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Original research article

An assessment of quality of life, health, and disability in patients undergoing lung resection

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Abstract

Background: Lung resection can cause changes in patients' functional status, potentially affecting their quality of life. For effective care planning after resection, it is necessary to identify areas of quality of life that require special attention.

Objectives: This prospective study aimed to compare the quality of life, health, and disability before lung resection and three months after it.

Methods: Quality of life, health, and disability were assessed using standardized tools: Short Form-12 version 2, and WHO Disability Assessment Schedule 2.

Results: The research group included 44 patients with a mean age of 65.7 years (min. 37, max. 79) referred for lung resection. Men were more represented in the study group (56.8%) than women. Three months after the surgery, statistically significant deterioration in the quality of life was observed in the domains of Physical functioning ($p = 0.016$) and Bodily pain ($p = 0.044$). Where disability was concerned, the overall score also deteriorated ($p < 0.001$). This was driven predominantly by the domains of Mobility ($p < 0.001$), Life activities ($p < 0.001$), and Participation ($p = 0.037$).

Conclusion: The deterioration in the quality of life in multiple domains three months after lung resection is highly significant. The deterioration in the domains Physical functioning and Bodily pain in the quality of life field, and of Mobility, Life activities, and Participation in the health and disability score identifies these areas as those that need special attention when planning post-surgery care for these patients.

Keywords: Assessment; Disability; Domains; Lung resection; Quality of life

Introduction

According to the World Health Organization (WHO), quality of life is defined as an individual's perception of their own life position in the context of the culture and value systems in which they live, in relation to their goals, interests, expectations, and standards (WHO, 2022). It is, therefore, a multidimensional construct encompassing domains such as physical health, level of independence, mental health, social relationships, environmental aspects, and spiritual concerns of the individual (Grant and Dean, 2011). Quality of life is considered to be measurable and forms an important part of the process of monitoring individual patients' health statuses. It is also an indicator of the need for certain interventions or services. In some areas, the indicators of the quality of life may also have prognostic significance (Sim et al., 2020).

In the field of pulmonary surgery, quality of life assessment is somewhat underestimated (Pompili, 2015) and the use of this indicator in Czech clinical practice is practically non-existent. Fortunately, patient-oriented care is generally on the rise and, therefore, the evaluation of the quality of life is increasingly penetrating the field of pulmonary surgery (Valsangkar et al., 2020). These results are highly important for the full and complex evaluation of the overall impact of surgical treatment on patients' lives and, therefore, for identifying areas where further care needs to be focused.

Lung resection is a surgical procedure in which a part of a lung or a whole lung is removed because of a tumor or another disease (such as bronchiectasis, emphysema, *etc.*) (Cleveland Clinic, 2023). Some authors (Szeliga et al. 2019; Win et al., 2005) reported a general deterioration in the quality of life after this procedure. Evaluation of the individual areas of the quality of life after lung resection can help identify issues

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that need particular attention during post-surgery care; this can, in turn, augment the recovery process and the outcome. Marzorati et al. (2020) emphasize the importance of monitoring the quality of life before and after lung resection (as well as other clinical and sociodemographic indicators), which may facilitate the implementation of the aforementioned patient-centered care.

The diagnosis alone usually does not provide enough information for a full understanding of the impacts of the disease on the patients' lives. It does not provide clear information on whether the disease prevents the patients from working and carrying out normal activities that are necessary to perform their roles in different social areas in the context of the illness. Potential disability is a major concern and its evaluation is valuable not only in terms of assessing the level of care needed by the patients or predicting the need for additional services in the care for the individual patients, but also in terms of prognosis, assessment of the need for social benefits, of current and future ability to perform employment, or of their post-treatment social integration (Üstün et al., 2010). Similar to the indicators of the quality of life, evaluation of the health and disability can help identify the current needs of the patient and set individual priorities of the care. This is highly desirable for helping with the recovery process and the individuals' return to everyday life after surgery, thus supporting patient-centered care.

Aim of the study

In this prospective study, we aim to evaluate the preoperative and postoperative (3-month follow-up) quality of life, health, and disability in patients referred for lung resection (for both tumor and non-tumor lung disease). Special attention is paid to the identification of areas (domains) with the greatest post-operative deterioration, which should help focus the care (including nursing, physiotherapy, and/or ergotherapy) in these patients.

