

Patient Satisfaction With Letter-Based Communication of LCS Pulmonary Nodule Results

Daoyue Wang, MD; Rui Shi, MD; Lili Hu, MD; Ran Chen, MD; Jun Sun, BS; Wei Huang, BS; Hongyang Zhou, BS; and Feng Rong, MD

Lung cancer is a disease with a high mortality rate that can be reduced by early detection with lung cancer screening (LCS) using low-dose CT (LDCT).¹ Encouraging outcomes from the National Lung Screening Trial and NELSON studies have led to LDCT becoming the gold-standard method for LCS in Europe and the US, and it has gained popularity in China in recent years.²⁻⁵ As rates of LCS have increased, so, too, have rates of false-positive results, especially in the detection of pulmonary nodules. Studies also show that millions of patients experience pulmonary nodules each year,⁶ and stress, anxiousness, and distress are commonly reported symptoms after receiving this diagnosis.^{7,8}

With the help of LCS implementation, the detection rate of pulmonary nodules has increased from 8% to 51%.^{9,10} Although there is ongoing research about patient education as part of joint decision-making before they undergo LCS, there is comparatively little published to inform best practice methods of follow-up communication to inform patients about their LCS results.¹¹ A pilot trial of a letter-based communication tool found that it helped to relieve anxiety and distress, having subsequent impact on patient perception and expectation of diagnosis and treatment strategies.^{8,12} The methods to convey the screening results may vary across health care settings, mainly including face-to-face consultation, telephone calls, letters, text messages (SMS), and emails.¹³⁻¹⁶ A systematic review of breast cancer and cervical cancer screening in the US showed that letter-based communication of results could reduce anxiety; however, as economical and efficient as it might be, it was at the expense of patient comprehension and satisfaction.^{17,18} Dickson et al previously reported that written communication methods for results were satisfactory for the majority of patients with pulmonary nodules detected on LDCT in the United Kingdom.¹⁹ However, a certain proportion of patients reported that due to the lack of opportunities to raise questions, receiving results by letters left them confused and concerned, thus contributing to their preference of LCS follow-up by phone calls instead.²⁰ There is a lack of evidence to indicate the influence of communication methods on the satisfaction of patients with pulmonary nodules in China. Our study was to assess patient satisfaction with letter-based communication of

ABSTRACT

OBJECTIVE: To analyze patient satisfaction with letter-based communication of lung cancer screening (LCS) pulmonary nodule results.

STUDY DESIGN: Prospective randomized controlled trial of LCS between May and December 2019.

METHODS: All participants came from a prospective randomized controlled study on pulmonary nodule results in LCS with low-dose CT (LDCT) to analyze patient satisfaction, perception of information received via letters, preferred methods of receiving results, and dissatisfaction-related characteristics.

RESULTS: A total of 153 patients were detected to have pulmonary nodules among 600 recruited participants in the lung cancer high-risk group screened using LDCT. Most of the patients were satisfied with receiving pulmonary nodule results via letters (78.4%; n = 120) and agreed that the letters contained an appropriate amount of information (83.7%; n = 128). Univariate logistic regression analysis revealed that satisfaction was related to age (OR, 0.905; 95% CI, 0.832-0.985), education level (OR, 0.367; 95% CI, 0.041-3.250), no family history of cancer (OR, 0.100; 95% CI, 0.011-0.914), and the number of nodules (OR, 6.028; 95% CI, 1.641-22.141). Of the patients who reported dissatisfaction with letter-based communication (7.2%; n = 11), the most common reasons cited were that they contained insufficient patient education materials and that it was difficult to comprehend the medical terminology. The majority of participants (61.4%; n = 94) reported that they would prefer the letter-based communication. No correlation was identified between satisfaction and gender, smoking status, alcohol consumption, risk factors, nodule size, or nodule location.

CONCLUSIONS: Patients were generally satisfied with receiving their LCS pulmonary nodule results via letters, reporting that the letters included adequate information about their diagnosis and follow-up steps. This may provide a basis for feasible result communication via letters for cancer screening programs in underdeveloped regions in China.

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pulmonary nodule results of LCS and investigate factors contributing to patient dissatisfaction, testing a feasible approach for large-scale LCS result communication.

