      | 2.463| 1.080–5.618  | 0.032* |
| IV                       | 0.883| 0.311–2.511  | 0.816  |

OR, odds ratio; CI, confidence intervals; SDM, shared decision-making
*Indicates statistical significance at P ≤ 0.01
**Indicates statistical significance at P ≤ 0.001
*Indicates statistical significance at P ≤ 0.05. Demographic characteristics: Omnibus tests of model coefficients: P ≤ 0.01; The Hosmer–Lemeshow goodness-of-fit test: χ² = 2.852, P = 0.898; Disease-related factors: Omnibus tests of model coefficients: P ≤ 0.01; The Hosmer–Lemeshow goodness-of-fit test: χ² = 2.388, P = 0.935

Lemeshow goodness-of-fit test: χ² = 8.764, P ≤ 0.01; The Hosmer–Lemeshow goodness-of-fit test: χ² = 2.388, P = 0.935
reasons, divorced or widowed lung cancer patients consider it extremely important to be involved in SDM about their treatment and care. In this context, medical staff should provide adequate decision support and information about patients’ concerns (treatment modalities, side effects, prognosis) for patients.

Cuypers et al. found that younger male cancer patients were more likely to be actively involved in medical decision-making, which was consistent with the results of this study (Cuypers et al. 2016). Men and younger patients are actually more willing to participate in SDM on treatment. Male patients generally take on more responsibilities in the family and can analyze treatment more rationally. Younger patients are more receptive to the disease and more knowledgeable about relevant information than the elderly. As a result, male and younger patients more actively participate in SDM on treatment.

We also found that patients who were introverted and had more children actually had higher levels of SDM involvement in care. We speculated that extroverted patients were willing to participate in care decision and chose more appropriate care for themselves. Hobbs et al. concluded that children also play an important role in the involvement of cancer patients in SDM (Hobbs et al. 2015). And Lee’s study showed that children’ involvement in patients’ medical decision-making increased patient satisfaction and compliance (Lee and Knobf 2016). Children were important sources of family support for cancer patients, suggesting that patients with more children had stronger family support systems. For complex care methods, children would help patients understand, which would help to increase the patients’ motivation to participate in care decisions.

The results of this study showed a higher level of participation in SDM on treatment and care among cancer patients with a disease duration of more than 6 months. Similarly, Shen et al. showed that patients with longer duration of cancer had higher awareness of participation in SDM (Shen et al. 2019). Analysis of the reasons may be that patients who have been diagnosed with cancer for less than 3 months may be in a fear psychological stage (Chen et al. 2016). They fear and refuse to acknowledge that they have been confirmed to have lung cancer. In this study, lung cancer patients with disease duration within 3–6 months had already started chemotherapy and experienced intolerable adverse effects, making them resist treatment and care options. As a result, patients at this stage are more likely to be passive recipients of therapeutic care rather than active participants in decision-making. Lung cancer patients with a course of more than 6 months may

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### Table 4 Multi-factor prediction of actual participation in SDM on care

| Characteristics                  | OR  | 95% CI      | P   |
|----------------------------------|-----|-------------|-----|
| **Demographic characteristics**  |     |             |     |
| Education level                  | 0.575 | 0.425–0.778 | <0.01** |
| Number of children               | 0.361 | 0.184–0.706 | 0.003** |
| Income (¥)                       | 0.347 | 0.180–0.670 | 0.002** |
| Personality                      | 0.244 | 0.106–0.558 | 0.001** |
| **Course of disease**            |     |             |     |
| <3 months                        | Reference | <0.01** |     |
| 3–6 months                       | 1.255 | 0.330–4.769 | 0.739 |
| > 6 months                       | 0.104 | 0.037–0.295 | <0.01** |
| **Pathological typing**          |     |             |     |
| I                                | Reference | 0.002** |     |
| II                               | 1.571 | 0.454–5.441 | 0.476 |
| III                              | 3.325 | 0.754–14.660 | 0.113 |
| IV                               | 0.328 | 0.090–1.195 | 0.328 |