Materials and methods

Study design and objective

Patients meeting the inclusion criteria (referral for lung resection, age 18+, orientation in place, time, and person) were contacted through the thoracic surgery center (outpatient clinic). Those who consented to participate were included in the study. The quality of life, health, and disability were evaluated using questionnaires (see below) at the thoracic surgery center at two time periods:

- one week to one month before the surgery, at the last pre-surgery visit of the patient to the outpatient clinic;
- three months after the surgery, during the 3-month follow-up visit in the outpatient clinic.

Processing of personal data was carried out in accordance with the requirements of Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) – "GDPR Regulation". In the outpatient clinic, patients participating in the study were assigned an identification number by a nurse working there to ensure anonymity.

Data collection

Data on the quality of life, health, and disability were collected via a questionnaire survey from May 2021 to August 2022 using two standardized instruments, namely the 12-Item Short-Form Health Survey and WHO Disability Assessment Schedule 2.0. In addition, data on the prevalence of risk factors for lung disease (smoking, working in a high-risk environment, family history of lung cancer), and sociodemographic data were collected. Face-to-face questionnaires were used.

12-Item Short-Form Health Survey

Quality of life was assessed using a generic instrument, namely the 12-Item Short-Form Health Survey (SF-12) developed from the Medical Outcomes Study 36-Item Short-Form Health Survey. This standardized instrument assesses multiple areas of physical and mental health, consisting of 8 domains: Physical functioning, Role-physical (physical health-related role limitations, including limitations in the kind of work or other usual activities and accomplishing less than the respondent would have liked), Bodily pain, General health, Vitality, Social functioning, Role-emotional, and Mental health. In accordance with the questionnaire's user manual, values were converted to a 0–100 scale, with higher scores indicating a better quality of life (Ware et al., 1996). For the purposes of this study, version 2 (SF-12v2) was used, in line with current recommendations (Maruish, 2012).

WHO Disability Assessment Schedule 2.0

Health and disability were evaluated using a generic standardized instrument, WHO Disability Assessment Schedule 2.0 (WHODAS), based on the principles of the International Classification of Functioning, Disability and Health (ICF). The tool evaluates the subjective perception of disability by the patient and directly corresponds to the ICF component "activity and participation". It includes six domains: Cognition (understanding and communicating), Mobility (moving and getting around), Self-care (hygiene, dressing, eating, and staying alone), Getting along (interacting with other people), Life activities (domestic responsibilities, leisure, work, and school), and Participation (joining in community activities). The total score (as well as domain scores) are expressed on a scale of 0–100%, with a higher score indicating a higher disability. In accordance with current recommendations, a 36-item version of this instrument was used for the purposes of this study (Üstün et al., 2010).

Data analysis

Data was input in the Epidata SW in an anonymized form. Data were processed in Stata v. 17. The level of statistical significance was set at 5%. Descriptive statistics methods were used to describe patient group characteristics. The Wilcoxon signed-rank test was used for pairwise comparison of quality of life and health and disability scores before and three months after lung resection. Mann–Whitney test and the Kruskal–Wallis test were used to represent the changes in quality of life and health and disability in relation to analysed variables. These changes were expressed as the difference in scores before and after surgery.

Results

Group characteristics

The study group comprised 44 patients with a mean age of 65.7 years (SD = 9.3, range 37–79 years). Men were represented more than women (56.8% vs 43.2%). Individuals with vocational or lower education constituted 61.4% of the study group. Lung cancer was present in the family history of 25% of

patients. 31.8% of participants had a personal history of occupational risk for lung diseases, most of whom had worked in a coal mine (71.4%). Non-smokers constituted 38.6% of the study group, former smokers 38.6%, and current smokers 22.8%. Those who declared themselves as smokers started smoking (on average) when they were 20 years old, and smoked an average of 12 cigarettes a day. Former smokers smoked an average of 13 cigarettes a day from 23–55 years of age. Histology of the resected tissue confirmed a tumor in the majority of patients (72.7%), most of which (87.5%) were malignant. Additional characteristics of the study group can be found in Table 1.