MATERIALS AND METHODS

Participants and Study Design

We conducted a prospective randomized controlled trial of LDCT-based LCS between May and December 2019,⁵ in which patients with pulmonary nodules who met the inclusion criteria for receiving letter-based communication of results were recruited in this study (eAppendix Figure [eAppendix available at ajmc.com]). The inclusion criteria were as follows: The screening result of LDCT indicated a pulmonary nodule (the imaging manifestations were isolated or multiple diameters ≤ 3 cm around the lungs, with increased focal, round-like solid, or subsolid density), the patients were enrolled within 3 months of receiving the LDCT screening results via letters, and all patients were adults who spoke Chinese or an Anhui dialect. The exclusion criteria were as follows: Patients had other tumor diseases or had a mental illness or cognitive impairment. Based on the LCS guidelines in China, the eligible LCS population includes patients aged 50 to 75 years with at least 1 of the following high-risk factors: (1) a smoking history of at least 30 pack-years (current smoker or former smoker with ≤ 15 years since quitting), (2) a nonsmoker exposed to passive smoking at home (from a family member) or in the workplace (from a colleague) for more than 20 years, and (3) a nonsmoker with a family history of lung cancer.²¹ The Medical Ethics Committee of Lu'an Hospital of Anhui Medical University approved this study, which was registered in the Chinese Clinical Trial Registry (ChiCTR1900023197) with informed consent obtained prior to study participation.

Disclosing a Pulmonary Nodule Result

Following the completion of LDCT and film reading of the results, the detected pulmonary nodules were managed according to guidelines²² and mutually discussed by imaging experts and clinical experts (2 radiologists with more than 10 years of experience, 2 medical oncologists, and 1 thoracic oncologist). The screening results were enclosed in a follow-up form (including whether there was any abnormality, specific abnormality, follow-up information, contact information, etc) (eAppendix Table 1), which was placed in an envelope together with the CT report, and the patients were notified by SMS/telephone that they would receive the letters at the designated time and place. Noncalcified nodules with a diameter greater than 4 mm were regarded as positive results. In addition to pulmonary nodules, abnormalities suggestive of clinically significant conditions and minor abnormalities were documented. Screening results were communicated to the participants within 4 weeks. The patients were expected to contact their doctors via phone calls or in person if any question arose.

TAKEAWAY POINTS

There is no evidence about the influence of communication methods on the satisfaction of patients with pulmonary nodules in China. In this study, we analyzed patient satisfaction with letter-based communication of pulmonary nodule results of lung cancer screening and investigated the characteristics related to dissatisfaction to provide a feasible approach for the communication of large-scale screening results in China in the future.

Satisfaction Results

Patients receiving LDCT were then surveyed by researchers via a face-to-face or telephone interview and their responses were captured using a previously verified Likert satisfaction scale.²³ The primary outcome of the research was to determine the proportion of patients who were satisfied with the communication of pulmonary nodule results via letters. The secondary objectives included assessing patients' perception of the amount of information and their preferred method of result communication. For the list of survey questions, please refer to eAppendix Table 2. If a patient could not complete the questionnaires independently (eg, due to frailty or illiteracy), the researcher would read and fill out the survey for them.

Data Analysis

We used SPSS 25.0 software (IBM) for data analysis. Measurement data that conformed to the normal distribution were expressed as mean (SD), whereas those that did not conform to the normal distribution were expressed as median (IQR). Descriptive data were presented using frequency and percentages. Multiclassification logistic regression analysis was used to analyze the relationship between satisfaction with letter communication and demographics/pulmonary nodules, and a *P* value of less than .05 was considered significant (2 sided).

RESULTS

Between May and December 2019, 900 participants were enrolled in the prospective randomized controlled trial, and 600 participants completed the LDCT scanning (eAppendix Figure). Among them, 153 participants were screened for pulmonary nodules and included in the analysis. The mean (SD) age of the participants was 58.8 (7.173) years, and 30% of participants were older than 65 years. Most participants were men (66.7%; *n* = 102), and the proportion of participants with an education level of primary school or below was 35.3% (*n* = 54), reflecting the low educational level of our sample. A large proportion (69.9%; *n* = 107) were current or former smokers, 3.3% (*n* = 5) had a family history of cancer, and 30.7% (*n* = 47) of participants were exposed daily to kitchen fumes (Table 1).

