

Accuracy of a respiratory assessment chatbot in a nationwide messaging system for layperson diagnosis and triage: a randomized preregistered study

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Study Description:

This study will evaluate the impact of using the GPT-4o compared to traditional online tools in the field of respiratory disease prevention, focusing on the dissemination of knowledge and behavior changes among the general public. We will explore the effectiveness of GPT-4o in enhancing public awareness and management capabilities regarding respiratory diseases and promoting appropriate preventive behaviors.

Arms and Interventions:

Arms: two groups (group 1: Internet-Based Group; Group 2: AI-Assisted Group) with an allocation ratio of 1:1.

Intervention: AI-Assisted Group: GPT-4O fine-tuned with the Lungdiag database

Internet-Based Group: no intervention

Study Design

Study type: Intervention randomized controlled trial

Estimated Enrollment: 2400

Allocation: ratio is 1:1

Intervention model: Parallel group design

Masking: Outcomes Assessor

Official title: **Accuracy of a respiratory assessment chatbot in a nationwide messaging**

system for layperson diagnosis and triage: a randomised preregistered study

Actual study start date: January 1, 2025

Primary Completion Date: May 31, 2025

Anticipated Study Completion Date: Jun 30, 2025

Primary Outcome Measures: The accuracy of participants in answering questions related to triage, diagnosis, and risk factor identification of respiratory diseases using artificial intelligence versus internet-based information retrieval assessed by questionnaire survey

Secondary Outcome Measures: 1. The accuracy of different subgroups in answering questions related

to triage, diagnosis, and risk factor identification of respiratory diseases using artificial intelligence versus internet-based information retrieval assessed by questionnaire survey

. 2. Time (in seconds) participants spend per questionnaire between the two study arms.

Inclusion and exclusion criteria:

Inclusion Criteria:

- No medical background
- Aged from 18 to 75 years old

Exclusion Criteria:

- Had a medical background
- Exceeds the age criteria
- Failed to comply with the survey requirements

Research Plan:

1. Questionnaire design: The questionnaire design should be concise and clear to ensure that the respondents can quickly understand and complete it. The questionnaire included basic information, respiratory disease triage and diagnosis, and risk factors for respiratory diseases.

2. Pre-experiment

3. Training and guidance: Organize a centralized training for all centers to ensure that the person in charge of each center understands the questionnaire content, distribution process and data collection requirements.

4. Data collection: Data will be collected through the distribution of questionnaires by the heads of multiple collaborating centers.

5. Data quality control: each center is required to enter real-time data in the process of questionnaire distribution and upload data through the online platform. A data review team was set up to review the uploaded data in real time to ensure data quality.

6. Data analysis

Key measures

The basic information of each participant, the accuracy of diagnosis and triage of respiratory diseases, and the accuracy of risk factors for respiratory diseases were collected.

Control of Risk

1. Emergency plan: Prepare emergency plans for each center, including handling plans for sudden diseases, traffic accidents and other situations.

2. Communication mechanism: Establish a real-time communication mechanism to ensure that the leaders of each center can contact the project team in time to get support and guidance when they encounter problems.

3. Data security management: the data were managed by the main researchers and saved in the form of paper questionnaire and electronic version. Except for the research team members who could view the data, all the staff outside the research team were not exposed.

4. Reporting and collection of adverse events and serious adverse events: the person in charge of each center shall appoint a special person to actively monitor and record all adverse events during the study, and the adverse events shall be reported through the electronic data collection system within 24 hours after being informed of the adverse events. A dual reporting system for serious adverse events was implemented. The responsible persons were required to fill in the Serious Adverse Event Report Form within 24 hours, and

report in writing to the safety manager of the sponsor and the Ethics committee of the institution by fax/encrypted email.

Objectives and statistical analysis Methods

With the aging of the global population and the increasing problem of environmental pollution, the incidence and mortality of respiratory diseases such as chronic obstructive pulmonary disease (COPD), asthma, and pulmonary fibrosis continue to rise, which has become a major challenge in the field of global public health. According to the data of the World Health Organization, COPD and asthma cause millions of deaths every year. Due to the hidden symptoms in the early stage, the diagnosis depends on experience and complex examinations, patients are often diagnosed in the middle and late stages, which miss the best opportunity for intervention. At the same time, the uneven distribution of primary medical resources and the shortage of specialists further aggravates the dilemma of inefficient diagnosis and treatment and insufficient patient management. In recent years, artificial intelligence technology has shown breakthroughs in the field of medicine, which has brought revolutionary breakthroughs in the prevention, diagnosis and triage of respiratory diseases. Through a national multicenter randomized controlled trial, this study aims to systematically evaluate the comprehensive value of AI-assisted screening in improving the early diagnosis rate of respiratory diseases, optimizing the allocation of medical resources and reducing the screening cost, so as to provide scientific basis for the construction of a precise prevention and treatment system for respiratory diseases.

Statistical description: For the description of quantitative indicators, the mean, standard deviation, median, minimum, maximum, lower quartile (Q1) and upper quartile (Q3) were calculated, and the rank indicators described the number and percentage of cases in each level.

Statistical inference: For the comparison of the general situation of the two groups, the comparison between the two groups of quantitative indicators was performed by group t test or Wilcoxon rank sum test according to the distribution of data, the chi-square test or exact probability method was used for categorical indicators (if the chi-square test was not applicable)

R (version 4.4.1) were used for statistical analysis. All statistical tests were two-sided unless otherwise specified. P values less than 0.05 (two-sided) would be considered as statistically significant.

Study Title:

**Accuracy of a respiratory assessment chatbot in a nationwide messaging system
for layperson diagnosis and triage: a randomised preregistered study**

1. Objectives and Hypotheses

Objectives

The primary objective of this study is to evaluate the utility of AI-driven tools, such as GPT-4o, in improving the accuracy of etiology identification, diagnosis, and triage decisions for respiratory diseases (including influenza, pneumonia, asthma, and chronic obstructive pulmonary disease [COPD]) among laypeople compared to standard Internet search tools.

The secondary objective is to compare the time required to complete the structured respiratory disease questionnaire between the AI-assisted group and the control group.

Hypotheses

This is a superiority trial hypothesizing that the AI group will demonstrate significantly higher overall diagnostic accuracy than the control group (expected minimum difference of 10% in accuracy rates).

2. Study Design and Population

2.1 Study Design

A multicenter, observer-blind, randomized controlled trial conducted from April to June 2025 across 24 healthcare systems in China. Participants were randomized in a 1:1 ratio to the AI group (using a GPT-4o-based mini-program integrated with the Lungdiag database) or the control group (using a standard Internet search tool). Randomization was stratified by study center, performed via a web-based computer program, and sealed in opaque envelopes. Outcome assessors (respiratory specialists) were blinded to group allocations, while participants, data collectors, and analysts were aware due to the intervention nature.

2.2 Study Population

Inclusion Criteria: Adults aged 18-75 years without a medical background, who signed an informed consent form. Recruitment aimed for national representation in gender, age, and region.

Exclusion Criteria: Individuals aged <18 or >75 years, those with a medical background, or those who did not sign an informed consent form.

Sample Size: 2,400 participants enrolled, yielding 2,176 analyzable cases after exclusions for non-compliance.

2.3 Sample Size Calculation

The sample size was calculated for a one-sided superiority test ($\alpha = 0.025$, 90% power) assuming 50% accuracy in the control group and 60% accuracy in the AI group (minimum detectable difference of 10%). The base sample was 1,036 participants (1:1 allocation). This was adjusted to 2,062 analyzable cases to account for clustering (intraclass correlation coefficient [ICC]=0.01, design effect=1.99). Recruitment was increased to 2,400 to accommodate approximately 15% attrition.

3. Statistical Methods

3.1 General Considerations

Analysis Population: Modified intention-to-treat (mITT) population, including only the 2,176 randomized participants with fully compliant and analyzable data after exclusions. Participants with incomplete or non-compliant questionnaires (e.g., missing core items or implausible responses) were excluded from the primary analysis, as their data were not utilized per protocol.

Software: R version 4.4.1, with packages such as tidyverse for data manipulation, readxl for importing Excel data, lme4 for generalized linear mixed-effects models (GLMM), emmeans for marginal means and contrasts, forestplot for visualization.

Significance: One-sided $p < 0.025$ for the primary outcome to align with the directional superiority hypothesis; two-sided $p < 0.05$ for secondary outcomes.

- **Multiple Testing:** Bonferroni correction applied for multiple comparisons across question types (adjusted significance threshold $p = 0.0167$).

3.2 Primary Endpoint Analysis

Endpoints: Accuracy rates (proportion of correct responses) for etiology identification (risk factor questions), diagnosis (case-based scenarios), and triage decisions, assessed against expert-defined standards.

Method: Chi-square test for between-group comparisons of accuracy rates; Wilson's score interval for 95% confidence intervals (CIs).

Model: GLMM with binomial distribution and logit link to account for clustering by participant and questionnaire item (random effects: participant ID and item ID; fixed effects: group allocation, question type, and baseline covariates such as age, sex, education, and region).

Effect Sizes: Planned calculations include relative risk (RR) with 95% CIs for accuracy improvement (e.g., $RR > 1$ indicating AI superiority) and absolute accuracy difference (e.g., percentage points) with 95% CIs.

3.3 Secondary Endpoint Analysis

Endpoint: Time to complete the questionnaire (in seconds), defined as the duration from start to submission.

Method: Wilcoxon rank-sum test due to anticipated non-normal distribution (confirmed via Shapiro-Wilk test); medians and interquartile ranges (IQRs) reported.

3.4 Subgroup Analyses

Strata: Pre-specified subgroups include age (<30 vs. ≥ 30 years), education level (bachelor's degree or below vs. above bachelor's degree), sex (male vs. female), and geographic region (Northern, Eastern, Central, Western, and Southern China).

Method: GLMM extended with interaction terms between group allocation and each subgroup variable to evaluate heterogeneity in intervention effects. A statistically significant interaction ($p < 0.05$) will indicate varying effects across subgroups. Results will be visualized in a forest plot using forestplot, displaying absolute differences (percentage points) with 95% CIs, alongside subgroup-specific accuracy rates.

3.5 Interim Analyses

Plan: No interim analyses were planned or conducted, as the study was completed in a single phase without adaptive elements. The final analysis encompasses only the data from the 2,176 analyzable cases, as the 224 non-compliant questionnaires were excluded and their data deemed invalid per protocol. All analyses are based on the fully compliant dataset collected post-trial completion.

3.6 Missing Data Handling

Rationale for Exclusions: Questionnaires were designed to require completion of all items for submission. However, 224 submissions (9.3% of enrolled) were excluded due to non-compliance with completion requirements. Specific reasons include: failure to answer all 12 core items or provide complete baseline demographic data; misclassification of participant group; inconsistent or implausible responses, such as the reporting of multiple diagnoses in the diagnostic question or multiple high-risk behaviours in the risk behaviour identification section, which contradicted the single-response design; and misuse of the triage question, where participants entered departmental names rather than specific urgent clinical conditions. These exclusions ensure data quality and alignment with protocol-defined standards, with exclusion rates summarized by group and reasons tabulated for transparency.

Supplementary Table S1. Post-randomization exclusions by study arm

Outcome	LungDiag group (n=1200)	Control group (n=1200)
Excluded from primary compliant- case analysis, n (%)	112 (9.3%)	112 (9.3%)
Missing core questions or baseline data, n (%)	46 (3.8%)	49 (4.1%)
Invalid triage input, n (%)	29 (2.4%)	27 (2.3%)
Incorrect group allocation, n (%)	25 (2.1%)	23 (1.9%)
Other reasons, n (%)	12 (1.0%)	13 (1.1%)
Included in primary compliant-case analysis, n (%)	1088 (90.7%)	1088 (90.7%)

Supplementary Table S2. Crude item-level pooled proportions, and Wilson 95% confidence intervals in the primary compliant-case analysis.

Type	LungDiag Group		Control Group		Comparison		P-Value
	Accuracy	95% CI	Accuracy	95% CI	Accuracy Difference	Difference 95% CI	
Total	0.651	(0.643, 0.659)	0.546	(0.538, 0.555)	0.105	(0.093, 0.117)	<0.001
Risk behaviour	0.716	(0.703, 0.730)	0.623	(0.608, 0.637)	0.094	(0.074, 0.113)	<0.001
Diagnostic	0.718	(0.704, 0.731)	0.541	(0.526, 0.556)	0.177	(0.157, 0.197)	<0.001
Triage	0.519	(0.504, 0.534)	0.475	(0.460, 0.490)	0.045	(0.024, 0.066)	<0.001

Note: Values are crude pooled item-level proportions calculated directly from observed responses, with Wilson 95% confidence intervals. Accuracy differences were calculated as crude between-group differences (LungDiag minus Control), and P values were derived from chi-square tests without continuity correction. Blank cells indicate unasked items and were excluded from the denominator. These crude proportions are provided for descriptive comparison and may differ from the model-based marginal accuracies estimated from the GLMM in the primary and sensitivity analyses.

1 Supplementary Table S3. Model-based predicted accuracy and treatment effects from GLMM
2 (4 Items Only)

Type	LungDiag Group		Control Group		Comparison		Risk Ratio (RR)	RR 95% CI	P-Value
	Accuracy	95% CI	Accuracy	95% CI	Risk Difference (RD)	RD 95% CI			
Total (4 Items)	0.632	(0.462, 0.803)	0.399	(0.225, 0.574)	0.233	(0.148, 0.318)	1.58	(1.21, 1.96)	<0.001

1 Supplementary Table S4. Crude item-level pooled proportions (4 Items Only).

Type	LungDiag Group		Control Group		Compariso n		P-Value
	Accuracy	95% CI	Accuracy	95% CI	Accuracy Difference	Difference 95% CI	
Total (4 Items)	0.621	(0.569, 0.670)	0.419	(0.370, 0.469)	0.202	(0.131, 0.273)	<0.001

Supplementary Table S5. Accuracy of triage performance by gold-standard urgency category.