Quality of life, health, and disability before and three months after lung resection

Three months after lung resection, the quality of life (as assessed by the SF-12v2) was significantly worse in the domains of Physical functioning ($p = 0.016$) and Bodily pain ($p = 0.044$). Interestingly however, the quality of life significantly improved in the domains of Role-physical ($p = 0.009$) and Social functioning ($p = 0.028$) three months after the surgery – see Table 2.

The mean overall WHODAS health and disability score before the resection was 6.1% (min. 0, max. 26.1), which rose to 10.2% (min. 0, max. 31.3) three months after the surgery. The overall disability score became significantly worse three months after the surgery compared to the pre-surgery condition ($p < 0.001$). This was associated particularly with the deterioration in the following domains: Mobility – moving and getting around ($p < 0.001$), Life activities – domestic responsibilities, leisure, work, and school ($p < 0.001$), and Participation – joining in community activities, participating in society ($p = 0.037$), which significantly deteriorated three months after surgery (Table 2).

Table 1. Patient group characteristics ($n = 44$)

Age	mean 65.7 (min. 37, max. 79)	
	n	%
Gender		
male	25	56.8
female	19	43.2
Education		
primary	5	11.4
vocational	22	50.0
secondary	11	25.0
secondary professional	1	2.2
tertiary	5	11.4
Cohabitation		
alone	10	22.7
with partner/husband/wife	22	50.0
with family	12	27.3
Smoking		
non-smoker	17	38.6
smoker	10	22.8
ex-smoker	17	38.6
Exposure to tobacco smoke		
not exposed	36	81.8
exposed at home	6	13.6
exposed at work	2	4.6
Family history of lung tumor		
no	33	75.0
yes	11	25.0
Occupational hazard		
no	30	68.2
yes	14	31.8
Post-surgery histology results		
non-tumor processes	12	27.3
tumors	32	72.7
malignant tumors	28	87.5
carcinoid	3	9.4
metastatic damage to the lungs	1	3.1

Table 2. Quality of life and health and disability scores before and 3 months after lung resection

Quality of life	Before the surgery			After the surgery			*p*-value*
	mean	SD	min.–max.	mean	SD	min.–max.	
General health	43.2	21.1	0–100	44.3	19.3	0–75	0.557
Physical functioning	71.6	28.3	0–100	59.7	35.4	0–100	**0.016**
Role-physical	23.3	23.6	0–100	34.1	26.6	0–100	**0.009**
Bodily pain	80.7	26.3	0–100	71.0	28.0	0–100	**0.044**
Vitality	84.7	19.6	25–100	83.5	18.6	50–100	0.767
Social functioning	74.4	31.2	0–100	83.5	24.7	0–100	**0.028**
Role-emotional	19.3	24.0	0–100	23.3	21.8	0–62.5	0.323
Mental health	70.2	18.1	20–100	73.9	17.6	32.5–100	0.354
Health & disability							
Total score	6.1	6.5	0–26.1	10.2	8.7	0–31.3	**<0.001**
Domain 1 Cognition	5.6	10.6	0–58.3	6.4	9.9	0–41.7	0.383
Domain 2 Mobility	9.4	14.0	0–50.0	14.5	14.0	0–50	**<0.001**
Domain 3 Self-care	2.3	5.2	0–18.8	1.6	4.7	0–18.8	0.533
Domain 4 Getting along	3.4	7.2	0–40.0	5.9	9.8	0–50.0	0.222
Domain 5 Life activities	3.9	8.8	0–43.8	14.6	14.4	0–50.0	**<0.001**
Domain 6 Participation	12.1	12.5	0–50.0	17.9	17.9	0–65.6	**0.037**

Note: SD – standard deviation, * Wilcoxon signed-rank test.

Changes in the quality of life and health and disability in relation to age, gender, education, and cohabitation status

Mean changes in the quality of life, health and disability, and individual domains were also investigated in relation to socio-economic characteristics. The association between the education level achieved and the General health domain (p = 0.010) was among the statistically significant. The quality of life improved after surgery for those with vocational or lower education, while the quality of life worsened for those with higher and university education. A significant association was also detected between the Role-physical domain and cohabitation (p = 0.023). The most significant deterioration in the Role-physical domain was observed for individuals living with family. A statistically significant relationship between the Vitality domain and sex was also revealed (p = 0.016). In men, the quality of life in this domain improved after surgery, while in women it deteriorated. Similarly, changes in the Social functioning domain were also associated with sex (p = 0.019), with women experiencing a more pronounced deterioration in this area (Table 3).