The pulmonary nodules were mostly single nodules (73.2%; *n* = 112), mainly located in the right lung (60.1%; *n* = 92), with a mean (SD) diameter of 6.55 (3.556) mm, and 24.2% (*n* = 37) were larger than 8 mm. Most nodules had clear edges (60.8%; *n* = 93) and were either

TABLE 1. Cohort Characteristics

Characteristic	Mean (SD) or n (%) (n = 153)
Age in years, mean (SD)	58.8 (7.173)
Gender, n (%)	
Male	102 (66.7)
Female	51 (33.3)
Marital status, n (%)	
Married	144 (94.1)
Divorced	6 (3.9)
Widowed	3 (2.0)
Education, n (%)	
Primary or less	54 (35.3)
Middle	88 (57.5)
College and above	11 (7.2)
Smoking index,* mean (SD)	45.55 (21.563)
25-29, n (%)	4 (2.6)
30-59, n (%)	124 (81.0)
≥ 60, n (%)	25 (16.3)
Smoking status, n (%)	
Smoker	107 (69.9)
Passive smoker	46 (30.1)
Drinking, n (%)	
Yes	80 (52.3)
No	73 (47.7)
Family history of cancer, n (%)	
Yes	5 (3.3)
No	101 (66.0)
Uncertain	47 (30.7)
Risk factors, n (%)	
Kitchen fumes	47 (30.7)
Occupational exposure	10 (6.5)
Others	3 (2.0)
None	93 (60.8)

*Smoking index is measured in pack-years.

TABLE 2. Nodule/Imaging Characteristics

Characteristic	Mean (SD) or n (%) (n = 153)
Number, n (%)	
1	112 (73.2)
≥ 2	41 (26.8)
Location, n (%)	
RUL	45 (29.4)
RML	17 (11.1)
RLL	30 (19.6)
LUL	22 (14.4)
LLL	5 (3.3)
Subpleural	21 (13.7)
Scattered lungs	13 (8.5)
Diameter in mm, mean (SD)	6.5549 (3.55557)
≤ 4.0, n (%)	26 (17.0)
4.1-4.9, n (%)	6 (3.9)
5.0-5.9, n (%)	39 (25.5)
6.0-7.9, n (%)	45 (29.4)
8.0-9.9, n (%)	22 (14.4)
≥ 10.0, n (%)	15 (9.8)
Border, n (%)	
Vague	55 (35.9)
Clear	93 (60.8)
Skin needling	5 (3.3)
Morph, n (%)	
Circular and oval	137 (89.5)
Irregular shape	16 (10.5)
Expression, n (%)	
SSN	103 (67.3)
pGGN	43 (28.1)
mGGN	5 (3.3)
Others	2 (1.3)

LLL, left lower lung; LUL, left upper lung; mGGN, mixed ground-glass nodule; pGGN, pure ground-glass nodule; RLL, right lower lung; RML, right middle lung; RUL, right upper lung; SSN, solitary solid nodule.

circular or oval (89.5%; n = 137). The most common CT appearance was solid nodules (67.3%; n = 103), followed by ground-glass nodules (31.4%; n = 48) (Table 2).

The results of the satisfaction survey are summarized in Table 3. Most participants (78.4%; n = 120) were content with receiving the results via letters, whereas 7.2% (n = 11) were dissatisfied. The main concerns were insufficient knowledge of pulmonary nodules and that the use of medical terminology in letters hindered their understanding of the results (eAppendix Table 3 and eAppendix Table 4). Some participants (3.3%; n = 5) reported no recollection of receiving the letters. The majority of patients (83.7%; n = 128) agreed that the letters contained the appropriate amount of information, stating that they would prefer letters from doctors (61.4%; n = 94); however, some expressed their wish to receive

phone calls from their doctors (28.1%; n = 43) or to consult hospital doctors (5.2%; n = 8).