Gold-standard urgency category	LungDiag group			Control group		
	Correct responses, n	Total responses, N	Accuracy, n/N (%)	Correct responses, n	Total responses, N	Accuracy, n/N (%)
Self-care	425	1117	425/1117 (38.0)	417	1079	417/1079 (38.6)
Within one day	445	1050	445/1050 (42.4)	425	1089	425/1089 (39.0)
Within one week	458	1094	458/1094 (41.9)	378	1091	378/1091 (34.6)
Emergency	942	1091	942/1091 (86.3)	843	1093	843/1093 (77.1)

Note: Values are item-level triage responses, not participant counts. Each participant in the primary compliant-case analysis answered four triage items; therefore, the total number of triage item-level responses was 4,352 per study arm. Denominators differ across gold-standard urgency categories because questionnaire items were randomly sampled from the respiratory case bank and classified according to their gold-standard urgency category.

Supplementary Table S6. Sensitivity and specificity for binary high-urgency triage recognition.

Group	Sensitivity	Specificity
LungDiag	1832/2141 (85.6)	1372/2211 (62.1)
Control	1766/2182 (80.9)	1216/2170 (56.0)

Note: Data are shown as n/N (%). High-urgency triage was defined as within 1 day or emergency. Non-high-urgency triage was defined as self-care or within 1 week. Sensitivity was calculated as $TP/(TP+FN)$, and specificity was calculated as $TN/(TN+FP)$. Blank cells were not counted because each participant received only a subset of the triage questions.

1 Supplementary Table S7. All-randomized sensitivity analyses according to the ITT
2 principle under deterministic boundary assumptions

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5 Panel A: LungDiag assigned-but-unanswered items coded as incorrect; control
6 assigned-but-unanswered items coded as correct

Type	LungDiag Group		Control Group		Comparison		Risk Ratio (RR)	RR 95% CI	P-Value
	Accuracy	95% CI	Accuracy	95% CI	Risk Difference (RD)	RD 95% CI			
Total	0.688	(0.639, 0.737)	0.554	(0.498, 0.610)	0.134	(0.112, 0.157)	1.24	(1.19, 1.30)	<0.001
Risk behaviour	0.783	(0.722, 0.844)	0.671	(0.592, 0.750)	0.112	(0.078, 0.146)	1.17	(1.10, 1.23)	<0.001
Diagnostic	0.812	(0.740, 0.884)	0.546	(0.430, 0.662)	0.266	(0.210, 0.322)	1.49	(1.29, 1.69)	<0.001
Triage	0.526	(0.435, 0.617)	0.474	(0.383, 0.565)	0.052	(0.027, 0.078)	1.11	(1.05, 1.17)	<0.001

7 Note: Assigned-but-unanswered items were represented as “NA” in the raw
8 questionnaire files and were deterministically recoded for sensitivity analyses.
9 Unasked items remained blank and were not included in the denominator. All
10 analyses included all 2,400 randomized participants and used the same item-level
11 GLMM framework as the primary analysis.

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14 Panel B: all assigned-but-unanswered items coded as correct in both arms

Type	LungDiag Group		Control Group		Comparison		Risk Ratio (RR)	RR 95% CI	P-Value
	Accuracy	95% CI	Accuracy	95% CI	Risk Difference (RD)	RD 95% CI			
Total	0.692	(0.643, 0.740)	0.554	(0.498, 0.610)	0.138	(0.115, 0.161)	1.25	(1.19, 1.31)	<0.001
Risk behaviour	0.785	(0.725, 0.846)	0.671	(0.592, 0.749)	0.115	(0.080, 0.149)	1.17	(1.10, 1.24)	<0.001
Diagnostic	0.812	(0.740, 0.884)	0.546	(0.430, 0.662)	0.266	(0.210, 0.322)	1.49	(1.29, 1.69)	<0.001
Triage	0.535	(0.444, 0.617)	0.474	(0.383, 0.565)	0.061	(0.036, 0.078)	1.13	(1.07, 1.19)	<0.001

Table 1: Accuracy of the LungDiag and Control Groups in the Comparison of the Risk Ratio (RR) and 95% CI									
Type	LungDiag Group		Control Group		Comparison		Risk Ratio (RR)	RR 95% CI	P-Value
	Accuracy	95% CI	Accuracy	95% CI	Risk Difference (RD)	RD 95% CI			
		0.626)		0.565)		0.086)			
15	Note: Assigned-but-unanswered items were represented as “NA” in the raw								
16	questionnaire files and were deterministically recoded for sensitivity analyses.								
17	Unasked items remained blank and were not included in the denominator. All								
18	analyses included all 2,400 randomized participants and used the same item-level								
19	GLMM framework as the primary analysis.								
20									
21									
22	Panel C: all assigned-but-unanswered items coded as incorrect in both arms								
Type	LungDiag Group		Control Group		Comparison		Risk Ratio (RR)	RR 95% CI	P-Value
	Accuracy	95% CI	Accuracy	95% CI	Risk Difference (RD)	RD 95% CI			
Total	0.688	(0.639, 0.737)	0.550	(0.493, 0.606)	0.138	(0.116, 0.161)	1.25	(1.19, 1.31)	<0.001
Risk behaviour	0.783	(0.722, 0.844)	0.667	(0.589, 0.746)	0.115	(0.081, 0.150)	1.17	(1.11, 1.24)	<0.001
Diagnostic	0.812	(0.740, 0.884)	0.546	(0.430, 0.662)	0.266	(0.210, 0.322)	1.49	(1.29, 1.69)	<0.001
Triage	0.526	(0.435, 0.616)	0.465	(0.375, 0.555)	0.061	(0.036, 0.086)	1.13	(1.07, 1.19)	<0.001
23	Note: Assigned-but-unanswered items were represented as “NA” in the raw								
24	questionnaire files and were deterministically recoded for sensitivity analyses.								
25	Unasked items remained blank and were not included in the denominator. All								
26	analyses included all 2,400 randomized participants and used the same item-level								
27	GLMM framework as the primary analysis.								
28									

Supplementary Table S8. Summary of Questions and Answers

Question number	Question	Answer
1	A 28-year-old male patient presented with nasal congestion and rhinorrhea for 3 days, accompanied by sore throat and low-grade fever, diagnosed with common cold. His daily behaviors included daily vitamin C supplementation, working late at night, taking cold showers, avoiding crowded places, and inconsistent mask-wearing. Which behavior is most likely to delay recovery?	Working late at night
2	A 19-year-old female patient presented with sore throat and conjunctival hyperemia, diagnosed with pharyngoconjunctival fever. Her daily behaviors included daily saline gargling, wearing sunglasses outdoors, sharing contact lens cleaning solution, isolating personal utensils, and rubbing eyes without subsequent handwashing. Which behavior is most likely to facilitate transmission of infection?	Sharing contact lens cleaning solution
3	A 35-year-old male patient allergic to penicillin had recurrent sore throat with purulence, diagnosed with tonsillitis. His daily behaviors included gargling with warm saline, avoiding spicy food, self-discontinuation of analgesics, frequent alcohol consumption during social events, and use of a humidifier. Which behavior most likely exacerbates inflammation?	Frequent alcohol consumption during social events
4	A 67-year-old female patient with cough, sputum production, and fever had chest X-ray showing right lower lung infiltrates, diagnosed with community-acquired pneumonia. Her daily behaviors included influenza vaccination, ventilating by opening windows, smoking 20 cigarettes per	Smoking

day, alcohol sponge baths during fever, and self-administration of antitussive agents. Which behavior most likely aggravates the condition?

- 5 A 42-year-old male patient presented with dry cough for 2 weeks without moist rales on auscultation, diagnosed with acute bronchitis. His daily behaviors included drinking honey water, using an air purifier, excessive use of throat lozenges, jogging in smoggy weather in the morning, and not wearing a mask. Which behavior most likely irritates the airway?
- Jogging in smoggy weather in the morning

- 6 A 50-year-old female patient with foul-smelling purulent sputum and chest CT showing cavity with air-fluid level was diagnosed with primary lung abscess. Her daily behaviors included untreated periodontitis, drainage of sputum in supine position, daily oral hygiene, vomiting following heavy alcohol consumption, and refusal of bronchoscopy. Which behavior most likely causes aspiration of vomitus?
- Vomiting following heavy alcohol consumption

- 7 A 31-year-old male patient with BMI 17.3 and positive sputum smear was diagnosed with infiltrative pulmonary tuberculosis. His daily behaviors included working late at night, daily protein intake below 30 grams, adherence to influenza vaccination, and jogging outdoors during smog. Which behavior most impairs immunity and predisposes to tuberculosis?
- Insufficient protein intake

8	A 22-year-old female patient experienced wheezing and reduced peak expiratory flow after exposure to cooking oil fumes, diagnosed with bronchial asthma. Her daily behaviors included weekly washing of bedding, use of air purifier, keeping a long-haired cat as a pet, maintaining an asthma diary, and wearing a mask in cold weather. Which behavior most likely triggers asthma attacks?	Keeping a long-haired cat as a pet
9	A 34-year-old female patient taking oral contraceptives for 5 years suddenly developed chest pain and elevated D-dimer, diagnosed with pulmonary embolism. Her daily behaviors included wearing compression stockings, discontinuing oral contraceptives, prolonged bed rest, prolonged sitting during long-distance air travel, and daily water intake over 2 liters. Which behavior most likely promotes thrombosis?	Prolonged sitting during long-distance air travel
10	A 28-year-old female patient with syncope after activity and right heart catheterization showing mean pulmonary artery pressure of 48 mmHg was diagnosed with pulmonary arterial hypertension. Her behaviors included low-salt diet, prolonged sedentary lifestyle, refusal to terminate pregnancy during gestation, regular monitoring of NT-proBNP, and insomnia without discontinuing medications. Which behavior most likely worsens pulmonary hypertension?	Refusal to terminate pregnancy during gestation
11	A 65-year-old male patient with a smoking index of 800 and chest CT showing a 2-cm spiculated nodule was diagnosed with lung cancer. His daily behaviors included high-fat diet, consumption of antioxidant-rich foods such as broccoli, asbestos exposure, early rising and late sleeping habits,	Asbestos exposure

and practicing diaphragmatic breathing. Which behavior is the most definitive carcinogenic factor?

12

A 19-year-old male patient with tall and thin body habitus presented with sudden chest pain and dyspnea, diagnosed with pneumothorax. His daily behaviors included smoking cessation for 3 months, intense jumping during basketball games, avoidance of air travel, and lying down immediately after prolonged meals. Which behavior most likely precipitates pneumothorax?

Intense jumping during basketball games

13

A 35-year-old female patient with tracheal deviation, jugular vein distension, and oxygen saturation of 85% was diagnosed with tension pneumothorax. Her behaviors included delayed medical treatment for 6 hours, use of antitussives, high-flow oxygen therapy, inserting a pen into the chest cavity for decompression, and family pressing the wound. Which emergency treatment is the most appropriate?

Inserting a pen into the chest cavity for decompression

14

A 41-year-old male patient with low-grade fever and chest pain, elevated ADA in pleural effusion, was diagnosed with tuberculous pleuritis. His behaviors included intermittent use of rifampicin, high-protein diet, occupational silica dust exposure, chronic smoking, and contact with patients with tuberculous pleuritis. Which behavior most likely leads to drug resistance?

Intermittent use of rifampicin

15	A 27-year-old female patient with myasthenia gravis characterized by fluctuating weakness worse in the evening and positive muscle weakness test was diagnosed with myasthenia gravis. Her daily behaviors included relaxing by hot bathing, regular vaccination, excessive running exercise, self-discontinuation of pyridostigmine following symptom relief, and no screening for thymoma. Which behavior most likely aggravates muscle weakness?	Self-discontinuation of pyridostigmine following symptom relief
16	A 14-year-old male patient with pectus excavatum and Haller index of 4.2 was diagnosed with funnel chest. His daily behaviors included maintaining swimming exercise, use of Nuss orthosis, avoiding supine sleeping, weightlifting for muscle gain, and lack of cardiopulmonary monitoring. Which behavior most likely worsens the deformity?	Weightlifting for muscle gain
17	A 12-year-old female patient with pectus carinatum presenting with anterior chest protrusion and exertional dyspnea was diagnosed with pigeon chest. Her daily behaviors included wearing braces for correction, supplementing calcium and vitamin D, performing chest expansion exercises, maintaining a stooped sitting posture for long periods, and habitual use of high pillows while sleeping. Which behavior most negatively affects development?	Maintaining a stooped sitting posture
18	A 33-year-old male patient with cold abscess and rib destruction, strongly positive PPD test, was diagnosed with chest wall tuberculosis. His behaviors included abscess puncture and drainage, high-calorie diet, contact with sputum-positive family members, self-incision and drainage, and	Intermittent use of isoniazid

intermittent use of isoniazid. Which behavior most likely leads to drug resistance and refractory disease?

19

A 61-year-old male patient presented with chest pain after meals. A barium meal examination showed herniation of the stomach into the thoracic cavity, and he was diagnosed with a diaphragmatic hernia. His daily behaviors included lying supine after meals, using abdominal binders for compression, eating small bites slowly, and straining during defecation with breath-holding. Which behavior most likely increases intra-abdominal pressure and worsens diaphragmatic hernia?