Table 3. Changes in the quality of life and health and disability scores before lung resection and three months after the surgery in association with sex, education (trade certificate or lower vs higher), and cohabitation status

Quality of life (p-value)	Sex*	Education**	Cohabitation**
General health	0.738	**0.010**	0.678
Physical functioning	0.262	0.372	0.915
Role-physical	0.743	0.427	**0.023**
Bodily pain	0.752	0.140	0.589
Vitality	**0.016**	0.166	0.143
Social functioning	**0.019**	0.100	0.564
Role-emotional	0.670	0.768	0.688
Mental health	0.054	0.051	0.812
Health & disability (p-value)	Sex*	Education**	Cohabitation**
Total score	0.492	0.972	0.494
Domain 1 Cognition	0.058	0.285	0.054
Domain 2 Mobility	0.062	0.948	0.888
Domain 3 Self-care	0.807	0.741	0.846
Domain 4 Getting along	0.281	0.252	0.260
Domain 5 Life activities	0.733	0.652	0.144
Domain 6 Participation	0.674	0.699	0.601

Note: * Mann–Whitney test; ** Kruskal–Wallis test.

Where the disability score (WHODAS) is concerned, no significant relationships between changes in the total score with age, gender, education, or cohabitation were revealed. Of the individual domains, only the paired change in the Self-care domain was significantly associated with age (p = 0.020) – the degree of disability in the Self-care domain deteriorated more for those aged under 65 years.

Changes in the quality of life, health, and disability in relation to postoperative histological findings

The results were also evaluated from the perspective of histological findings from the resected material. Patients were classified into two categories – those with a histologically confirmed tumor and those with other diagnoses. No associations were found for either the quality of life or the health and disability questionnaires and histological findings (neither in the overall scores nor in the individual domains).

Discussion

Studies assessing the quality of life and disability after lung resection from the perspective of nursing practice are rare. This represents a gap in the scientific background of nursing after this type of surgery. In the field of pulmonary surgery, quality of life is usually evaluated from the perspective of the surgical technique used or the resection volume. According to Singer et al. (2020), patients with lung cancer after thoracoscopic surgery have better scores in the domains of Physical functioning and Bodily pain compared to open surgery. Video-assisted thoracic surgery (VATS) is, according to the available literature, also associated with better quality of life shortly after the procedure than open thoracic surgery, but long-term outcomes in relation to quality of life are comparable (Hopkins et al., 2017). According to Bendixen et al. (2016), the use of VATS is associated with better quality of life and less pain one year after surgery than thoracotomy.

Currently, the quality of life after pulmonary surgery is predominantly addressed in scientific publications in the context of lung resection for cancer (Pompili et al., 2013; Saad et al., 2007; Szeliga et al., 2019), rather than lung resection in general. It would be logical to assume that in the case of malignancies, the post-surgery quality of life can also be influenced by the fact that these patients typically undergo an adjuvant treatment. However, our results indicate that this might not be the case. We have not found any statistically significant relationship between the changes in the quality of life or health and disability and the post-surgery histological findings. While this result needs to be confirmed in a larger sample of patients, our findings can be supported by Dunková and Bužgová (2012) who found no significant changes in the quality of life in patients after chemotherapy due to bronchogenic carcinoma.

It is generally accepted that lung resection is associated with a deterioration in the quality of life (Szeliga et al. 2019; Win et al., 2005), with quality of life outcomes returning to baseline values at six months (Win et al, 2005). In our study, the quality of life was found to deteriorate three months after lung resection in the domains of Physical functioning and Bodily pain, a finding similar to the study by Balduyck et al. (2009). In that study, the authors also concluded that in elderly individuals (70+ years), the quality of life returns to baseline values at 3–6 months after lung resection, except in the domains of Physical functioning and Shortness of breath. However, the mean age in our study was approximately 4 years younger than in theirs, and the generic tool we used to assess the quality of life does not directly address the symptom of dyspnea. We, however, assume that dyspnea can be associated both with suboptimal physical functioning and with pain, which can significantly limit bodily functions. This is consistent with the findings of Pompili et al. (2021) who investigated the quality of life in the context of symptoms such as dyspnea, pain, wound tenderness, walking, and physical functioning in the

early postoperative period after lung resection. These aspects were found to be worsened in the early postoperative period. Khullar et al. (2017) also confirm a significant increase in pain, fatigue, sleep deterioration, and decline in physical function after lung resection, with improvement in these areas moving towards baseline values over 6 months.

