



Assessing patient perception and preferences for outcomes in lung cancer resection surgery: a cross-sectional study

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Background: Surgical resection is the primary treatment for early-stage lung cancer, but little is known about the outcomes that truly matter to patients. This aim of our study was to identify the aspects of postoperative outcomes that matter most to patients undergoing lung cancer surgery and explore the influence of clinical and demographic factors on their importance ratings.

Methods: We performed a cross-sectional study of patients undergoing lung resection for non-small cell lung cancer at our institution from November 2021 to May 2022. Patients were surveyed using a self-developed questionnaire and the European Organisation for Research and Treatment of Cancer core health-related quality of life questionnaire (EORTC QLQ-C30) prior to surgery. Ordinal logistic regression was performed to determine associations between individual patient factors and outcome importance ratings.

Results: Forty patients completed the survey during the study period. Patients prioritized oncologic outcomes, with 95% rating R0 resection and cancer recurrence as “very important”. Other important factors included overall survival (90%), postoperative complications (e.g., myocardial infarction: 92.5%, infection: 87.5%), and the need for reoperation (82.5%). Health-related quality of life factors, such as chronic pain (77.5%) and the ability to return to normal physical and exercise levels (75%), were also highly valued. Certain patient clinical and demographic factors demonstrated significant associations with importance placed on certain outcomes. Preoperative health-related quality of life scores did not influence outcome importance ratings.

Conclusions: This study provides insights into the outcomes that matter most to patients undergoing lung cancer surgery. Oncologic outcomes and postoperative complications were prioritized, while scar-related factors were less important. Patient preferences varied based on demographic and clinical factors. Understanding these preferences can enhance shared decision-making and improve patient-centered care in thoracic surgical oncology.

Keywords: Lung cancer surgery; patient perception; outcome preferences; health-related quality of life; shared decision-making

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Introduction

Surgical resection continues to be the primary mode of treatment for early-stage lung cancer and remains a vital component of the multimodality treatment for locally advanced disease (1). The traditional perceptions of thoracic oncology community for value of treatment (including lung cancer surgery) are usually based on survival and quality of life benefits balanced against risks of mortality and morbidity.

While numerous studies have utilized a range of patient-reported outcome measures, including the EORTC-QLQ-C30, MD Anderson Symptom Inventory, Short Form-36, and other condition-specific questionnaires (2), to evaluate the impact of lung cancer resection on health-related quality of life, a critical knowledge gap remains regarding the outcomes that truly matter to patients. To quantify patient health-related quality of life outcomes in routine clinical setting. Despite these efforts to assess various aspects of postoperative recovery and care, the essential question of what outcomes hold genuine significance for patients remains largely unexplored, an important question as choice of treatment is strongly based on personal values and preferences (3). As a result, it is crucial to delve deeper into patient's perspective, particularly in the context of patient-centered care and shared decision making, to gain a comprehensive understanding of their values

and preferences regarding the outcomes of surgery (4). By bridging this gap in knowledge, surgeons can provide more informed guidance, tailor treatment approaches, and ultimately deliver efficient patient-centered care that aligns with individual needs and goals (5).

The aim of this study is to better understand what aspects of postoperative recovery, care and outcomes mattered most to patients undergoing lung cancer surgery, and to explore how baseline clinical, demographic factors and patient's preoperative health-related quality of life may influence how groups of individuals place their importance on different post-operative outcomes measures. We present this article in accordance with the STROBE reporting checklist (available at <https://jtd.amegroups.com/article/view/10.21037/jtd-23-1800/rc>).

Methods

We surveyed patients diagnosed with non-small cell lung cancer and undergoing (any form of) lung cancer surgery at the Royal Brompton Hospital between November 2021 and May 2022. We included patients across all disease stages as this will enable us to understand how patients at different stages prioritize certain outcomes. We excluded patients undergoing urgent or emergency surgery, those who were unable to give informed consent or without pre-operative tissue confirmed diagnosis of lung cancer. All patients had previously been assessed and consulted by a consultant thoracic surgeon or senior thoracic surgical trainee in the preoperative clinic.