Straining during defecation with breath-holding

20

A 62-year-old male patient with a 10-year history of chronic obstructive pulmonary disease was admitted due to acute respiratory failure presenting with worsening dyspnea and fatigue. His daily behaviors included drinking hot tea after waking, sunbathing on the balcony after meals, eating nuts at noon, opening windows to inhale cold air before sleep as refreshment, and occasionally using hot towels on the chest. Which behavior most likely induces acute respiratory failure?

Opening windows to inhale cold air before sleep as refreshment

21

A 58-year-old male patient diagnosed with COPD reported daily exposure to secondhand smoke from spouse, high-salt diet, chronic sleep deprivation, preference for pickled foods, 20 years of coal mining employment, and sedentary lifestyle on weekends. Which behavior is the highest risk factor leading to COPD?

20 years of coal mining employment

22	A 60-year-old female patient diagnosed with lung cancer had daily behaviors including daily consumption of sugar-sweetened beverages, long-term use of scented candles, 30-year history of smoking, prolonged sitting in the office, insufficient sleep, and weekend mahjong playing. Which behavior is the sole high-risk factor for lung cancer?	30-year history of smoking
23	A 45-year-old female patient with recurrent bronchiectasis infections was diagnosed with bronchiectasis. Her daily behaviors included daily intake of iced milk tea, frequent manicures (chemical solvent exposure), staying up late watching TV series, high-sugar diet, history of untreated childhood pertussis, and keeping pet cats. Which behavior is the most definitive high-risk factor related to bronchiectasis?	History of untreated childhood pertussis
24	A 65-year-old male patient diagnosed with fibrosing interstitial lung disease had behaviors including 15 years of occupational exposure in an asbestos factory, daily consumption of fried foods, long-term hair dye use (chemical exposure), gardening, occasional alcohol consumption, and insufficient sleep. Which behavior is the most direct high-risk factor related to fibrosing interstitial lung disease?	15 years of occupational exposure in an asbestos factory
25	A 40-year-old male patient diagnosed with obstructive sleep apnea had daily behaviors including daily consumption of carbonated beverages, a BMI of 35, long-term betel nut chewing, sedentary office work, preference for late-night snacks, and overnight gaming on weekends. Which behavior is the primary high-risk factor related to obstructive sleep apnea?	BMI 35 (obesity)

26	A 55-year-old male patient diagnosed with esophageal cancer presented with late-stage dysphagia, persistent cough, and dyspnea suggestive of airway invasion. His daily behaviors included frequent consumption of spicy snack sticks (high additives), farming work, daily consumption of high-proof liquor for 20 years, long-term betel nut chewing, daily consumption of hot coffee, and irregular sleep patterns. Which behavior is the highest risk factor for esophageal cancer?	Daily consumption of high-proof liquor for 20 years
27	A 28-year-old male patient diagnosed with pulmonary tuberculosis had behaviors including chronic sleep deprivation, high-sugar diet, living with tuberculosis patients, keeping hamsters, daily consumption of sugary drinks, and weekend all-night gaming. Which behavior is the most direct high-risk factor related to pulmonary tuberculosis?	Living with tuberculosis patients
28	A 50-year-old male patient diagnosed with acute empyema had behaviors including heavy alcohol consumption (500 ml white liquor daily), farming, frequent consumption of instant noodles, pneumonia not treated according to guidelines, motorcycle commuting, and insufficient sleep. Which behavior is the highest risk factor related to acute empyema?	Pneumonia not treated according to guidelines
29	A 55-year-old male patient diagnosed with silicosis had daily behaviors including daily alcohol consumption, high-salt diet, chronic sleep deprivation, weekend fishing without protection, 20 years of work in a quartz sand factory, and occasional smoking. Which behavior is the highest risk factor related to silicosis?	20 years of work in a quartz sand factory

30	A 25-year-old female patient diagnosed with palmar hyperhidrosis had daily behaviors including long-term consumption of functional beverages, working overtime until late at night every day, high-sugar diet, staying up late watching short videos, sedentary lifestyle on weekends, and keeping pet hamsters. Which behavior is the highest risk factor related to palmar hyperhidrosis?	Working overtime until late at night every day (high mental stress)
31	A 30-year-old female patient diagnosed with airway foreign body obstruction had daily behaviors including talking or laughing while eating, sedentary office work, using a mobile phone during meals, keeping pet dogs, weekend yoga practice, and frequent consumption of jelly. Which behavior is the most definitive high-risk factor related to airway foreign body obstruction?	Talking or laughing while eating (causing food aspiration)
32	A 40-year-old female patient diagnosed with hypersensitivity pneumonitis had daily behaviors including long-term use of scented candles, high-sugar diet, sedentary office work, weekend baking, raising pigeons for 5 years (cleaning bird droppings daily without protection), and insufficient sleep. Which behavior is the most direct high-risk factor related to hypersensitivity pneumonitis?	Raising pigeons for 5 years (exposure to antigens from bird droppings)
33	A 60-year-old female patient diagnosed with fungal pneumonia had daily behaviors including daily intake of honey water, raising cats, dogs, and birds, high-fat diet, long-term prophylactic antibiotic use to prevent colds, regular travel, and staying up late watching TV series. Which behavior is the highest risk factor for fungal pneumonia?	Long-term prophylactic antibiotic use to prevent colds

34	A 22-year-old male patient with sudden pneumothorax had behaviors including a tall and thin body habitus (height 190 cm), 2-year smoking history, daily intake of carbonated beverages, staying up late gaming, long-term use of contact lenses, and sedentary lifestyle on weekends. Which behavior is the most definitive high-risk factor related to spontaneous pneumothorax?	Tall and thin body habitus (fragile alveolar structures)
35	A 38-year-old female patient diagnosed with diaphragmatic hernia had daily behaviors including long-term wearing of corsets, sedentary office work, a BMI of 35 (postpartum obesity without weight loss), daily consumption of milk tea, staying up late watching shows on weekends, and high-salt diet. Which behavior is the most direct high-risk factor related to diaphragmatic hernia?	BMI 35 (obesity)
36	A 32-year-old female patient diagnosed with carbon monoxide poisoning had daily behaviors including daily yoga practice in a basement (enclosed space), chronic sleep deprivation, sedentary office work, weekend use of scented candles at home for relaxation, daily intake of 5 cups of coffee for alertness, and unrepaired malfunction of gas water heater. Which behavior is the most direct high-risk factor causing poisoning?	Unrepaired malfunction of gas water heater
37	A 30-year-old female patient developed severe illness following influenza infection. Behaviors included lack of influenza vaccination, commuting by subway without mask, daily milk tea consumption, working late overtime, keeping pet cats, and weekend shopping. Which behavior is the most direct high-risk factor related	Lack of influenza vaccination (absence of immune protection)

to influenza?

38	A 50-year-old male patient diagnosed with interstitial lung disease had daily behaviors including working at a chicken farm for 15 years (exposure to poultry feather dust), daily smoking, high-fat diet, weekend fishing, home incense burning, and insufficient sleep. Which behavior is the most definitive high-risk factor related to interstitial lung disease?	Working at a chicken farm for 15 years (organic dust exposure)
39	A 25-year-old female patient with chronic allergic rhinitis had daily behaviors including keeping plush toys in the bedroom (dust mite proliferation), daily coffee consumption, direct air conditioning blowing in the office, staying up late using mobile phone, weekend hiking, and avoidance of spicy food. Which behavior is the highest risk factor related to allergic rhinitis?	Keeping plush toys in the bedroom (dust mite exposure)
40	A 45-year-old female patient with sudden pulmonary embolism had daily behaviors including prolonged sitting as a programmer, taking oral contraceptives for 5 years, weekly barbecue consumption, frequent use of high heels, staying home watching shows on weekends, and keeping pet rabbits. Which behavior is the highest risk factor related to sudden pulmonary embolism?	Taking oral contraceptives for 5 years (increased risk of thrombosis)

41	A 58-year-old male patient with advanced lung cancer developed pulmonary aspergillosis after chemotherapy. His daily behaviors included long-term corticosteroid use without tapering the dose as advised, keeping flowers at home (humid potted soil), daily honey water consumption, no mask use outdoors, weekend golf, and high-sugar diet. Which behavior is the highest risk factor causing aspergillosis infection?	Long-term corticosteroid use (immunosuppression)
42	A 58-year-old male patient with COPD was in coma due to hypercapnic respiratory acidosis. Behaviors included inhaling 100% pure oxygen for health purposes, daily consumption of energy drinks, hyperventilation caused by anxiety, no oxygen monitoring, use of air purifier at home, and bed rest on weekends. Which behavior directly induced coma?	Inhaling a high concentration of pure oxygen (suppression of the respiratory center due to excessive oxygen therapy)
43	A 30-year-old female patient with no prior health issues developed dizziness and nausea after heating with a coal stove overnight and was diagnosed with carbon monoxide poisoning. Her behaviors included closing windows tightly before sleeping, taking hot baths after dinner, boiling water with an electric kettle for tea, using mosquito coils for sleep aid, and daily morning yoga. Which behavior directly caused carbon monoxide poisoning?	Closing windows tightly before sleeping
44	A 55-year-old male patient with 5-year history of heart disease was hospitalized for pulmonary edema with worsening dyspnea and cough. His daily behaviors included reading newspaper after breakfast, drinking warm water and listening to music before sleep, sitting on the sofa using mobile phone after meals, occasionally walking the dog downstairs, 20-minute	Frequent colds caused by exposure to cold temperatures

midday naps, and frequent colds caused by exposure to cold temperatures. Which behavior most likely worsens pulmonary edema?

45	Current Issue: Fatigue and nasal congestion for two days. Additional Details: 30-year-old male, mild sore throat, no fever, exposure to sick colleagues. Correct Diagnosis: [Please fill in the most likely disease name].	Common Cold
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46	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Self-Care
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47	Current Issue: Sore throat and difficulty swallowing. Additional Details: 12-year-old male, fever of 38.5°C, swollen tonsils, enlarged cervical lymph nodes. Correct Diagnosis: [Please fill in the most likely disease name].	Tonsillitis
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48	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Within One Day
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49	Current Issue: Fever and productive cough for five days. Additional Details: 50-year-old male, smoker, slightly rapid breathing, green sputum, chest tightness. Correct Diagnosis: [Please fill in the most likely disease name].	Community-Acquired Pneumonia
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50	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Within One Week
51	Current Issue: Cough and wheezing for three days. Additional Details: 35-year-old female, no fever, history of allergies, CT shows mild bronchial wall thickening, chest tightness, and nasal congestion. Correct Diagnosis: [Please fill in the most likely disease name].	Acute Bronchitis
52	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Within One Day
53	Current Issue: High fever and chest pain for one week. Additional Details: 45-year-old male, purulent sputum, weight loss, long-term bedridden, history of diabetes. Correct Diagnosis: [Please fill in the most likely disease name].	Primary Lung Abscess
54	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Emergency
55	Current Issue: Chronic cough, excessive night sweats. Additional Details: 40-year-old male, smoking history, weight loss, contact with tuberculosis patients, fatigue. Correct Diagnosis: [Please fill in the most likely disease name].	Pulmonary Tuberculosis

56	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Within One Week
57	Current Issue: Persistent cough and low-grade fever. Additional Details: 60-year-old female, immunocompromised, long-term antibiotic use for cold prevention, decreased appetite. Correct Diagnosis: [Please fill in the most likely disease name].	Fungal Pneumonia
58	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Within One Week
59	Current Issue: Cough and fever after rural travel. Additional Details: 33-year-old male, fatigue, recent consumption of raw meat, diarrhea, and joint pain. Correct Diagnosis: [Please fill in the most likely disease name].	Pulmonary Parasitic Infection
60	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Within One Week
61	Current Issue: Shortness of breath and wheezing. Additional Details: 28-year-old male, symptoms worsen after dust exposure, no fever, no cough or sputum reported, history of similar episodes possibly related to environmental factors. Correct	Bronchial Asthma

Diagnosis: [Please fill in the most likely disease name].