Our study also found a significant deterioration in the overall level of disability three months after surgery. This was driven particularly by the deterioration in the Mobility (moving and getting around), Participation, and Life activities (domestic responsibilities, leisure, work, and school) domains. Similarly to us, Blakely et al. (2021) found deterioration in activities of daily living, which are directly related to both mobility and life activities of the patient. Their study also revealed a deterioration in the physical quality of life. These inferior results were observed 12 months after the surgery, which is in direct contradiction to the claims of Win et al. (2005) and Szeliga et al. (2019) who indicate quality of life returns to baseline values as early as 6 months after lung resection for cancer. These contradictions suggest the need for a long-term study monitoring these indicators in a sufficiently large cohort that could help to reveal the overall progress in the quality of life/health and disability after lung resection.

Interestingly, according to the SF-12v2, a statistically significant improvement of the quality of life in the domains Role-physical and Social functioning was observed three months after the surgery. On the other hand, the WHODAS questionnaire showed a significant deterioration in the domains of Life activities (domestic responsibilities, leisure, work, and school) and Participation (joining in community activities, participating in society) three months after the resection. In our opinion, these seemingly contradictory results can be explained by the number of items in each questionnaire. The WHODAS instrument contains 8 questions in the Life activities domain and also in the Participation domain.. From our point of view, it, therefore, captures these domains more comprehensively compared to the SF-12v2, which contains only two questions for the Role-physical domain and only one question for the Social functioning domain.

Avery et al. (2020) analyzed the quality of life one month to one year after lung resection. One month after the surgery, deterioration was found in the overall health, role-performance, social functioning, and, in particular, physical health. Symptoms such as worsening of fatigue, pain, shortness of breath, *etc.*, also appear. Symptoms such as fatigue and breathlessness, along with the impaired quality of life in physical health and in the ability to perform roles and social functions, persisted up to one year after surgery.

According to Marzorati et al. (2020), age is one of the predictors of the change in the quality of life in patients undergoing lung resection. Our study did not find any association between age and the change in the quality of life after the surgery. We did, however, detect a statistically significant association between disability in the domain of Self-care and age, where the deterioration in disability after surgery was significantly more pronounced in individuals <65 years of age. This might be caused by the fact that younger individuals, who are assumed to have only low or no disability before the surgery, are more susceptible to the deterioration in the Self-care domain caused by the surgery than elderly patients whose level of disability in that domain is generally higher due to age-related changes that are present even before the lung resection. This is why the potential post-surgery increase in this domain can be perceived less dramatically in the older age group than in the younger one. However, in our study the change in the overall health and disability was not associated with age. This is consistent with findings by Presley et al. (2021). The overall disability scores in their study did not change significantly with age or sex: it must, however, be noted that their patient group consisted solely of patients with tumors, while our study included patients both with and without tumors. Presley et al. (2021) also found that higher disability in patients with advanced lung cancer was associated with a more common occurrence of symptoms of anxiety and depression.

Our study also found a higher deterioration in the Social functioning domain after surgery in women than in men. This is in line with the findings of the study by Zirafa et al. (2023), where women generally reported a lower quality of life in the mental dimension, both 15 days and three months after the lung resection. Sováriová Soosová (2016) emphasizes that creating opportunities for maintaining and building social contacts in the hospital setting is extremely important, especially for the elderly population.

Exercise interventions count among the methods that have a possible positive impact on the quality of life, health, and disability. These interventions are generally recommended in patients with lung cancer (Ma et al., 2020). The importance of exercise training during postoperative care has also been highlighted in a systematic review and meta-analysis from the Cochrane Library. According to that meta-analysis, exercising after lung resection improves both the patient's physical quality of life and his/her exercise capacity. In addition, it also reduces the patient's dyspnea (Cavalheri et al., 2019). From the perspective of nursing practice, it is therefore essential to include patient education about these facts in patient care, and to collaborate within a multidisciplinary team with physiotherapists who can recommend individualized exercise with respect to the patient's condition and fitness.