Quality of life assessment

Pre-operative quality of life assessment was undertaken using European Organisation for Research and Treatment of Cancer core health-related quality of life questionnaire (QLQ-C30), an internationally recognised cancer-specific health-related quality of life questionnaire that is composed of 30 questions (6) in five multi-item scales (physical, role, cognitive, emotional and social), three multi-item symptom scales (fatigue, pain, nausea and vomiting), five single-item symptom scales (dyspnoea, insomnia, appetite loss, constipation, diarrhoea), a two-item global quality of life scale, and a final single item assessing economic impact of the disease. The reliability of the EORTC QLQ-C30 has been evaluated extensively in multiple international studies

Highlight box

Key findings

- Oncologic outcomes and postoperative complications were the most highly prioritized outcomes rated by patients.
- Certain patient clinical and demographic factors demonstrated significant associations with importance placed on certain outcomes.

What is known and what is new?

- Surgical resection is the primary treatment for early-stage lung cancer, but little is known about the outcomes that truly matter to patients.
- This study provides insights into the outcomes that matter most to patients undergoing lung cancer surgery and potential factors that may influence their preference and perception of outcomes.

What is the implication, and what should change now?

- Understanding patient preferences can enhance shared decision-making and improve patient-centered care in thoracic surgical oncology.

in the context of lung cancer resection surgery (7).

Self-developed questionnaire

In order to develop such a questionnaire, we conducted a literature review about the common outcomes and complications after lung cancer surgery and engaged in academic discussions within the thoracic surgical team at the Royal Brompton Hospital. Additionally, consent forms were carefully reviewed to understand the typical risk of surgery and associated complications quoted by surgeons in the decision-making process. This enabled us to identify and prioritize outcomes that are both commonly encountered in our clinical practice and also discussed during the thoracic surgical consenting process. The main lung cancer surgery related outcomes included were overall survival, surgical scar size, number of surgical scars, postoperative pain, shortness of breath, degree of resection, cancer completely resected (R0 resection), need for postoperative intensive care admission, atelectasis, infection, myocardial infarction, cardiac arrhythmia, chronic pain, chest drain removal, hospital length of stay, ability to return to normal physical level, time needed to return to work, the need for hospital readmission, the need for reoperation, cancer recurrence, and the prospects of same-day discharge. Simple terms were used in the questionnaire to ensure patients could understand the aforementioned outcomes (Appendix 1). An additional open-ended question was added to assess patient perception of the maximum surgical mortality rate that they are willing to accept.

The self-developed questionnaire was modified into 23 questions. Most questions employed a 5-point Likert scale to measure patient preferences for specific outcomes of lung cancer resection surgery. A Likert scale is a psychometric scale which enables respondents to express their level of agreement to a statement, which in this case, 1 was “Not Important” to 5, which was “Very Important”. The wording of the Likert scale was created to ensure that patients were not able to answer a “neutral” response, so that neutrality would not be applicable in the context of the questionnaire. The aim of this scale was to assess the importance that patients placed on individual outcomes, postoperative complications and aspects of patients’ postoperative recovery that are common to lung cancer resection.

A five-patient pilot study was conducted to evaluate the feasibility and to improve the questionnaire. One problem that was raised was that some patients were not able to quantify the maximum mortality risk that they were willing

to accept for surgery in the open-ended question, and hence an extra option of “I don’t know” was added into the question. The questionnaire was conducted during the same timeframe as the EORTC QLQ-C30. Patients were interviewed preoperatively in the wards with a single interviewer. There were also opportunities for interaction and discussion during the course of the interview.

We documented clinical factors including body mass index (BMI), cancer stage, type of planned surgery, preoperative lung function [forced expiratory volume in 1 second (FEV1) & diffusion capacity for carbon monoxide (DLCO)], and coexisting respiratory conditions, alongside demographic factors such as age, sex, and smoking status, as per protocol. All materials including the study protocol and questionnaire underwent extensive peer-review by the thoracic surgical team. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). This study was approved as a service evaluation by the Clinical Audit and Effectiveness Department of the Royal Brompton Hospital under the project code 4947 and informed consent was obtained from all individual participants.