62	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Within One Day
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63	Current Issue: Chronic cough and shortness of breath during activity. Additional Details: 65-year-old male, former smoker, long-term cough, decreased exercise tolerance, lower limb edema. Correct Diagnosis: [Please fill in the most likely disease name].	COPD
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64	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Within One Week
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65	Current Issue: Bloody sputum for several weeks. Additional Details: 50-year-old female, recurrent infections, history of bronchitis, whooping cough, chest pain, and fatigue. Correct Diagnosis: [Please fill in the most likely disease name].	Bronchiectasis
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66	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Within One Week
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67	Current Issue: Progressive dyspnea, worsening for one day. Additional Details: 70-year-old male, dry cough, no smoking history, clubbing of fingers, fatigue, chest CT shows bilateral interstitial changes and honeycombing. Correct Diagnosis: [Please fill in the most likely disease name].	Idiopathic Pulmonary Fibrosis
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68	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Within One Day
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69	Current Issue: Dry cough and fatigue for many years. Additional Details: 55-year-old male, miner, long-term dust exposure, shortness of breath after activity. Correct Diagnosis: [Please fill in the most likely disease name].	Pneumoconiosis
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70	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Within One Week
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71	Current Issue: Wheezing and fever after farm work. Additional Details: 42-year-old female, no asthma history, recent exposure to moldy hay, skin itching. Correct Diagnosis: [Please fill in the most likely disease name].	Hypersensitivity Pneumonitis
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72	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Within One Day
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73	Current Issue: Sudden chest pain and dyspnea. Additional Details: 60-year-old female, recent surgery, right leg swelling, palpitations, and dizziness. Correct Diagnosis: [Please fill in the most likely disease name].	Pulmonary Embolism
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74	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Emergency
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75	Current Issue: Fatigue and shortness of breath. Additional Details: 45-year-old female, ankle swelling, no recent infection, dizziness, and cyanosis. Correct Diagnosis: [Please fill in the most likely disease name].	Pulmonary Hypertension
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76	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Within One Week
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77	Current Issue: Chronic cough and weight loss. Additional Details: 68-year-old male, smoker, hemoptysis, chest pain, and decreased appetite. Correct Diagnosis: [Please fill in the most likely disease name].	Lung Cancer
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78	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Within One Day
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79	Current Issue: Loud snoring and daytime sleepiness. Additional Details: 40-year-old male, obese, partner reports nocturnal apnea, morning headache. Correct Diagnosis: [Please fill in the most likely disease name].	Obstructive Sleep Apnea
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80	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Within One Week
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81	Current Issue: Sudden chest pain and shortness of breath. Additional Details: 30-year-old male, tall and thin, recent intense right chest pain after exercise, brief pain, relieved by rest, no persistent chest pain, occasional mild dyspnea, no cyanosis or severe shortness of breath, chest X-ray shows increased translucency in right lung. Correct Diagnosis: [Please fill in the most likely disease name].	Pneumothorax
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82	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Self-Care
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83	Current Issue: Sucking sound from chest wound. Additional Details: 25-year-old male, stabbed, air entering wound, cyanosis, and hypotension. Correct Diagnosis: [Please fill in the most likely disease name].	Open Pneumothorax
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84	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Emergency
85	Current Issue: Severe dyspnea and chest pressure. Additional Details: 35-year-old male, post-trauma, extreme dyspnea, jugular vein distension, and hypoxia. Correct Diagnosis: [Please fill in the most likely disease name].	Tension Pneumothorax
86	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Emergency
87	Current Issue: Chest pain and low-grade fever. Additional Details: 38-year-old female, history of tuberculosis, chest tightness, fatigue, pleural effusion. Correct Diagnosis: [Please fill in the most likely disease name].	Tuberculous Pleuritis
88	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Within One Day
89	Current Issue: Asymptomatic, abnormal findings on physical exam. Additional Details: 45-year-old male, 20-year smoking history, chest X-ray shows a large, solitary bulla in the right lung apex, regular shape, clear borders, no pneumothorax or infection signs. Correct Diagnosis: [Please fill in the	Pulmonary Bulla

most likely disease name].

90	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Self-Care
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91	Current Issue: Abnormal lung findings on physical exam. Additional Details: 45-year-old male, CT shows a solid, smooth mass in the right lung, clear borders. Correct Diagnosis: [Please fill in the most likely disease name].	Pulmonary Cyst
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92	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Self-Care
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93	Current Issue: Recurrent cough with infection, worsening for one day. Additional Details: 30-year-old female, temperature of 38.9°C, yellow-green purulent sputum, oral amoxicillin ineffective, CT shows abnormal area in the left lower lung, separated from normal lung tissue, with abnormal blood supply. Correct Diagnosis: [Please fill in the most likely disease name].	Pulmonary Sequestration
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94	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Within One Day
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95	Current Issue: Progressive dysphagia and chest pain for several months. Additional Details: 60-year-old male, weight loss, smoker, acid reflux, hoarseness. Correct Diagnosis: [Please fill in the most likely disease name].	Esophageal Cancer
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96	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Within One Day
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97	Current Issue: Chest tightness and occasional dry cough for the past 6 months. Additional Details: 42-year-old female, intermittent retrosternal discomfort, mild muscle weakness, symptoms worsen with activity, relieved by rest, occasional mild upper limb weakness, no significant weight loss, fever, or night sweats, general condition stable, slightly reduced upper limb muscle strength, chest CT shows a thymic mass in the anterior mediastinum, size approximately 4.0×3.8 cm, clear borders, uniform density. Correct Diagnosis: [Please fill in the most likely disease name].	Thymoma
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98	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Within One Week
99	Current Issue: Muscle weakness, ptosis, shortness of breath after activity. Additional Details: 35-year-old female, mild symptoms in the morning, worsening ptosis in the evening, occasional diplopia (1-2 times daily, lasting a few minutes), no dysphagia. Correct Diagnosis: [Please fill in the most likely disease name].	Myasthenia Gravis
100	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Within One Week
101	Current Issue: Chest deformity since childhood. Additional Details: 18-year-old male, chest depression, no dyspnea, no psychological or aesthetic concerns. Correct Diagnosis: [Please fill in the most likely disease name].	Pectus Excavatum
102	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Self-Care

103	Current Issue: Chest protrusion since birth. Additional Details: 15-year-old female, no pain, no aesthetic concerns, no activity limitations. Correct Diagnosis: [Please fill in the most likely disease name].	Pectus Carinatum
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104	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Self-Care
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105	Current Issue: Chest wall pain and swelling. Additional Details: 40-year-old male, history of tuberculosis, local fistula with pus discharge, low-grade fever, fatigue. Correct Diagnosis: [Please fill in the most likely disease name].	Chest Wall Tuberculosis
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106	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Within One Day
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107	Current Issue: Chest pain and shortness of breath. Additional Details: 30-year-old male, post-car accident, significant chest tenderness, cyanosis, and hypoxia. Correct Diagnosis: [Please fill in the most likely disease name].	Chest Trauma (Rib Fracture with Hemopneumothorax)
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108	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Emergency
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109	Current Issue: Sudden dyspnea after a severe accident, with throat discomfort, persistent cough, and tearing chest pain. Additional Details: 32-year-old male, acute onset, dyspnea immediately after the accident, worsened by coughing, bloody sputum, "air leakage" sensation during breathing, tachypnea, oxygen saturation of 88%, asymmetric bilateral breath sounds, significantly reduced right lung breath sounds, localized wheezing, subcutaneous emphysema in the neck and upper chest, "crunching" sound in the mediastinum. Correct Diagnosis: [Please fill in the most likely disease name].	Tracheobronchial Rupture
110	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Emergency
111	Current Issue: Fever and chest pain for one week. Additional Details: 50-year-old male, right-sided chest pain described as stabbing, worsened by deep breathing or coughing, significant dyspnea, especially after activity, persistent dry cough, occasional small amounts of yellow purulent sputum, recent diagnosis of pneumonia, high fever, chills, and chest tightness. Correct Diagnosis: [Please fill in the most likely disease name].	Acute Empyema
112	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Emergency

113	Current Issue: Severe chest pain after vomiting. Additional Details: 55-year-old male, history of alcoholism, dysphagia, high fever, subcutaneous crepitus in the neck. Correct Diagnosis: [Please fill in the most likely disease name].	Esophageal Perforation
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114	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Emergency
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115	Current Issue: Excessive hand sweating. Additional Details: 25-year-old female, worsens with stress, cold and clammy palms, no other systemic symptoms. Correct Diagnosis: [Please fill in the most likely disease name].	Palmar Hyperhidrosis
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116	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Self-Care
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117	Current Issue: Abdominal pain and dyspnea. Additional Details: 60-year-old male, post-trauma, persistent dull pain in the upper abdomen with intermittent exacerbation, radiating to the chest, dyspnea at rest, worsened by deep breathing or activity, chest tightness, nausea, vomiting initially gastric contents then bile, increasing frequency, chest and abdominal pressure and discomfort preventing normal eating and resting, symptoms persistent and worsening. Correct Diagnosis: [Please fill in the most likely	Diaphragmatic Hernia
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disease name].

118	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Emergency
119	Current Issue: Dyspnea after activity and worsening nocturnal paroxysmal dyspnea for one day. Additional Details: 65-year-old female, history of hypertension and chronic heart failure, mild cough with small amounts of white sputum, no pink frothy sputum, blood pressure 150/90 mmHg, heart rate 90 bpm, previous chest X-ray shows bilateral diffuse shadows. Correct Diagnosis: [Please fill in the most likely disease name].	Pulmonary Edema
120	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Within One Day
121	Current Issue: Unconsciousness. Additional Details: 30-year-old male, headache, nausea after heating in a confined space, sudden unconsciousness, cherry-red skin. Correct Diagnosis: [Please fill in the most likely disease name].	Carbon Monoxide Poisoning

122	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Emergency
123	Current Issue: Fever and headache for two days. Additional Details: 25-year-old female, fever of 38.5°C, headache, fatigue, mild sore throat, no dyspnea. Correct Diagnosis: [Please fill in the most likely disease name].	Influenza
124	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Self-Care
125	Current Issue: Worsening dyspnea. Additional Details: 65-year-old male, history of COPD, sudden onset, worsening dyspnea, severe discomfort at rest and during activity, decreased exercise tolerance, chest tightness, cough, scant sputum, cyanosis, lethargy, oxygen saturation significantly decreased on personal oximeter. Correct Diagnosis: [Please fill in the most likely disease name].	Acute Respiratory Failure
126	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Emergency

127	Current Issue: Lung nodule found on physical exam, asymptomatic. Additional Details: 45-year-old female, CT shows a small nodule in the right lung, diameter <6 mm, smooth edges, no smoking history, no cough or chest pain. Correct Diagnosis: [Please fill in the most likely disease name].	Pulmonary Nodule
128	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Self-Care
129	Current Issue: Sudden blindness and lower limb weakness for one day. Additional Details: 28-year-old female, post-intense argument with colleague, dyspnea, no abnormalities on examination, no limb paralysis, stable vital signs. Correct Diagnosis: [Please fill in the most likely disease name].	Conversion Disorder
130	Correct Triage: [Choose one from "Self-Care", "Within One Week", "Within One Day", "Emergency"].	Self-Care
131	Current Issue: Nasal congestion, sneezing, clear nasal discharge for one week. Additional Details: 25-year-old female, onset in spring, no fever, pale and edematous nasal mucosa, dust mite allergy. Correct Diagnosis: [Please fill in the most likely disease name].	Allergic Rhinitis

132

Correct Triage: [Choose one from
"Self-Care", "Within One Week",
"Within One Day", "Emergency"].

Self-Care

补充表 S8：问题与答案总结

题号	问题	答案
1	患者男，28 岁，鼻塞流涕 3 天，伴咽痛低热，确诊为普通感冒。以下是该病人的日常行为：每日补充维生素 C、熬夜工作至凌晨、坚持冷水浴、避免去人群密集处、未规范戴口罩。上述何种行为最易延缓恢复？	熬夜工作
2	患者女，19 岁，咽痛眼红伴结膜充血，确诊为咽结膜炎。以下是该病人的日常行为：每日盐水漱口、佩戴太阳镜外出、共用隐形眼镜护理液、隔离个人餐具、揉眼后未洗手。上述何种行为最易传播感染？	共用护理液
3	患者男，35 岁，反复咽痛伴化脓，有青霉素过敏史，确诊为扁桃体炎。以下是该病人的日常行为：温盐水漱口、避免辛辣饮食、自行停用止痛药、饮酒应酬频繁、使用加湿器。上述何种行为最易加重炎症？	饮酒应酬
4	患者女，67 岁，咳嗽咳痰伴发热，胸片示右下肺浸润影，确诊为社区获得性肺炎。以下是该病人的日常行为：接种流感疫苗、开窗通风、吸烟 20 支/日、高热时酒精擦浴、自行服用镇咳药。上述何种行为最易加重病情？	吸烟
5	患者男，42 岁，干咳 2 周，听诊无湿啰音，确诊为急性支气管炎。以下是该病人的日常行为：饮用蜂蜜水、使用空气净化器、过度使用喉糖、雾霾天晨跑、未佩戴口罩。上述何种行为最易刺激气道？	雾霾天晨跑

- 6 患者女，50 岁，咳恶臭脓痰，CT 示空洞伴液平，确诊为原发性肺脓肿。以下是该病人的日常行为：牙周炎未治疗、仰卧位排痰、每日口腔护理、酗酒后呕吐、拒绝支气管镜。上述何种行为最易致误吸呕吐物？
酗酒后呕吐
- 7 患者男，31 岁，BMI17.3，痰涂片阳性，确诊为浸润性肺结核。以下是该病人的日常行为：工作至深夜、每日蛋白质摄入<30g、坚持接种流感疫苗、雾霾天户外跑步。上述何种行为损坏免疫，最容易导致肺结核？
蛋白质不足
- 8 患者女，22 岁，闻油烟后喘息，峰流速下降，确诊为支气管哮喘。以下是该病人的日常行为：每周清洗被褥、使用空气净化器、饲养长毛猫、坚持记录哮喘日记、天气寒冷时外出戴口罩。上述何种行为最易诱发哮喘发作？
饲养长毛猫
- 9 患者女，34 岁，口服避孕药 5 年，突发胸痛 D-二聚体升高，确诊为肺栓塞。以下是该病人的日常行为：穿弹力袜、停用避孕药、长期卧床休息、长途飞行久坐、每日饮水量>2L。上述何种行为最容易促血栓形成？
久坐飞行
- 10 患者女，28 岁，活动后晕厥，右心导管 mPAP 48mmHg，确诊为肺动脉高压。以下是该病人的行为：低盐饮食、长期久坐不动、妊娠期拒绝终止妊娠、规律监测 NT-proBNP、失眠未停用治疗药物。上述何种行为最容易加重肺高压？
妊娠期拒绝终止妊娠
- 11 患者男，65 岁，吸烟指数 800，CT 发现 2cm 毛刺结节，确诊为肺癌。以下是该病人的日常行为：每天高油脂饮食、食用西兰花等抗氧化食物、接触石棉瓦、早起晚睡、练习腹式呼吸。上述何种行为是最明确的致癌因素？
接触石棉

12 患者男，19 岁，瘦高体型，突发胸痛伴呼吸困难，确诊为气胸。以下是该病人的日常行为：戒烟 3 个月、篮球赛时剧烈跳跃、避免乘坐飞机、长时间饮食后立即平卧休息。上述何种行为最易诱发气胸？