The results of logistic regression indicated that patient satisfaction with letter communication was markedly associated with age, education, family history of cancer, and number of nodules (Table 4). Participants who were older (OR, 0.905; 95% CI, 0.832-0.985), who had an education level of primary school or below (OR, 0.367; 95% CI, 0.041-3.250), and who had no family history of cancer (OR, 0.100; 95% CI, 0.011-0.914) were less likely to be satisfied with receiving the pulmonary nodule results via letters. In contrast, patients with a single nodule (OR, 6.028; 95% CI, 1.641-22.141) expressed higher satisfaction with letter communication. No significant association was found between satisfaction and gender, smoking status, alcohol consumption, risk factors, nodule size, or nodule location.

TABLE 3. Participants' Reported Satisfaction, Perception of Information Being Reported by Letter, and Preferred Method of Contact for Pulmonary Nodule Results

Question	n (%)
How satisfied were you with receiving the results by letter?	
Satisfied	120 (78.4)
Neither satisfied nor dissatisfied	17 (11.1)
Dissatisfied	11 (7.2)
Can't remember	5 (3.3)
How do you feel about the amount of information in the results letter?	
Too much information	4 (2.6)
Just the right amount of information	128 (83.7)
Not enough information	14 (9.2)
Can't remember	7 (4.6)
If you could have chosen how to receive your results, which of the following methods would you have preferred?	
Letter from doctor	94 (61.4)
Telephone call from a doctor	43 (28.1)
Telephone call from a nurse	4 (2.6)
Appointment with a community doctor	4 (2.6)
Appointment with a hospital doctor	8 (5.2)

TABLE 4. Univariate Logistic Regression Analysis Assessing Demographic and Pulmonary Nodule Characteristics of Participants Who Were Satisfied With Result Notification by Letter

Characteristic	Satisfaction OR (95% CI)	P
Age (years)	0.905 (0.832-0.985)	.021
Male	2.492 (0.716-8.671)	.151
Married	1.556 (0.685-13.108)	.697
Primary school education or less	0.367 (0.041-3.250)	.028
Smoking index	1.002 (0.970-1.035)	.902
Smoker	1.944 (0.557-6.783)	.297
Drinking	5.098 (1.037-25.056)	.259
No family history of cancer	0.100 (0.011-0.914)	.041
Kitchen fumes	2.958 (0.509-17.184)	.227
Single nodule	6.028 (1.641-22.141)	.007
Right upper lung	5.250 (0.898-30.700)	.066
Nodule size (mm)	0.947 (0.796-1.127)	.541
Border vague	10.750 (0.560-206.439)	.115
Circular and oval	2.156 (0.214-21.730)	.515
Solitary solid nodule	6.156 (1.134-18.570)	.507

DISCUSSION

A prospective randomized controlled study was conducted on LCS using LDCT, and pulmonary nodules were detected in 153 (25.5%) of 600 patients. The results of the present study indicate there is a high level of patient satisfaction associated with receiving pulmonary nodule results via letter-based communication (78.4%). In addition, most participants agreed that the letter included an adequate amount of information (83.7%). Increased patient satisfaction with letter communication was associated with participants who had a family history of cancer. Decreased participant satisfaction was correlated with increased age, reduced education level, and increased number of nodules.

With the aging of the population, the communication preferences of older individuals are an underexplored but important topic. The current study found that decreased participant satisfaction with letters was associated with increased age. Aging can lead to declines in communication abilities and physical activities.²⁴ Older Chinese individuals seem to prefer face-to-face communication, in which body movements and verbal communication promote mutual understanding to a great extent.

Decreased participant satisfaction with letters was found to be associated with reduced education level. Education is known to play a crucial part in an individual's decision-making on health issues, and health education may greatly facilitate one's understanding of the association between health behaviors and outcomes.²⁵ Despite the remarkable progress of the education level of Chinese rural residents in recent years, it still lags behind the general Chinese population.²⁶

Interestingly, participants with a family history of cancer showed higher levels of satisfaction, which might be attributable to increased familiarity with the subject matter from previous family experience. It is generally known that joint decision-making before LCS is of particular importance.¹¹ Bhamani et al²⁷ showed that the use of information booklets to prepare participants for potential LCS results and follow-up was a helpful adjunct to the written method of result communication for large-scale LCS programs, and participants who remembered receiving the booklets tended to be more satisfied with the process of result communication by letters. Better strategies are needed to inform patients of the potential risks of pulmonary nodules. Thus, it is necessary to carry out pulmonary nodule educational efforts before screening, provide brochures in the letters, and elaborate on the risks of lung cancer.