Statistical analysis

Continuous data was presented as mean with standard deviation (SD) or median with interquartile range as appropriate to statistical distribution. Categorical data was presented as frequency and percentage (%). All scores of the EORTC QLQ-C30 were linearly transformed according to the scoring manual so that all scores ranged from a scale of 0 to 100. For the global health and functioning scores, a higher score represents a higher level of functioning. For the symptom scales, higher scores represent a greater degree of symptoms. To determine whether patients’ clinical factors, demographic factors, and health-related quality of life scores influenced which factors were more important to patients, ordinal logistical regression analysis was performed, whereby a P value of less than 0.05 was used to indicate statistical significance. Brant-Wald test was conducted to test for proportional odds assumption. A P value of less than 0.05 would indicate a rejection of the null hypothesis of the proportional odds assumption. Statistical analysis was performed using statistical software R 4.2.0.

Results

A total of 40 patients completed the questionnaire in this

Table 1 Demographic and clinical data of the study population

Patient characteristic	Data, n=40
Age, years	68 [10]
Sex	
Male	22 (55.0)
Female	18 (45.0)
Smoking	
Never smoker	7 (17.5)
Previous smoker	23 (57.5)
Current smoker	10 (25.0)
Coexisting respiratory conditions	12 (30.0)
Surgical approach	
Video-assisted thoracoscopic surgery	28 (70.0)
Thoracotomy	12 (30.0)
Extent of resection	
Lobectomy	33 (82.5)
Sublobar resection	7 (17.5)
Clinical stage	
Stage I	32 (80.0)
Stage II	5 (12.5.0)
Stage III	1 (2.5.0)
Stage IV	2 (5.0)
Lung function	
FEV1	88.0 (22.2)
DLCO	76.0 (21.3)
BMI, kg/m ²	26.9 [4.8]

Data are presented as mean [SD] or n (%). FEV1, forced expiratory volume in 1 second; DLCO, diffusion capacity for carbon monoxide; BMI, body mass index; SD, standard deviation.

study. The mean (SD) patient age was 68 (10). Of the 40 respondents, 45% were male (n=18), 55% were female (n=22). The smoking frequency of patients was distributed as follows, 17.5% never smoker (n=7), 57.5% ex-smoker (n=23), 25% current smoker (n=10). In terms of the intended extent of the lung cancer resection, it consisted of 33 (82.5%) in the lobectomy group and 7 (17.5%) in the sublobar resection group. For the intended surgical approach, there were 28 (70%) in the VATS group and 12 (30%) in the thoracotomy group. The distribution of clinical cancer staging was as follows: 32 (80%) stage

Table 2 EORTC QLQ-C30 scores of the study population

Global Health Status/QOL	Data, mean (SD)
Functional scales	74 (23)
Physical functioning	90.3 (16.5)
Role functioning	93.3 (15.9)
Emotional functioning	75.0 (23.1)
Cognitive functioning	85.8 (21.2)
Social functioning	86.7 (24.8)
Symptom scales	
Fatigue	17.5 (25.4)
Nausea and vomiting	2.9 (9.2)
Pain	15.8 (28.5)
Dyspnoea	24.2 (30.2)
Insomnia	22.5 (29.6)
Appetite loss	5.0 (14.2)
Constipation	6.7 (15.5)
Diarrhoea	3.3 (16.5)
Financial difficulties	3.3 (16.5)

EORTC QLQ-C30, EORTC core quality of life questionnaire (QLQ-C30); QOL, quality of life; SD, standard deviation.

I, 5 (12.5%), stage II, 1 (2.5%) stage III, 2 (5%) stage IV. Twelve patients (30%) had coexisting or previous respiratory conditions. This is summarised below in *Table 1*. All patients successfully completed the questionnaires. All questionnaires were well understood, including the 23 self-developed items. Mean scores and standard deviations of the EORTC QLQ-C30 scales are shown in *Table 2*.