剧烈跳跃

13 患者女，35 岁，气管偏移颈静脉怒张，血氧 85%，确诊为张力性气胸。以下是该病人的行为：延误就医 6 小时、使用镇咳药、高流量吸氧、随身钢笔插入胸腔放气、家属按压伤口。上述何种紧急处置最合适？

随身钢笔插入胸腔放气

14 患者男，41 岁，低热胸痛，胸水 ADA 升高，确诊为结核性胸膜炎。以下是该病人的行为：间断服用利福平、高蛋白饮食、接触矽尘作业、长期吸烟、与结核性胸膜炎密切接触者接触。上述何种行为最易致耐药？

间断服药

15 患者女，27 岁，晨轻暮重性肌无力，呼吸费力，肌无力试验阳性，确诊为重症肌无力。以下是该病人的日常行为：高温泡澡放松、规律接种疫苗、过度跑步锻炼、感觉缓解后自行停用溴吡斯的明、未检测过胸腺瘤。上述何种行为最易加重肌无力？

停用药物

16 患者男，14 岁，胸骨凹陷 Haller 指数 4.2，确诊为漏斗胸。以下是该病人的日常行为：坚持游泳锻炼、使用 Nuss 矫形器、避免仰卧位睡眠、举重训练增肌、未监测心肺功能。上述何种行为最容易加重畸形？

举重训练

17 患者女，12 岁，胸骨前凸伴活动后气促，确诊为鸡胸。以下是该病人的日常行为：佩戴支具矫正、补充钙剂与维生素 D、进行扩胸运动、长期佝偻坐姿、习惯高枕睡眠。上述何种行为最影响发育？

佝偻坐姿

18	患者男，33 岁，寒性脓肿伴肋骨破坏，PPD 强阳性，确诊为胸壁结核。以下是该病人的日常行为：脓肿穿刺抽液、高热量饮食、与痰菌阳性家属接触、自行切开引流、间断服用异烟肼。上述何种行为最容易导致耐药，难以治愈病情？	间断服药
19	患者男，61 岁，进食后胸痛，钡餐示胃疝入胸腔，确诊为膈疝。以下是该病人的日常行为：餐后仰卧休息、使用腹带加压、吃饭小口慢咽、用力排便屏气。上述何种行为最容易增加腹压，加重膈疝？	用力排便
20	患者男，62 岁，有慢性阻塞性肺病病史 10 年，近两天呼吸急促、乏力加重，确诊急性呼吸衰竭住院。其日常行为包括：早上起床后喝杯热茶、饭后坐在阳台晒太阳、中午喜欢吃点坚果零食、晚上临睡前开窗吸入冷空气醒神、偶尔用热毛巾敷胸口。上述何种行为最易诱发急性呼吸衰竭？	开窗吸入冷空气醒神
21	58 岁男性，确诊为 COPD（慢性阻塞性肺疾病）。行为包括每日吸二手烟（配偶吸烟）、高盐饮食、长期熬夜刷短视频、爱吃腌制食品、煤矿工作 20 年、周末宅家不运动。问题：上述行为中导致其 COPD 的最高危险因素是？	煤矿工作 20 年（职业粉尘暴露）。
22	60 岁女性，确诊肺癌。日常行为包括每日喝含糖饮料、长期使用香薰蜡烛、吸烟 30 年、办公室久坐、睡眠不足、周末打麻将。问题：上述行为中肺癌唯一的高危因素是？	吸烟 30 年。
23	45 岁女性，反复支气管扩张感染。确诊为支气管扩张。日常行为包括每日喝冰奶茶、长期美甲（化学溶剂暴露）、熬夜追剧、高糖饮食、幼年百日咳未根治、养宠物猫。问题：上述行为中最明确的支气管扩张相关的高危因素是？	幼年百日咳未根治。

24 65 岁男性，确诊纤维化性间质性肺病。行为包括石棉厂工作 15 年、每日吃油炸食品、长期染发（化学暴露）、养花种草、偶尔饮酒、睡眠不足。问题：上述行为中最直接的肺纤维化相关的高危因素是？

石棉厂工作 15 年。

25 40 岁男性，确诊阻塞性睡眠呼吸暂停。日常行为包括每日喝碳酸饮料、BMI35、长期嚼槟榔、办公室久坐、爱吃夜宵、周末通宵打游戏。问题：上述行为中最主要的阻塞性睡眠呼吸暂停相关的高危因素是？

BMI 35（肥胖）。

26 患者男，55 岁，确诊食管癌，晚期出现吞咽困难、持续性咳嗽及呼吸困难（提示侵犯呼吸道）。日常行为包括喜食辣条（高添加剂食品）、务农、每日饮用高度白酒 20 年、长期嚼槟榔、每日喝烫咖啡、睡眠不规律。上述行为中明确的食管癌最高危因素是？

每日饮用高度白酒

27 28 岁男性，确诊肺结核。日常行为包括长期熬夜、高糖饮食、与结核病患者同住、养仓鼠、每日喝含糖饮料、周末通宵玩游戏。问题：上述行为中最直接的肺结核相关的高危因素是？

与结核病患者同住。

28 50 岁男性，确诊急性脓胸。日常行为包括酗酒（每日白酒 500ml）、务农、长期吃方便面、肺炎未规范治疗、骑摩托车通勤、睡眠不足。问题：上述行为中明确的急性脓胸相关的最高危因素是？

肺炎未规范治疗。

29 55 岁男性，确诊矽肺。日常行为包括每日饮酒、高盐饮食、长期熬夜、周末钓鱼（无防护）、石英砂厂工作 20 年、偶尔吸烟。问题：上述行为中与矽肺相关的最高危因素是？

石英砂厂工作 20 年。

30 25 岁女性，确诊手汗症。日常行为包括长期喝功能性饮料、每日加班至深夜、高糖饮食、熬夜刷短视频、周末宅家不运动、养宠物仓鼠。问题：上述行为中与手汗症相关的最高危的因素是？

每日加班至深夜（精神压力大）。

31 30 岁女性，确诊呼吸道异物梗阻。日常行为包括进食时说话或大笑、办公室久坐、用餐时使用手机、养宠物狗、周末练习瑜伽、经常食用果冻。问题：上述行为中明确的与呼吸道异物梗阻相关的最高危因素是？

进食时说话或大笑（导致食物误吸）。

32 40 岁女性，确诊过敏性肺炎。日常行为包括长期使用香薰蜡烛、高糖饮食、办公室久坐、周末烘焙、养鸽 5 年（每日清理鸟粪未防护）、睡眠不足。问题：上述行为中与过敏性肺炎相关的最直接高危因素是？

养鸽 5 年（鸟粪抗原暴露）。

33 60 岁女性，确诊真菌性肺炎。日常行为包括每日饮用蜂蜜水、养小猫小狗小鸟、高脂饮食、长期使用抗生素预防感冒、定期旅游、熬夜看剧。问题：上述行为中真菌性肺炎的最高危因素是？

使用抗生素预防感冒。

34 22 岁男性，突发气胸。日常行为包括瘦高体型（身高 190cm）、吸烟 2 年、每日喝碳酸饮料、熬夜打游戏、长期佩戴隐形眼镜、周末宅家不运动。问题：上述行为中最明确的与突发气胸相关的高危因素是？

瘦高体型（肺泡结构脆弱）。

35 38 岁女性，确诊膈疝。日常行为包括长期穿塑身衣、办公室久坐、BMI35（产后肥胖未减重）、每日喝奶茶、周末熬夜刷刷、高盐饮食。问题：上述行为中与膈疝相关的最直接高危因素是？

BMI 35（腹压增高）。

36 32 岁女性，确诊一氧化碳中毒。日常行为包括每日在地下室练习瑜伽（密闭空间）、长期熬夜追剧、办公室久坐、周末在家点香薰蜡烛放松、每日喝 5 杯咖啡提神，燃气热水器故障未修复。问题：上述行为中导致中毒的最直接高危因素是？

燃气热水器故障未修复

37 患者：30 岁女性，流感后发展为重症。行为包括未接种流感疫苗、地铁通勤未戴口罩、每天喝奶茶、熬夜加班、养宠物猫、周末逛街。问题：上述行为中流感相关的最直接高危因素是？

未接种流感疫苗（免疫防御缺失）。

38 患者：50 岁男性，确诊间质性肺病。日常行为包括养鸡场工作 15 年（禽类羽毛粉尘暴露）、每日吸烟、高脂饮食、周末钓鱼、家中会烧香、睡眠不足。问题：上述行为中与间质性肺病相关的最明确的高危因素是？

养鸡场工作 15 年（有机粉尘暴露）。

39 患者：25 岁女性，常年过敏性鼻炎。日常行为包括卧室堆放毛绒玩具（尘螨滋生）、每天喝咖啡、办公室空调直吹、熬夜刷手机、周末爬山、不吃辛辣食物。问题：上述行为中与过敏性鼻炎相关的最高危因素是？

卧室毛绒玩具（尘螨暴露）。

40 患者：45 岁女性，突发肺栓塞。日常行为包括作为程序员的久坐工作、口服避孕药 5 年、每周吃烧烤、爱穿高跟鞋、周末宅家追剧、养宠物兔。问题：上述行为中明确的与突发性肺栓塞相关的最高危因素是？

口服避孕药 5 年（增加血栓风险）。

41 患者男，58 岁，晚期肺癌化疗后确诊肺曲霉菌感染。日常行为包括长期使用激素（未遵医嘱减量）、家中养花（潮湿盆栽土壤）、每日喝蜂蜜水、未戴口罩外出、周末打高尔夫、高糖饮食。问题：上述行为中导致曲霉菌感染的最高危因素是？

长期使用激素（免疫抑制）。

42 男性 COPD (慢性阻塞性肺疾病) 患者, 58 岁, 昏迷不醒, 确诊为呼吸性酸中毒昏迷。行为包括吸入百分百纯氧保健、每日喝功能饮料、焦虑过度换气、未监测血氧、家中使用了空气净化器、周末卧床不动。问题: 上述行为中直接诱发昏迷的因素是?

吸高浓度纯氧 (过度氧疗抑制呼吸中枢)。

43 患者女, 30 岁, 健康史无异常, 昨晚使用煤炉取暖后出现头晕、恶心, 送医确诊为一氧化碳中毒。其行为包括: 睡觉前关紧窗户、晚饭后洗热水澡、用电磁炉烧水泡茶、点蚊香助眠、每日早起做瑜伽。上述何种行为是一氧化碳中毒的直接原因?

睡觉前关紧窗户

44 患者男, 55 岁, 心脏病史 5 年, 确诊肺水肿后住院, 近来呼吸困难和咳嗽加重。其日常行为包括: 每天早饭后看会儿报纸、睡前喝点温水听音乐、饭后喜欢坐沙发上刷手机、偶尔下楼遛狗、中午小睡 20 分钟, 经常受冷感冒。上述何种行为最易加重肺水肿?

经常受冷感冒

45 当前问题: 感到疲倦和鼻塞两天。额外细节: 30 岁男性, 轻度咽痛, 无发热, 接触过生病同事。正确诊断: [请填写最可能的疾病名称]。

普通感冒

46 正确分诊: [请从“自我护理”“一周内”“一天内”“紧急”中选择一项]。

自我护理

47 当前问题: 咽痛和吞咽困难。额外细节: 12 岁男性, 发热 38.5°C , 扁桃体红肿, 颈部淋巴结肿大。正确诊断: [请填写最可能的疾病名称]。

扁桃体炎

48 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 一天内

49 当前问题：发热和咳嗽带痰五天。额外细
节：50 岁男性，吸烟者，呼吸稍快，咳绿
色痰，伴胸闷。正确诊断：[请填写最可能
的疾病名称]。 社区获得性肺炎

50 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 一周内

51 当前问题：咳嗽和喘息三天。额外细节：
35 岁女性，无发热，有过敏史，CT 显示支
气管壁轻度增厚，伴胸闷和鼻塞。正确诊
断：[请填写最可能的疾病名称]。 急性支气管炎

52 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 一天内

53 当前问题：高热和胸痛一周。额外细节：
45 岁男性，咳脓样痰，体重减轻，长期卧
床，有糖尿病史。正确诊断：[请填写最可
能的疾病名称]。 原发性肺脓肿

54 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 紧急

55 当前问题：慢性咳嗽、夜间出汗较多。额外细节：40 岁男性，吸烟史，体重减轻，与结核病患者有接触史，疲劳。正确诊断：[请填写最可能的疾病名称]。 肺结核

56 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 一周内

57 当前问题：持续咳嗽和低热。额外细节：60 岁女性，免疫功能低下，长期使用抗生素预防感冒，伴食欲下降。正确诊断：[请填写最可能的疾病名称]。 真菌性肺炎

58 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 一周内

59 当前问题：咳嗽和发热，农村旅行后。额外细节：33 岁男性，疲倦，最近吃过大量生肉，伴腹泻和关节痛。正确诊断：[请填写最可能的疾病名称]。 肺寄生虫病

60 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 一周内

当前问题：呼吸急促和喘息。额外细节：
患者男，28 岁，因呼吸急促和喘息就诊，
伴有胸闷感。症状在接触灰尘后加重，无
61 发热，无咳嗽或咳痰报告。患者自述过去
曾有类似症状反复发作，可能与某些环境
因素有关，但未提及具体诊断。正确诊断：
[请填写最可能的疾病名称]。 支气管哮喘

62 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 一天内

当前问题：慢性咳嗽和活动时气短。额外
细节：65 岁男性，前吸烟者，长期咳嗽，
63 活动耐力下降，伴下肢水肿。正确诊断：[请
填写最可能的疾病名称]。 COPD