Our survey demonstrated that the majority of patients (61.4%) would choose letters as the communication method, which was consistent with the findings of Dickson et al.¹⁹ British participants in that research were shown to be highly satisfied with the letter communication of pulmonary nodule results in LCS, suggesting that it was their preferred method. However, some participants (28.1%) reported dissatisfaction with letter-based LCS follow-up, preferring results by telephone, which offered them the opportunities for verbal interactions with doctors. These were primarily older patients and those with a low education level who had insufficient knowledge of pulmonary nodules. No correlation was found between satisfaction and gender, smoking status, alcohol consumption, risk factors, nodule location, or nodule size. There is still immense potential

to improve the effectiveness of result communication via letters. In the future, communication strategies for using letters can be enhanced by taking into consideration the patients' age, education level, nodule size, and number of nodules.

Limitations

The limitations of this study lie in the small sample size, the confined geographical region, and the recruitment of participants who were mostly less educated, thereby reducing the generalizability of the findings. Additionally, it lacked information about the influence of pulmonary nodules on the participants' psychological factors. The time of waiting for results and the participants' socioeconomic status were not taken into account either. The study also may be subject to recall bias, as the survey was conducted 3 months after patients received their LCS follow-up letters. Nevertheless, the application of reproducible study methods is evident in the present trial. The protocol devised in the present survey can serve as a reference for future research, and the follow-up letter and recruitment flowchart provided in the eAppendix can also be applied in the evaluation of study outcomes of larger sample sizes and diverse patient cohorts.

CONCLUSIONS

Our research findings indicate that participants are generally satisfied with the results of pulmonary nodule testing conveyed by letters and agree that the letters offer a sufficient amount of information, which may support the feasibility of transmitting cancer screening results via letters in underdeveloped regions of China. Hopefully, these findings have implications in the implementation of clinical training, the improvement of physician-patient relationships, and the optimization of patient care. To increase levels of patient satisfaction for better adherence and outcomes, further improvement in communication strategies should be addressed. ■

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Author Affiliations: Department of Oncology, Lu'an Hospital of Anhui Medical University (DW, RS, LH, RC, JS, WH, HZ, FR), Lu'an, Anhui, China; Department of Oncology, The First Affiliated Hospital of Anhui Medical University (DW), Hefei, Anhui, China.