Table 3 demonstrates what patients perceived as important factors of the surgical procedure and postoperative recovery process. Oncologic outcomes such as R0 resection and cancer recurrence were the factors that were most important to patients when considering undergoing surgery for lung cancer, with 38 out of 40 (95%) patients rating the two aforementioned factors as “very important”. Other factors that were commonly considered as “very important” by patients included overall survival (36, 90%), postoperative complications such as myocardial infarction (37, 92.5%) and infection (35, 87.5%), the need for reoperation (33, 82.5%) and the prospects of hospital readmission (30, 75%). Some factors concerning postoperative health-related quality of life were also commonly rated as “very important” by patients, such as “Chronic Pain” (31, 77.5%) and “the ability

Table 3 Patient rating of importance for outcomes for lung cancer resection surgery

Outcome	Not important	Slightly important	Moderately important	Important	Very important
Overall survival	0	0	1	3	36
Postoperative pain	0	4	3	9	24
Shortness of breath	0	0	9	11	20
Extent of resection	3	4	10	14	9
Scar size	24	5	5	5	1
Scar number	26	5	6	3	0
R0 resection	0	0	0	2	38
ICU admission	4	0	8	15	13
Atelectasis	0	4	3	8	25
Infection	0	0	0	5	35
Myocardial infarction	0	0	0	3	37
Arrhythmia	0	4	7	16	13
Chronic pain	0	1	1	7	31
Chest drain removal	6	10	16	2	6
Length of hospital stay	11	5	11	6	7
Normal physical level	0	1	0	9	30
Short time return to work	10	5	13	7	5
Readmission	0	3	2	5	30
Reoperation	0	1	3	3	33
Cancer recurrence	0	0	0	2	38
Day-case surgery	32	4	4	0	0

ICU, intensive care unit.

to return to normal physical and exercise level” (30, 75%). Factors that were less commonly rated as “very important” included a short time needed to return to work (5, 12.5%), duration of chest drain inserted before removal (6, 15%), and length of hospital stay (7, 17.5%). The prospects of “day-case surgery” was the least important factor with 32 out of 40 (80%) patients rating it as “not important”. Other factors that were commonly rated as “not important” were scar number (26, 65%) and scar size (24, 60%).

In terms of the question regarding the maximum risk of death that patients were willing to accept, patients were willing to accept a median of 5% (2–10%) as compared to the median risk of death quoted by the surgeon 2% (1–2%). 13 patients (32.5%) were not able to quantify a maximum risk of death they are willing to accept and hence answered “I don’t know” for the question. Statistically significant

results from the ordinal logistic regression are summarised in *Table 4*. Brant-Wald test was used to test the models for the proportional odds assumption. Patients’ quality of life score on the EORTC-QLQ-C30 scales did not have any significant association with whether they were more likely to rank an outcome or factor as more important. In terms of scar size and number, patient sex was a significant factor. Male patients were less likely to rate the scar size (OR =0.12, P=0.005) and number of scars (OR =0.10, P=0.008) as important. Male patients were also less likely to rate the need for ICU admission (OR =0.29, P=0.04), postoperative atelectasis (OR =0.24, P=0.03), the ability to return to normal physical and exercise level (OR =0.12, P=0.02) and the need for readmission (OR =0.11, p=0.01) as important factors to consider before undergoing lung cancer resection. Certain clinical characteristics such as lung function, clinical

Table 4 Significant variables determined by ordinal logistic regression and Brant-Wald test

Outcome	Significant variables	Odds ratio	P value
Scar size	Male	0.12	<0.01
Scar number	Male	0.10	<0.01
ICU admission	Male	0.29	0.04
	Lung function (FEV1)	0.97	0.04
Atelectasis	Male	0.24	0.03
Length of stay	Lung function (FEV1)	0.97	0.03
Return to normal physical and exercise level	Male	0.12	0.02
Short time needed to return to work	Clinical stage	0.33	0.03
Readmission	Male	0.11	0.01
Reoperation	Clinical stage	0.38	0.02
	Extent of resection	0.0000000760	<0.01
Day-case surgery	Coexisting respiratory condition	0.0000000795	<0.01

ICU, intensive care unit; FEV1, forced expiratory volume in 1 second.

stage, coexisting respiratory disease and intended extent of resection demonstrated significant association with certain outcomes. Patients with better lung function (FEV1) were less likely to rate the need for ICU admission (OR =0.97, P=0.04) and also the hospital length of stay (OR =0.97, P=0.03) as important. Patients with a more severe clinical stage of cancer were also less likely to rate the ability to return to work in a short time (OR =0.33, P=0.03) and the need for reoperation (OR =0.38, P=0.02) as important. Patients undergoing lobectomy as compared to sublobar resection were less likely to rate the need for reoperation as important (OR =7.60e-08, P<0.001). Lastly, patients with coexisting respiratory conditions were also less likely to rate the prospects of day-case surgery as important (OR =7.95e-09, P<0.001).