64 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 一周内

当前问题：咳血痰数周。额外细节：50 岁
女性，反复感染，有支气管炎史，百日咳
65 病，伴胸痛和乏力。正确诊断：[请填写最
可能的疾病名称]。 支气管扩张

66 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 一周内

当前问题：进行性呼吸困难，加重一天。
额外细节：70 岁男性，干咳，无吸烟史，
67 伴指端杵状指和乏力，胸部 CT 显示双肺间 特发性肺纤维化
质性改变和蜂窝肺。正确诊断：[请填写最
可能的疾病名称]。

68 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 一天内

当前问题：干咳和疲倦多年。额外细节：
69 55 岁男性，矿工，长期粉尘暴露，伴活动 尘肺病
后气短。正确诊断：[请填写最可能的疾病
名称]。

70 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 一周内

当前问题：农活后喘息和发热。额外细节：
42 岁女性，无哮喘史，近期接触霉变干草，
71 伴皮肤瘙痒。正确诊断：[请填写最可能的 过敏性肺炎
疾病名称]。

72 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 一天内

73 当前问题：突发胸痛和呼吸困难。额外细
节：60 岁女性，近期手术，右腿肿胀，伴
心悸和头晕。正确诊断：[请填写最可能的
疾病名称]。 肺栓塞

74 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 紧急

75 当前问题：疲倦和呼吸急促。额外细节：
45 岁女性，脚踝肿，无近期感染，伴头晕
和紫绀。正确诊断：[请填写最可能的疾病
名称]。 肺动脉高压

76 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 一周内

77 当前问题：慢性咳嗽和体重减轻。额外细
节：68 岁男性，吸烟者，咳血，伴胸痛和
食欲下降。正确诊断：[请填写最可能的疾
病名称]。 肺癌

78 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 一天内

79 当前问题：鼾声大和白天嗜睡。额外细节：
40 岁男性，肥胖，伴侣报告夜间呼吸暂停，
伴晨起头痛。正确诊断：[请填写最可能的
疾病名称]。 阻塞性睡眠呼吸暂停

80 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 一周内

81 当前问题：突发胸痛和呼吸急促。额外细
节：30 岁男性，身材高瘦，近期在运动后
突发右胸部剧烈疼痛，但疼痛感短暂，休
息后明显减轻，无持续性胸痛。偶有轻微
呼吸不畅，但无紫绀或严重呼吸急促。胸
片显示右肺局部透亮度略增。正确诊断：
[请填写最可能的疾病名称]。 气胸

82 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 自我护理

83 当前问题：胸部伤口有吸气声。额外细节：
25 岁男性，被刺伤，空气从伤口进入，伴
发绀和低血压。正确诊断：[请填写最可能
的疾病名称]。 开放性气胸

84 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 紧急

85 当前问题：严重呼吸困难和胸压感。额外
细节：35 岁男性，外伤后，呼吸极度困难，
伴颈静脉怒张和低氧。正确诊断：[请填写
最可能的疾病名称]。 张力性气胸

86 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 紧急

87 当前问题：胸痛和低热。额外细节：38 岁
女性，有结核史，伴胸闷和乏力，胸腔积
液。正确诊断：[请填写最可能的疾病名
称]。 结核性胸膜炎

88 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 一天内

89 当前问题：无明显症状，体检发现异常。
额外细节：45 岁男，吸烟史 20 年，胸片
显示右肺尖部位有一个明显的、单发的大
疱，形态较为规则，边界清晰，无气胸或
感染征象。正确诊断：[请填写最可能的疾
病名称]。 肺大疱

90 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 自我护理

91 当前问题：体检发现肺部异常。额外细节：
男，45 岁，CT 检查发现右肺实性光滑肿物，
边界清晰。正确诊断：[请填写最可能的疾
病名称]。 肺囊肿

92 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 自我护理

93 当前问题：反复咳嗽伴感染，加重一天。
额外细节：女，30 岁，体温 38.9℃，咳黄
绿色脓痰，口服阿莫西林无效 CT 检查发现
左下肺异常区域，与正常肺组织分隔，伴
有异常血管供应。正确诊断：[请填写最可
能的疾病名称]。 肺隔离症

94 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 一天内

95 当前问题：进行性吞咽困难和胸痛数月。
额外细节：60 岁男性，体重减轻，吸烟者，
伴反酸和声音嘶哑。正确诊断：[请填写最
可能的疾病名称]。 食管癌

96 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 一天内

当前问题：近 6 个月胸闷及偶发性干咳就诊。额外细节：42 岁女性，伴间歇性胸骨后不适及轻度肌无力感，症状于活动后加重，休息后缓解。患者自述偶有上肢轻微无力，否认明显体重下降、发热或夜间盗汗。一般情况尚可，双上肢肌力稍减。胸部 CT 示前纵隔胸腺区肿块，大小约 4.0×3.8 厘米，边界清晰，密度均匀。正确诊断：[请填写最可能的疾病名称]。 胸腺瘤

98 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 一周内

当前问题：肌肉无力，眼睑下垂，活动后气短。额外细节：35 岁女性，晨起症状轻微，傍晚眼睑下垂加重，伴偶发复视（每日 1-2 次，持续数分钟），无吞咽困难。正确诊断：[请填写最可能的疾病名称]。 肌无力

100 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 一周内

101 当前问题：自幼胸部畸形。额外细节：18岁男性，胸部凹陷，无呼吸困难，无心理和外观压力。正确诊断：[请填写最可能的疾病名称]。

漏斗胸

102 正确分诊：[请从“自我护理”“一周内”“一天内”“紧急”中选择一项]。

自我护理

103 当前问题：出生时胸部突出。额外细节：15岁女性，无疼痛，无外观困扰，无活动受限。正确诊断：[请填写最可能的疾病名称]。

鸡胸

104 正确分诊：[请从“自我护理”“一周内”“一天内”“紧急”中选择一项]。

自我护理

105 当前问题：胸壁疼痛和肿胀。额外细节：40岁男性，有结核史，局部有瘰管流脓，伴低热和乏力。正确诊断：[请填写最可能的疾病名称]。

胸壁结核

106 正确分诊：[请从“自我护理”“一周内”“一天内”“紧急”中选择一项]。

一天内

107 当前问题：胸痛和呼吸急促。额外细节：30 岁男性，车祸后，胸部压痛明显，伴紫绀和低氧。正确诊断：[请填写最可能的疾病名称]。 胸部外伤（肋骨骨折伴血气胸）

108 正确分诊：[请从“自我护理”“一周内”“一天内”“紧急”中选择一项]。 紧急

109 当前问题：重型事故后突发呼吸困难就诊，伴有喉部不适、持续性咳嗽及胸骨后撕裂样疼痛。额外细节：32 岁男性，症状起病急骤，患者自述事故后即感气促，咳嗽时加重，伴大量血痰、呼吸时有“漏气感”，呼吸急促，血氧饱和度 88%，双侧胸部呼吸音不对称，右侧呼吸音减弱明显，伴局部哮鸣音，颈部及上胸部皮下气肿明显，纵隔区可闻及“咯吱声”。正确诊断：[请填写最可能的疾病名称]。 气管支气管断裂

110 正确分诊：[请从“自我护理”“一周内”“一天内”“紧急”中选择一项]。 紧急

111 当前问题：发热和胸痛一周。额外细节：50 岁男性，近 1 周来主诉右侧胸痛，描述为刺痛感，尤其在深呼吸或咳嗽时加重。他感到明显的呼吸困难，称“喘不过气来”，尤其在活动后更为明显。患者还提到持续的干咳，偶尔咳出少量黄色脓性痰。病人同时报告近期确诊肺炎，伴高热寒战和胸闷。正确诊断：[请填写最可能的疾病名称]。 急性脓胸

112 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 紧急

113 当前问题：呕吐后剧烈胸痛。额外细节：
55 岁男性，酗酒史，伴吞咽困难和高热，
颈部有皮下捻发感。正确诊断：[请填写最
可能的疾病名称]。 食管穿孔

114 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 紧急

115 当前问题：手部多汗。额外细节：25 岁女
性，压力时加重，伴手掌湿冷，无其他系
统症状。正确诊断：[请填写最可能的疾病
名称]。 手汗症

116 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 自我护理

117 当前问题：腹痛和呼吸困难。额外细节：
60 岁男性，外伤后上腹持续钝痛阵发加
剧，疼痛向胸部放射，静息时就呼吸急促，
深呼吸或活动后加重伴胸闷。有恶心呕吐，
初为胃内容物后含胆汁且次数增多。胸腹
部压迫感和不适感使无法正常进食休息，
症状持续且加重。正确诊断：[请填写最可
能的疾病名称]。 膈疝

118 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 紧急

当前问题：活动后呼吸困难和夜间阵发性
呼吸困难加重 1 天。额外细节：65 岁女性，
119 有高血压和慢性心衰病史，轻微咳嗽伴少
量白色痰，无粉红色泡沫痰。血压 肺水肿
150/90mmHg，心率 90 次/分。既往胸片示
双肺弥漫性阴影。正确诊断：[请填写最可
能的疾病名称]。

120 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 一天内

当前问题：昏迷不醒。额外细节：30 岁男
性，密闭室内取暖后头痛、恶心，突发昏
121 迷，皮肤樱桃红。正确诊断：[请填写最可
能的疾病名称]。 一氧化碳中毒

122 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 紧急

当前问题：发热头痛两天。额外细节：25
岁女性，发热 38.5℃，头痛乏力，咽痛轻
123 微，无呼吸困难。正确诊断：[请填写最可
能的疾病名称]。 流感

124 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 自我护理

125 当前问题：呼吸困难加重。额外细节：65岁男性患者，既往有慢阻肺病史。此次突然发病，气促加重、呼吸困难持续，静息与活动时均严重不适，活动耐力下降。自觉胸闷、咳嗽、痰少，口唇发绀，精神疲倦嗜睡，自带血氧仪示血氧饱和度明显下降。正确诊断：[请填写最可能的疾病名称]。 急性呼吸衰竭

126 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 紧急

127 当前问题：体检发现肺结节，无症状。额外细节：45岁女性，CT显示右肺小结节直径<6mm，边缘光滑，无吸烟史，无咳嗽或胸痛。正确诊断：[请填写最可能的疾病名称]。 肺结节

128 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 自我护理

129 当前问题：突发性失明和下肢无力1天。额外细节：28岁女性，与同事激烈争执后呼吸急促后发病，检查无异常，无肢体瘫痪体征，生命体征平稳。正确诊断：[请填写最可能的疾病名称]。 癔症

130 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 自我护理

131 当前问题：鼻塞、打喷嚏、流清涕一周。
额外细节：25 岁女性，春季发病，无发热，
鼻黏膜苍白水肿，尘螨过敏。正确诊断：[请
填写最可能的疾病名称]。 过敏性鼻炎

132 正确分诊：[请从“自我护理”“一周内”
“一天内”“紧急”中选择一项]。 自我护理

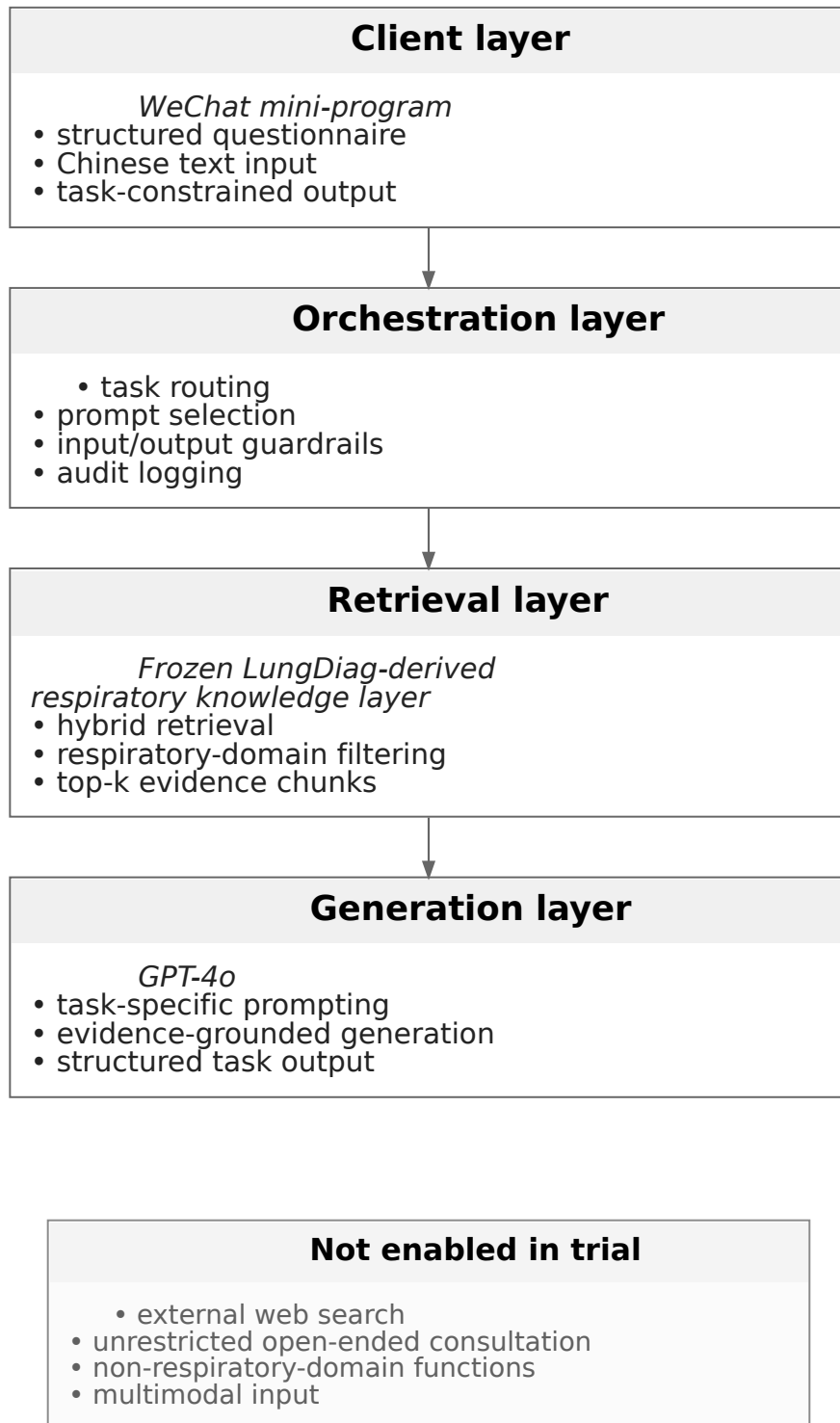
Supplementary Appendix A. Trial-time Implementation of the GPT-4o / LungDiag-derived Mini-program Intervention

This appendix provides a full operational specification of the intervention that was deployed and tested during the trial. It is written so that an independent team could reproduce the system at the architectural and workflow level, while commercially sensitive assets (exact prompt text, proprietary retrieval-engine configuration, and the LungDiag-derived knowledge layer) remain undisclosed. Where disclosure is withheld, we give a functionally equivalent mock specification sufficient for appraisal.