OR, odds ratio; CI, confidence intervals; SDM, shared decision-making

*Indicates statistical significance at P ≤ 0.05. Demographic characteristics: Omnibus tests of model coefficients: P ≤ 0.01; The Hosmer–Lemeshow goodness-of-fit test: χ² = 13.090, P = 0.109; disease-related factors: Omnibus tests of model coefficients: P ≤ 0.01; The Hosmer–Lemeshow goodness-of-fit test: χ² = 4.738, P = 0.692

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### Table 5 Multi-factor prediction of perceived importance of SDM on care

| Characteristics                  | OR  | 95% CI      | P   |
|----------------------------------|-----|-------------|-----|
| **Demographic characteristics**  |     |             |     |
| Gender                           | 2.302 | 1.175–4.513 | 0.015* |
| Marital status                   | 0.320 | 0.109–0.936 | 0.037* |
| Education level                  | 0.625 | 0.487–0.801 | <0.01** |
| Income                           | 0.500 | 0.301–0.830 | 0.007** |
| **Course of disease**            |     |             |     |
| <3 months                        | Reference | <0.01** |     |
| 3–6 months                       | 2.945 | 1.135–7.641 | 0.026* |
| > 6 months                       | 0.329 | 0.153–0.708 | 0.004** |
| **Pathological typing**          |     |             |     |
| I                                | Reference | 0.001** |     |
| II                               | 1.311 | 0.520–3.303 | 0.566 |
| III                              | 2.110 | 0.703–6.330 | 0.183 |
| IV                               | 0.251 | 0.086–0.727 | 0.011* |

OR, odds ratio; CI, confidence intervals; SDM, shared decision-making

*Indicates statistical significance at P ≤ 0.05. Demographic characteristics: Omnibus tests of model coefficients: P ≤ 0.01; The Hosmer–Lemeshow goodness-of-fit test: χ² = 10.207, P = 0.177; disease-related factors: Omnibus tests of model coefficients: P ≤ 0.01; The Hosmer–Lemeshow goodness-of-fit test: χ² = 1.617, P = 0.951
be in the adaptation period, accept their own diagnostic facts, actively participate in the treatment and care of SDM and discuss more useful programs.

TNM stage is an important determinant of survival in lung cancer patients (Woodard et al. 2016). For patients with stage III lung cancer, the 5-year survival rate is much lower than that for stages I and II, and most patients receive chemotherapy and radiotherapy with enduring adverse reactions (Woodard et al. 2016). Shen et al. concluded that stage II and III cancer patients had higher levels of involvement in SDM, which was inconsistent with the results of this study (Shen et al. 2019). We speculated that patients with stage III lung cancer in this study were not better off after receiving treatment and did not consider decision on treatment approach to be important. Shen et al. found that stage IV cancer patients had low awareness of participation in SDM and that their patients perceived limited treatment care options (Shen et al. 2019). However, our study found that stage IV patients considered SDM on care to be more important. This may be related to the fact that Shen's study was conducted on breast cancer patients, who have a higher 5-year survival rate compared to lung cancer patients. The 5-year survival rate for patients with stage IV lung cancer pathology was estimated to be 13%, compared to 2% for clinical stage IV patients (Woodard et al. 2016). Patients with stage IV lung cancer present symptoms such as cough, dyspnea, hemoptysis and chest pain. For these reasons, we speculate that patients prefer care methods that promote a better quality of life rather than pursuing a longer survival rate. Therefore, they focus more on the care approach.

Healthcare professionals can use patient decision aids to help patients understand the treatment process and encourage them to express their wishes. The patient decision aids website, established by the Ottawa Hospital Research Association, is a platform that provides decision support (Patient Decision Aids 2020). We can directly download and use the patient decision aids list for lung cancer screening patients on this platform. A patient decision aid for treatment selection for lung cancer patients has been developed in the Netherlands (http://www.keuzehulp-longkanker.nl/). Patients can comprehensively consider the pros and cons of surgery and targeted radiotherapy based on the information on this website and decide together with their clinician.

Decision coaching is another form of patient decision aid, which is developed in accordance with IPADS (Rahn et al. 2021). Rahn et al. (2018) conducted a preliminary randomized controlled study in which a decision aid implemented by a nurse-led decision coach facilitated patient participation in SDM (Rahn et al. 2018). Also, there was evidence that decision coaching could avoid decision-making entanglement and improve the quality of communication with patients and facilitate their learning (Stacey and Légaré 2020).