Discussion

Establishing patient preferences is crucial to improving patient satisfaction and quality of surgical care in the management of thoracic malignancies. Our study has demonstrated that oncologic outcomes, overall survival, the ability to return to normal physical and exercise level and also postoperative complications such as myocardial infarction and infection are considered by patients as the most important factors for undergoing elective lung resection for non-small cell lung cancer.

Other important factors included chronic pain, the need for readmission and also the possibility of reoperation. The least important factors rated by patients were the prospects of day-case surgery and scar cosmesis. These findings are consistent with some reported studies concerning other surgical specialties. Mak *et al.* reported that patients with gallstone disease undergoing elective laparoscopic cholecystectomy valued long-term quality of life the most, and rated scar cosmesis and the prospects of same day discharge to be the least important (3). While Winterborn *et al.* reported that the risk of death, postoperative complications and organ failure were outcomes that were most commonly rated as important to patients with abdominal aortic aneurysms undergoing open or endovascular surgical repair. Similarly, the length and location of incision was also most commonly judged as not important at all (8).

In terms of the maximum surgical mortality that patients were willing to accept, patients were willing to accept a much higher median mortality of 5% as compared to the 2% quoted by surgeons. Some patients who completed the questionnaire were able to quote a risk of death as high as 20% for the maximum mortality rate that they are willing to accept. This is unsurprising, as Dowie *et al.* demonstrated from a decision analysis model on a group of high-risk patients with stage Ia non-small cell lung cancer undergoing lung resection, that when patients were taking into account

the risk of death along with the potential for a definitive cure by either surgery or radiotherapy, patients may be willing to accept a threshold risk of surgical mortality that is much higher than the British Thoracic Society guideline surgical mortality threshold figures (9). This result was also similar to a qualitative interview study by Powell *et al.*, where patients were willing to accept high levels of perioperative mortality risk as there was an underlying desire to “get rid” of the cancer. Many patients also justified their willingness to accept high levels of mortality risk as they have the underlying perception that surgery was not a treatment to be rejected due to limited alternatives (10). This indicates that therapeutic decisions by patients with lung cancer involves a complex mix of trade-offs between the various potential outcomes that are associated with surgery.

In this study, particular attention has been paid to how different patient demographics would influence patient preferences for certain outcomes. An intriguing revelation was that patients’ preoperative quality of life as demonstrated by the various scales of the EORTC QLQ-C30 did not have an impact on what patients perceived as important. Patient sex appears to be a significant variable for various factors, mainly concerning postoperative recovery and possible complications. For outcomes regarding scar cosmesis, the odds of male patients rating scar size and number of scars as important was 88% and 90% lower than female patients respectively. This was similar to Mak *et al.*, which demonstrated that females were more likely to perceive scar cosmesis as important (3). It was also interesting to see that for inpatients with more advanced disease, the odds of rating the need for reoperation as more important was 63% lower than early stage patients. This reinforces the need to tailor information to patients when consenting towards surgery, and also to identify what patients of different demographics and clinical severity want from their surgery.

The importance of oncologic outcomes

One key finding that is highlighted from this study is that more patients rated oncologic outcomes such as R0 resection and cancer recurrence as important than overall survival. This ultimately begs the question on whether disease-free survival should be the gold standard measurement alongside overall survival in randomised controlled trials concerning lung cancer. Major clinical trials concerning both neoadjuvant and adjuvant therapies for

resectable non-small cell lung cancer such as IMpower10, ADAURA, CheckMate816 and KEYNOTE-091 have now adopted disease-free survival as primary endpoints (11-14). Given that an increasing number of clinical trials in thoracic surgery and oncology are using disease-free survival as the primary outcome, disease-free survival should be considered as co-primary outcomes with overall survival in future studies in order for clinicians to answer important clinical questions and to also address patients’ needs. At the same time, more work into the economic modelling of treating recurrent disease has to be done by healthcare providers to reduce the burden of cancer recurrence for patients.