A rehabilitation program combining group exercises and individual consultations was shown to have positive effects on emotional comfort and mental health (Sommer et al., 2018). Li et al. (2013) reported that systematic rehabilitation programs including the control of breath, respiratory exercises, exercises of the upper and lower limbs, mobilization, and supplementary physiotherapy are beneficial to patients undergoing lung resection due to a tumor – and not only from the perspective of improving the quality of life in these patients (including improvement in pain and of respiratory symptoms). According to Fiorelli et al. (2020), chronic post-operative pain in the thoracic region, which negatively influences all domains of the quality of life, can be found in up to 35% of patients. Therefore, it is extremely important to also focus on pain management within the scope of postoperative care – not only using pharmacotherapy but also education, cognitive-behavioral therapy, biofeedback, progressive relaxation, exercise, electrotherapy, or even acupuncture, and others (SIGN, 2019).

The presented study comes with limitations, such as a relatively small patient group, single-center design, absence of patients with benign tumors in the study groups, and imbalanced distribution of patients from the perspective of age and education. Despite these limitations, this study brings new findings on the impacts of lung resection on the patients' quality of life, and brings attention to domains that need to be particularly emphasized in post-operative care. It would be highly desirable to study the quality of life, health, and disability of these patients over a longer period (at least after 6 and twelve months). Future research should also focus on interventions that can improve these domains.

Conclusion

Three months after lung resection due to tumor- or non-tumor diseases, we observed deterioration in the quality of life in the domains of Physical functioning and Bodily pain compared to the pre-surgery condition. In addition, the level of disability also increased, especially in the domains of Mobility, Life activities, and Participation. Post-surgery care for these patients should, therefore, pay special attention to improving physical functioning and pain reduction, which could also positively affect the return of the patient to social and professional life. Effective methods to improve physical functioning seem to be systematic rehabilitation programmes and, for pain reduction, exercise and educational interventions or cognitive-behavioral therapy.

Conflict of interest

The authors have no conflict of interest to declare.

Ethics approval

The study respected the principles of the Declaration of Helsinki. Patients' participation was voluntary and anonymous, with all included patients providing written informed consent. The study was approved by the Ethics Committee of the University Hospital Ostrava (reference number 232/2021) and by the Ethics Committee of the Faculty of Medicine, University of Ostrava (reference number 05/2021).

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Hodnocení kvality života a disability u pacientů podstupujících plicní resekci

Souhrn

Úvod: Plicní resekce může zapříčinit změny ve funkčním stavu a z toho důvodu také v kvalitě života pacientů, kteří ji podstupují. Aby bylo plánování péče o tyto pacienty efektivní, je potřeba identifikovat oblasti, které si vyžadují zvláštní pozornost.
Cíl: Cílem této prospektivní studie bylo porovnat kvalitu života a disabilitu před plicní resekcí a tři měsíce po ní.
Metodika: Kvalita života a disabilita byly hodnoceny pomocí standardizovaných nástrojů: Short Form-12 verze 2 a WHO Disability Assessment Schedule 2.
Výsledky: Výzkumný vzorek zahrnoval 44 pacientů indikovaných k plicní resekci. Průměrný věk v souboru byl 65,7 let (min. 37, max. 79), 56,8 % představovali muži. Tři měsíce po resekci bylo zjištěno zhoršení kvality života v doménách Fyzické zdraví ($p = 0{,}016$) a Bolest ($p = 0.044$). Došlo také k signifikantní změně celkové úrovně disability ($p < 0.001$). Signifikantní změny disability byly zjištěny také v doménách Mobilita ($p < 0.001$), Životní aktivity ($p < 0.001$) a Účast ve společnosti ($p = 0.037$).
Závěr: Tři měsíce po resekci plic bylo zjištěno statisticky významné zhoršení kvality života a disability ve více doménách. Fyzické zdraví, Bolest, Mobilita, Životní aktivity a Účast ve společnosti byly identifikovány jako oblasti, které při plánování pooperační péče o tyto pacienty vyžadují zvláštní pozornost.

Klíčová slova: disabilita; domény; hodnocení; kvalita života; plicní resekce

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