A1. Architecture overview

The evaluated intervention is an integrated system with four layers (Figure A1):

1. **Client layer** — a WeChat mini-program that renders the structured questionnaire, accepts Chinese text input, and displays task-constrained output.
2. **Orchestration layer** — a stateless task router (Xingyun-hosted) that enforces the three-task workflow, selects the matching prompt template, enforces input/output guardrails, and writes audit logs.
3. **Retrieval layer** — a retrieval-augmented generation (RAG) stack that queries a frozen LungDiag-derived respiratory knowledge layer and returns the top-k respiratory-domain chunks.
4. **Generation layer** — GPT-4o (OpenAI), accessed through APIYI-routed API under commercial paid terms, invoked with task-specific prompts plus retrieved evidence.



Supplementary Figure A1. Trial-time architecture and deployment boundaries of the GPT-4o/LungDiag-derived WeChat mini-program intervention. The diagram summarizes the participant-facing WeChat mini-program client layer, the orchestration layer, the frozen LungDiag-derived respiratory knowledge retrieval layer and the GPT-4o generation layer used during the trial. It also shows functions that were not enabled in the deployed trial version, including external web search, unrestricted open-ended consultation, non-respiratory-domain functions and multimodal input.

The reference open-source stack used to rebuild an equivalent pipeline is:

- **LangChain** (<https://github.com/langchain-ai/langchain>) or **LlamaIndex** (https://github.com/run-llama/llama_index) for orchestration and retriever composition.
- **BGE-M3** (<https://github.com/FlagOpen/FlagEmbedding>) for Chinese-capable dense + sparse embeddings.
- **FAISS** (<https://github.com/facebookresearch/faiss>) or **Milvus** (<https://github.com/milvus-io/milvus>) for the vector store.
- **bge-reranker-v2-m3** for cross-encoder reranking.
- Alternative end-to-end reference: **LightRAG** (<https://github.com/HKUDS/LightRAG>) for graph-augmented retrieval; this matches the "knowledge-graph reasoning" terminology used in the main text and was used during internal prototyping to validate the retrieval topology.

The deployed trial version is a proprietary adaptation of the above topology. Any re-implementation built from these open-source components against a comparable respiratory knowledge layer will reproduce the functional behavior evaluated in the trial.

A1.1 Participant-facing access pathway

To document the participant-facing access route to the evaluated intervention, we provide the public-facing platform URL and the WeChat mini-program entry QR code used for access to the mini-program interface.

Supplementary Figure A2. Participant-facing access route to the evaluated intervention

a, Public-facing platform URL associated with the intervention: <https://www.xingyunjk.com>

b, WeChat mini-program entry QR code corresponding to the participant access route used in the

study.



A2. LungDiag-derived respiratory knowledge layer

A2.1 Provenance

The knowledge layer is derived from the LungDiag respiratory diagnostic framework (Liang et al., *MedComm* 2025;6:e70043), which was itself built from 31,267 de-identified electronic health records (EHRs) from the National Center for Respiratory Medicine and affiliated centers (admission dates 1 Nov 2012 – 30 Oct 2019) and externally tested on 1,142 EHRs from three additional hospitals. The original framework uses a Bi-LSTM-CRF named-entity recognizer with BIO tagging, the PIAT interactive annotation platform, UMLS/ICD-10 concept standardization, and a fine-grained deep-phenotyping pipeline that yielded 252 standardized clinical features across 10 respiratory disease categories (COPD, bronchial asthma, bronchiectasis, airway stenosis, pulmonary hypertension, lung space-occupying lesions / lung cancer, pulmonary infectious diseases, pulmonary tuberculosis, pleural disease, interstitial lung disease).

A2.2 Scope, form, and transformations applied for the trial

For the present trial, the knowledge layer was re-engineered from the LungDiag feature graph into a retrievable document corpus. No raw identifiable EHR text was indexed. The indexed content consists of:

- **Disease concept cards** (n ≈ 10 major categories + subtypes): canonical name, ICD-10 codes, typical chief complaints, cardinal and supporting symptoms, imaging patterns, laboratory signatures, first-line medications, common differentials.
- **Symptom → disease association records** (n ≈ 250 standardized features × weighted edges to the 10 disease categories), serialized as short evidence statements ("productive cough > 3 months in ≥ 2 consecutive years is associated with COPD...").
- **Triage-pattern records**: red-flag symptom clusters mapped to the four trial triage levels (emergency, within one day, within one week, self-care), derived from category-level EHR outcomes and cross-referenced against the respiratory terminology base of 11,988 clinical terms released with the original LungDiag study.

Questionnaire cases, gold-standard answers, and scoring rubrics were held out of the index and stored in a separate audit-only repository (Appendix B, Appendix C); no chunk in the retrieval index

contains trial case text, trial diagnostic keys, or triage keys.

A2.3 Chunking and indexing

Each record was segmented into semantic chunks of 256–512 tokens with a 64-token overlap using a recursive-character splitter with Chinese sentence-boundary heuristics (equivalent to LangChain's RecursiveCharacterTextSplitter configured for Chinese punctuation). Chunks carry the following metadata: doc_id, disease_category, content_type ∈ {disease_card, symptom_association, triage_pattern}, source_version. Embeddings were produced with a BGE-family Chinese embedding model; a parallel sparse index (BM25) was built for hybrid retrieval. The vector store was hosted inside the Tier-III-classified environment; chunks never leave the deployment perimeter.

A2.4 Guideline relationship

Guideline materials from the Chinese Medical Association Respiratory Disease Branch, GOLD, and ATS/ERS were used only for questionnaire construction and Delphi gold-standard adjudication (see Methods, Clinical Case Construction). These guideline documents were **not** indexed into the trial-time knowledge layer. This separation was verified by (i) hashing every document in the knowledge-layer corpus, (ii) hashing every questionnaire case and gold-standard answer, and (iii) confirming no hash overlap before freeze.

A2.5 Governance, freeze, and update policy

The knowledge layer is owned and maintained by the authors' research group. Vendors (Xingyun, APIYI) had no role in content governance, curation, or updates. The trial-time release (internal version V1.0) was frozen on 31 March 2025, before participant enrollment, and remained fixed throughout enrollment (April–June 2025). No content edits, re-embeddings, or schema changes were performed during enrollment. Post-trial updates follow a separate governance cycle outside the scope of this report.

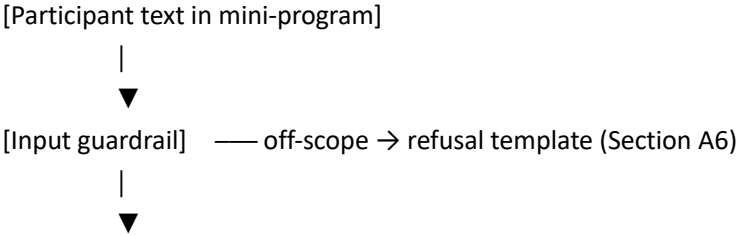
A2.6 Retrieval-quality management

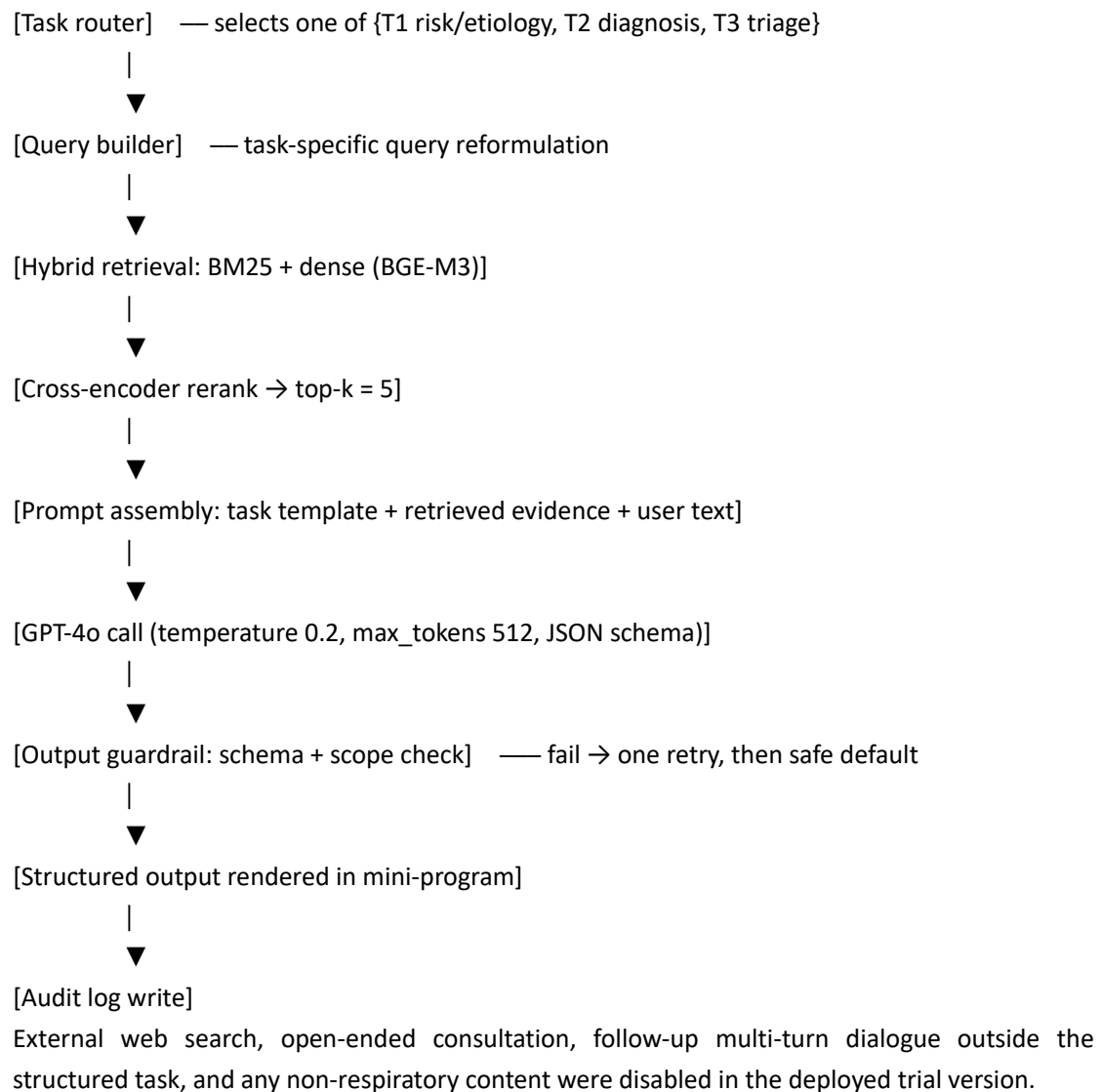
No standalone retrieval benchmark was prespecified as a primary outcome. Retrieval relevance was managed as a trial-time quality-control process:

- **Pre-deployment checks:** 200 synthetic respiratory queries (stratified over the 10 disease categories and three task types) were executed; the primary acceptance criterion was that ≥ 1 of the top-5 retrieved chunks carried metadata matching the ground-truth disease category (in internal checks the observed rate was ≥ 0.9; the exact figure is recorded in the internal acceptance report).
- **Audit logging during trial:** every retrieval call wrote retrieval_status, retrieved_doc_ids, and retrieval_score_top1 to the audit log (Section A7), enabling post hoc inspection of retrieval behavior without altering the deployed logic.

A3. Trial-time workflow

For every participant–item pair the workflow was:





A4. Prompt frameworks (mock equivalents)

The exact prompt strings are proprietary. The following mock templates are functionally equivalent at the task and structure level and can be used by an independent team to reproduce the workflow. Placeholders use {{variable}} syntax.

A4.1 System prompt (shared)

You are a clinical-information assistant constrained to the respiratory disease domain. You answer only three task types: (T1) risk-behavior or etiologic clue identification, (T2) preliminary diagnosis, (T3) triage recommendation.

Rules:

- Use only the information in {{retrieved_evidence}} and the user's case text.
- If the user's question is not respiratory, reply with the refusal template.
- Return a single JSON object matching the schema for the current task.
- Do not provide treatment plans, drug dosing, or procedural instructions.
- Do not invent evidence not present in {{retrieved_evidence}}.
- All responses are in simplified Chinese.

A4.2 Template 1 — Risk-behavior / etiology identification (T1)

Task: Identify the single highest-risk behavior or etiologic clue implied by the case.