Extent of resection

Another implication of the findings from our study is on the recent landmark thoracic surgical trial JCOG0802. Saji *et al.* argued for segmentectomy to be the new standard of care for patients with small-sized peripheral non-small cell lung cancer, as the segmentectomy arm demonstrated a superiority and non-inferiority in overall survival. However, it was also recorded that the segmentectomy arm did not demonstrate a clinically significant reduction in lung function loss despite of its lung parenchymal sparing nature. At the same time, the study also demonstrated nearly double local recurrence rates and double the odds of developing pulmonary complications (15). As shown from our study, patients showed stronger preference for oncologic outcomes and postoperative complications as compared to the extent of resection and postoperative loss of lung function. This would ultimately affect patient choice during their consideration and decision-making prior to undergoing lung cancer resection surgery. While segmentectomy offers potential benefits in overall survival, its lower oncologic and clinical safety compared to lobectomy raises questions not only about surgeon adoption but also about patient perception and acceptance. Future decision-making analyses, such as conjoint analysis, are needed to understand the preferences of this patient population and inform treatment decisions between lobectomy and segmentectomy, considering both benefits and pitfalls.

Enhanced recovery after surgery (ERAS)

ERAS pathways are being utilised increasingly by surgeons in general. Protocolised and evidence-based guidelines for perioperative care have been demonstrated to reduce the risk for postoperative complications and hospital length

of stay while at the same time not compromising patient safety (16). While our study demonstrated that patients did not rate hospital length of stay as important, it is important to note that patient preference for outcomes such as no postoperative complications was high. Hence, healthcare providers should continue implementing and developing effective ERAS programmes for patients undergoing lung cancer resection to reduce both the risk of mortality and postoperative complications from surgery. Successful implementation of enhanced recovery programmes can ultimately enable better patient satisfaction and postoperative quality of life, while at the same time optimising hospitalization cost and resource allocation for healthcare providers.

Limitations

We acknowledge that there are several limitations to our study. Firstly, our findings were limited by the small sample size recruited, and hence a large-sized study may be warranted to produce greater statistical power to determine any possible associations between clinical, demographic factors and health-related quality of life with patient perceptions of outcome importance. Secondly, we examined patient preferences in the preoperative period. It is unclear whether patient preferences would differ when they have experienced the outcomes of their decision making and hence it is imperative for the questionnaire to be addressed in a follow-up study employing a postoperative cohort. Furthermore, we only examined explicit patient preferences rather than the implicit subconscious preferences. While there is no gold standard method for measuring patient preferences, there is a possibility of differences between explicit (conscious) and implicit (subconscious) preferences. There was evidence of some forms of discordance between patients' choices as Thrumurthy *et al.* demonstrated that patients' explicit and implicit preferences differed for most of the outcomes of interest in the surgical management of esophagogastric cancer, using a combination of a discrete choice experiment and a rating scale (4). Another limitation of the design of rating scales is that we were unable to quantify the relative strength of the preference for a particular outcome, and also how much patients were willing to trade off for certain outcomes of interest. However, Kaplan *et al.* demonstrated the rating scale scored highest in terms of internal validity as compared to other more complex decision analysis techniques such as conjoint analysis and time trade-off method a study

involving treatment for prostate cancer (17). Nonetheless, future research studies should employ the aforementioned techniques in conjunction with rating scales to elicit key differences between patients' perceived and true preferences. Lastly, the patients were recruited from a majority western population, it is unclear as to whether the results will be generalizable for other populations of different racial and ethnic origins due to underlying differences in cultural values and perceptions regarding cancer and surgical treatments.

Conclusions

Our study highlights the various priorities patients place on different outcomes in lung cancer resection surgery, and that patients with different demographics would prioritise outcomes differently during their consideration for surgery. During the surgical decision-making process, surgeons must accept the weight of the patients' individual decision. At the same time, they must be aware of the differences in outcome preferences and perceptions between themselves and the patients. Our study also highlights the crucial elements of different priorities among patients during the healthcare delivery process and the importance of aligning these elements to deliver patient-centred care.

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Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). This study was approved as a service evaluation by the Clinical Audit and Effectiveness Department of the Royal Brompton Hospital under the project code 4947 and informed consent was obtained from all individual participants.

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