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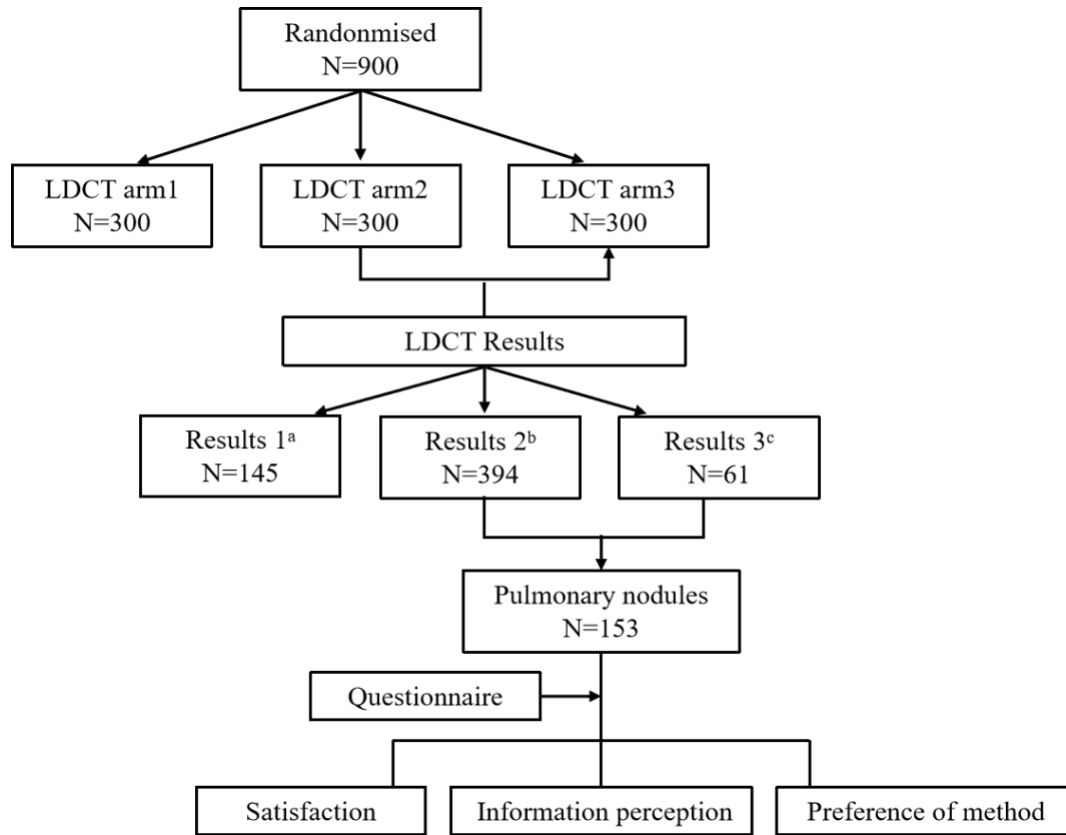
Address Correspondence to: Feng Rong, MD, Department of Oncology, Lu'an Hospital of Anhui Medical University, No.21 of Wanxi Avenue, Lu'an, 237005, Anhui, China. Email: wazhl1996@163.com.

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eAppendix Figure. Flowchart of the Participants



LDCT, low-dose CT.

^aNormal.

^bAbnormal, irrespective of tumor.

^cAbnormal, not excluding tumor.

eAppendix Table 1. The letter of disclosing result

Feasibility study of low-dose Spiral CT combined with inflammatory cytokines in Lung Cancer Screening

Dear ___ volunteers:

Thank you for participating in this screening study in your busy schedule.

We officially report to you the results of this screening:

1、 This is your number of LDCT checks:

Baseline One-year screening Two-year screening Positive follow-up

2、 The quality of this CT inspection:

Superior Good Bad

3、 Whether there is any abnormality in this inspection:

Yes, minor abnormalities, but not considering the tumor

Yes, we don't rule out tumors

No

4、 Specific abnormal situation:

Based on the results of this inspection, we recommend the following to you:

No need for diagnostic intervention Compare the historical image data

Recheck CT after 3 months Recheck CT after 6 months

Further inspection Reexamination after 1 year

Thank you again for your active participation, our project team will continue to pay attention to your health!

**Lung Cancer Early Screening Project Group of
Lu'an Hospital of Anhui
Medical University**

If you change your mobile phone number or consult about health problems in the future, please contact the project team at 0564-3634523; contact address: lung cancer screening office, 1st floor, Building 4, East Hospital, Lu'an People's Hospital (working hours from Monday to Friday).

eAppendix Table 2. Likert Satisfaction Scale

1. How satisfied with the results by letter?

- Satisfied
- Neither satisfied nor dissatisfied
- Dissatisfied
- Can't remember

2. How do you feel about the amount of information in the results letter?

- Too much information
- Just the right amount of information
- Not enough information
- Can't remember

3. If you could have chosen how to receive your results, which of the following methods

would you have preferred?

- Letter from doctor
- Telephone call from a doctor
- Telephone call from a nurse
- Appointment with the community doctor
- Appointment with a hospital doctor

eAppendix Table 3. Medical terminology in the CT Report

Medical terminology

Solitary solid nodule
Ground-glass density shadows
Miliary pulmonary nodules
Strip shadow
Proliferative foci
Foci of calcification
Thickening of lung texture
Lobulation

...

eAppendix Table 4. Participants' concerns regarding pulmonary nodule communication and possible solutions

Concern	Possible Solutions
Inadequate understanding of pulmonary nodule	prescreening shared decision-making; Provides a brochure on letters; Describe the risk of lung cancer
Medical terminology	Plain and simple language; Pictures; Audio and video