Case text:

{{user_case_text}}

Retrieved respiratory-domain evidence (top-k, frozen knowledge layer):

{{retrieved_evidence}}

Respond as JSON:

```
{
  "task": "T1_risk",
  "risk_factor": "<short noun phrase, in Chinese>",
  "evidence_chunk_ids": ["<id1>", "<id2>", ...],
  "confidence": "<high|medium|low>"
}
```

A4.3 Template 2 — Preliminary diagnosis (T2)

Task: Select the single most likely preliminary respiratory diagnosis from the case. Restrict the answer to respiratory conditions supported by the retrieved evidence.

Case text:

{{user_case_text}}

Retrieved respiratory-domain evidence (top-k, frozen knowledge layer):

{{retrieved_evidence}}

Respond as JSON:

```
{
  "task": "T2_diagnosis",
  "preliminary_diagnosis": "<single Chinese disease term>",
  "supporting_features": ["<feature 1>", "<feature 2>", ...],
  "evidence_chunk_ids": ["<id1>", "<id2>", ...],
  "confidence": "<high|medium|low>"
}
```

A4.4 Template 3 — Triage recommendation (T3)

Task: Produce a triage recommendation from the four trial categories: "emergency", "within one day", "within one week", "self-care". Base the recommendation on symptom severity, red-flag features, and the retrieved evidence.

Case text:

{{user_case_text}}

Retrieved respiratory-domain evidence (top-k, frozen knowledge layer):

{{retrieved_evidence}}

Respond as JSON:

```
{
  "task": "T3_triage",
  "triage_level": "<emergency|within_one_day|within_one_week|self_care>",
  "red_flags": [<flag 1>, <flag 2>, ...],
  "rationale": "<one-sentence Chinese justification>",
  "evidence_chunk_ids": [<id1>, <id2>, ...]
}
```

A4.5 Refusal template (out-of-scope)

```
{
  "task": "refusal",
  "reason": "该问题不在本工具的呼吸系统评估范围内；请咨询相关专科医生。"
}
```

The production system uses internally optimized Chinese prompt strings with additional safety language. The mock templates above preserve the **task boundary**, **required output schema**, **evidence-grounding requirement**, and **refusal behavior** that an independent evaluator needs to reproduce the system's behavioral envelope.

A5. Retrieval and generation configuration (functional specification)

Parameter	Deployed trial value	Reference open-source equivalent
Chunk size	256–512 tokens, 64-token overlap	RecursiveCharacterTextSplitter (LangChain)
Embedding model	BGE-family Chinese dense model	BAAI/bge-m3 (HuggingFace)
Sparse index	BM25 over segmented Chinese text	rank_bm25 + jieba tokenizer
Hybrid fusion	Reciprocal-rank fusion	LlamaIndex QueryFusionRetriever
Reranker	Cross-encoder, Chinese-capable	BAAI/bge-reranker-v2-m3
Top-k retrieved	5	—
Domain filter	metadata = respiratory	Vector-store metadata filter
LLM	GPT-4o (OpenAI)	—
Temperature	0.2	—
max_tokens	512	—

Parameter	Deployed trial value	Reference open-source equivalent
Output format	JSON schema enforced	response_format={"type":"json_object"}
Retry policy	1 retry on schema failure, then safe default	—

Exact chunking parameters, reranker thresholds, domain filters, and query-rewrite rules used in the deployed version are proprietary. The values above are documented at the resolution needed to reproduce functional behavior; fine-tuning within the specified ranges does not change the trial-time task boundaries.

A6. Guardrails

Three guardrail layers were active throughout enrollment:

1. **Input guardrail** — a keyword + classifier check rejected questions outside the respiratory domain, queries requesting drug dosing or surgical instructions, and queries requesting identification of individuals. Rejections returned the refusal template (A4.5) and were logged with error_flag = "out_of_scope".
2. **Retrieval guardrail** — queries returning zero respiratory-domain chunks above a minimum similarity threshold triggered a "low-evidence" path: the system returned the refusal template rather than generating unsupported output, and logged retrieval_status = "low_evidence".
3. **Output guardrail** — the generated JSON was validated against the task's schema; unknown fields, missing required fields, or out-of-vocabulary values (e.g., triage level not in the four allowed strings) caused one automatic retry with a stricter reminder, then — if the retry also failed — a safe default response was returned (refusal for T1/T2; "within_one_week" with an explicit uncertainty note for T3) and error_flag = "schema_fail" was recorded.

The deployed system does **not** fall back to unrestricted GPT-4o responses, external web search, or cached answers when a guardrail trips.

A7. Logging fields

Every participant–item call wrote a single audit record with the following fields:

Field	Description	Use
timestamp_utc	ISO-8601 server timestamp	Audit trail
session_id	Salted hash of participant/session identifier	De-identified linkage
assigned_task_type	T1 / T2 / T3	Workflow trace
user_input_text	Verbatim Chinese input	Audit + post hoc review

Field	Description	Use
retrieval_status	ok / low_evidence / error	QC
retrieved_doc_ids	List of top-k chunk IDs (hashed references)	Retrieval audit
retrieval_score_top_1	Top-1 rerank score	Retrieval audit
ai_output_text	Raw JSON string returned by GPT-4o	Audit + scoring support
error_flag	none / out_of_scope / low_evidence / schema_fail / api_error	Failure mode tracing
completion_time_ms	Wall-clock turn latency	Secondary outcome
model_version	GPT-4o model tag reported by API	Reproducibility
knowledge_layer_version	V1.0 (frozen 2025-03-31)	Reproducibility

Logs were read-only for investigators, reviewed for operational health only, and did not feed back into the deployed logic during enrollment.

A8. Failure modes and handling

Failure mode	Detection	Handling	Logged flag
Off-scope user input	Input guardrail	Refusal template	out_of_scope
No relevant retrieval	Score < threshold	Refusal template	low_evidence
LLM API timeout / error	API layer	One retry; then safe default response	api_error
Malformed JSON output	Output schema validator	One retry with stricter reminder; then safe default	schema_fail
Triage level outside four allowed values	Output schema validator	Same as above; safe default = within_one_week + uncertainty note	schema_fail

Failure mode	Detection	Handling	Logged flag
Mini-program / network error on client	Client telemetry	Participant re-prompted; item recorded as unanswered	—

All failure paths are **rule-bound and non-adaptive**: the deployed intervention logic was not modified mid-enrollment on the basis of any individual output.

A9. Deployment boundaries

The evaluated workflow was restricted to:

- text-only Chinese input inside the mini-program;
- retrieval from the frozen LungDiag-derived respiratory knowledge layer only;
- one of three task-constrained outputs per call;
- no external web search, no unrestricted open-ended consultation, no multi-turn follow-up outside the structured questionnaire, no image or voice input, no connection to patient EHRs.

Features available in the broader product environment but not enabled during the trial are out of scope for this evaluation.

A10. Availability, reproducibility, and non-disclosure boundary

Released (DOI-backed, citable):

- Statistical analysis code: <https://github.com/asleepm/rct-analysis-code>
- Supplementary Appendix A (this document), Appendix B (scoring rubric and questionnaire administration), Appendix C (composition of the 88-case respiratory question bank), Supplementary Data 1 (triage urgency source data).

Provided in Supplementary Table S8: full questionnaire materials and gold-standard answer keys.

Not released (commercial / data-governance constraints):

- Trial-specific WeChat mini-program source code.
- Exact internal prompt text, exact chunking and reranker thresholds, proprietary retrieval-engine configuration.
- The LungDiag-derived respiratory knowledge layer itself.

Minimal reproducible specification provided instead (this appendix): architecture, knowledge-layer provenance/scope/governance/freeze policy, chunking and embedding approach with open-source equivalents, mock prompt templates preserving the task/schema envelope, guardrail layers, logging fields, failure-mode table, and deployment boundaries. An independent team building a system against the above specification with the open-source stack listed in Section A1 can reproduce the functional behavior evaluated in this trial.

Supplementary Table A1. LungDiag-derived respiratory knowledge layer (trial-time summary)

Attribute	Value
Trial-time role	Evidence-support layer for RAG; not a case bank, answer-key repository, or scoring rubric

Attribute	Value
Provenance	Derived from LungDiag EHR-based respiratory framework (Liang et al., 2025)
Data form	Standardized concept cards, symptom–disease associations, triage patterns; no raw identifiable EHR text
Clinical scope	Respiratory disease-related content only
Terminology scope	Disease names, symptoms, laboratory tests, imaging findings, medications, procedures
Disease categories	10 original LungDiag categories
Guideline relationship	Guideline and questionnaire materials maintained separately; not indexed
Chunk size	256–512 tokens, 64-token overlap
Embedding	BGE-family Chinese model
Retrieval	Hybrid dense + BM25, cross-encoder rerank, top-k = 5
Trial version	Frozen internal release V1.0
Freeze date	31 March 2025 (before enrollment)
Update policy	Fixed throughout enrollment (April–June 2025)
Governance	Authors' research group; Xingyun/APIYI had no governance role
Leakage prevention	Hash-based separation of index from questionnaire/answer keys
Retrieval QC	Pre-deployment acceptance checks + trial-time audit logging
Interpretation boundary	Evaluates the integrated mini-program, not the knowledge layer in isolation

Supplementary Table A2. Trial-time logging categories

See Section A7 above. All fields were captured for every participant–item call.

Appendix B. Scoring rubric and questionnaire administration

This appendix summarises the scoring rules and administration procedures used for the questionnaire-based assessment in the trial.

1. Scope of the questionnaire

The questionnaire comprised risk-related behavior or etiologic clue identification items, diagnosis items, and triage items. Diagnosis items and triage items shared the same case stem but were scored independently.

2. Scoring rules for risk-related behavior or etiologic clue identification items

Respondents were required to identify and enter the single most relevant high-risk behavior or etiologic clue based on the information provided in the case stem. Responses that did not follow the task instruction were considered invalid. Blank responses, responses consisting only of numbers, or clearly irrelevant free-text entries were treated as invalid questionnaire responses and were excluded from analysis.

3. Scoring rules for diagnosis items

Each diagnosis item had one predefined correct diagnostic target. Respondents were required to provide one and only one diagnosis. Multiple diagnoses entered for a single item were scored as incorrect. Clinically equivalent disease names or synonymous expressions were accepted, provided that they matched the intended diagnosis defined in the answer key. Thus, more than one wording could be acceptable, but only one diagnosis could be submitted for scoring.

4. Scoring rules for triage items

Respondents were required to select one and only one response from the four predefined triage categories: "Self-care," "Within a week," "Within a day," and "Emergency." Multiple selections for a single item were scored as incorrect. Responses that did not correspond to one of the four predefined triage categories were also scored as incorrect.

5. Relationship between diagnosis and triage scoring

Diagnosis and triage items were scored separately even when linked to the same case stem. A correct diagnosis did not imply a correct triage decision, and vice versa.

6. Questionnaire administration and supervision

Questionnaire completion was conducted under standardised supervision. All facilitators received training before trial implementation and were required to follow uniform procedures. Facilitators were not permitted to disclose, suggest, or hint at the correct answers. Their role was limited to explaining how to complete the questionnaire according to the item instructions, how to use the mini-program for information retrieval when applicable, and how to supervise completion in a standardised manner.

7. Key principles used for scoring

Item type	Valid response	Incorrect / invalid response
Risk / Etiology	One most relevant high-risk behavior or etiologic clue	Blank, number-only, irrelevant text, or answers not following the stem instruction

Diagnosis	One diagnosis only; synonymous disease names acceptable if clinically equivalent	Multiple diagnoses for one item
Triage	One choice only from the four predefined categories	Multiple choices or free text outside the four categories

Appendix C. Composition of the 88-case respiratory question bank

Classification basis. “Previously established diagnosis or pre-existing condition explicitly stated” refers to vignettes that explicitly named a prior diagnosis, chronic condition, congenital abnormality, or previously identified finding in the scenario text. “Symptom-led, no prior diagnosis stated” refers to vignettes framed primarily around presenting symptoms or recurrent complaints without an explicitly stated prior diagnosis.

Panel A. Scenario composition and diagnostic framing

Case-bank component	No. of vignettes	Acute / subacute presentations	Chronic, recurrent, incidental, or structural presentations	Previously established diagnosis or pre-existing condition explicitly stated	Symptom-led, no prior diagnosis stated
Etiology / risk-behavior vignettes	44	24	20	44	0
Diagnosis/triage vignettes	44	23	21	11	33
Total	88	47	41	55	33

Interpretive note. The 88-case bank intentionally combined acute infectious conditions, acute non-infectious emergencies, chronic airway and parenchymal diseases, and incidentally detected or structurally defined thoracic conditions. By design, all etiology / risk-behavior items were diagnosis-anchored. In contrast, the diagnosis/triage subset was predominantly symptom-led while still retaining a smaller group of vignettes that explicitly stated a previously established diagnosis or pre-existing condition.

Panel B. Diagnosis/triage vignette composition by four-category gold-standard triage label

Four-category gold-standard triage label	No. of vignettes	Acute / subacute presentations	Chronic, recurrent, incidental, or structural presentations	Previously established diagnosis or pre-existing condition explicitly stated	Symptom-led, no prior diagnosis stated
Self-care	11	4	7	6	5
Within one week	11	3	8	1	10
Within one day	11	5	6	3	8
Emergency	11	11	0	1	10
Total	44	23	21	11	33

Interpretive note. The diagnosis/triage vignette subset was evenly distributed across the four gold-standard triage labels, with 11 vignettes assigned to each label. Panel B expands this distribution using the same diagnostic-framing strata as Panel A. The category-specific counts show that the four triage labels included different mixes of acute/subacute and chronic/recurrent/incidental/structural presentations; the gold-standard triage label reflected the clinical acuity represented in the vignette rather than the presentation type alone.