The MAGIC program, proposed by the British Health Foundation, has developed option grids to help patients engage with SDM (The Health Foundation 2012). Currently, treatment option grids are used in a wide range of diseases, such as breast cancer, knee joint arthritis, prostate cancer (Durand et al. 2020; Kinsey et al. 2017; Scalia et al. 2019). Study confirmed that the application of option grids in lung cancer screening could lead to better SDM experience and advanced knowledge of lung cancer screening (Sferra et al. 2020). With advances in medicine and the popularity of SDM, it is imperative to encourage lung cancer patients to participate in SDM. Healthcare professionals can use patient decision aids to help patients choose decisions that match their values, preferences, and personal goals.

**Clinical implications**

In the Chinese cultural context and healthcare system, clinicians lack sufficient time to explain the pros and cons of different treatments to patients. As close partners of clinicians, nurses have more contact with patients than clinicians and are more likely to provide health education and understand patients’ wishes regarding treatment and care options. Transitional care is critical for chronic diseases such as cancer, and community health workers are the primary providers of transition care services in the community. Within certain limits of authority, we can train oncology nurse specialists in SDM to join medical staff-patient-family and hospital-home-communities to provide SDM for patients. We should use SDM to maximize patient autonomy and use patient decision aids to help them make decisions.

**Limitation**

However, this study has the following limitations. First, lung cancer patients from a comprehensive medical center in Qingdao (a first-tier city in the coastal region of east-central China) were selected for this study, which may hinder the representative and generalization of our results. Therefore, lung cancer patients from more regions could be selected to explore their level of participation and attitudes towards SDM in future study. Second, shared decision-making involves not only patients but also their family members. In this study, we did not collect the opinions from family members. In traditional Chinese culture, healthcare providers worry that lung cancer patients will not be able to accept the adverse consequences of the disease. Then, healthcare providers mostly adopt protective strategies to communicate with family members about patients’ condition and treatment and care measures, leaving it up to family members to decide whether to inform patients about their disease. Therefore, family members are the main influencers of lung cancer patients’ participation in SDM. Third, it is best to analyze the
study results through questionnaires and interviews. Interview is important to understand the perceptions of cancer patients and families about shared decision-making. Therefore, we will conduct in-depth interviews with lung cancer patients to obtain more detailed information and include patients' family members in future studies. The results of this study could guide intervention and will include additional factors as well as family involvement.

Conclusions

Actual participation and perceived importance in SDM on treatment and care among lung cancer patients were low and there was variation between them. Lung cancer patients' actual participation in SDM on treatment and care was affected by background factors (education level, household income) and health care provider factors (lack of time, attitude towards SDM). Therefore, SDM orientation sessions should be designed accordingly to the social background of lung cancer patients to help them actively participate. Due to the limited time of clinicians, nurses are better suitable to act as liaisons between patients and physicians to provide SDM support. Thus, SDM knowledge training for oncology nurses is beneficial in facilitating SDM.

Authors' contributions All authors contributed to the study conception and design. Study design and material preparation were performed by Ying Wang, Bo Hu, and Jinna Zhang. Data collection and analysis were performed by Ying Wang, Jinna Zhang, Bo Hu, Jizhe Wang, Laixiang Zhang, Xiaohua Li, and Xiuli Zhu. The first draft of the manuscript was written by Ying Wang, Jinna Zhang, and Bo Hu and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Funding The study was funded by Project of Research Planning Foundation on Humanities and Social Sciences of the Ministry of Education (No. 20YJAZH144).

Availability of data and materials All authors declared that all data and materials as well as software application or custom code support their published claims and comply with field standards.

Declarations

Conflict of interest All authors declare that they have no conflict of interest.

Ethics approval This study was conducted according to the Declaration of Helsinki and were supported by the ethical committee of the university which the researchers affiliated.

Consent to participate Before distributing the questionnaires, all the patients signed the informed consents. That indicated that they understood the nature and purpose of the study and they knew that their personal information would not be divulged.

Consent for publication Not applicable. Because this is not a case study, but cross-sectional study. We collect data anonymously. We present the results by analysing a large number of quantitative data and there will be no information leakage of any participants.

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