A Survey Study on the Health Emergency Response Capacity of Community Healthcare Workers for Respiratory Infectious Diseases (Postprint)

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Abstract

Background: In recent years, emerging respiratory infectious diseases have imposed a severe disease and economic burden on China. Community health service centers have gradually gained attention in the prevention and control of respiratory infectious diseases; consequently, medical staff at these centers need to possess certain health emergency response capabilities for respiratory infectious diseases to cope with the increasing prevention and control efforts. However, current research on the emergency response capabilities of community medical staff for respiratory infectious diseases and their associated factors remains limited.

Objective: To investigate and analyze the health emergency response capabilities for respiratory infectious diseases among community medical staff across different dimensions, explore their associated factors, and provide a basis for the evaluation and training of these capabilities.

Methods: In November 2023, a phased convenience sampling method was employed to select three districts—Xicheng, Fengtai, and Daxing—from the central urban, urban, and inner suburban areas of Beijing. From each district, three community health service centers were selected, and approximately 50 medical staff members were recruited from each center as survey participants. This study utilized a self-developed questionnaire on health emergency response capabilities for respiratory infectious diseases among community medical staff by the research team.

Results: This study surveyed a total of 509 community medical staff members. After excluding 2 questionnaires from non-clinical departments and from clinical departments where the work content was unrelated to departmental

services, 507 valid questionnaires were obtained. The average emergency response capability score for community medical staff in this study was (0.598$\pm$0.136). *Among the two primary indicators, the average score for response capability was* (0.602$\pm$0.152), *an* 0.322, $P < 0.001$), *those with senior professional titles* (= 0.118, P = 0.012), *and individuals who participated in relevant training and emergency drills six times or more in the past year* (0.225, $P < 0.001$) *had higher scores for health emergency response capabilities for respiratory infectious diseases* 0.210, P=0.015) had lower scores.

Conclusion: Health emergency response capabilities for respiratory infectious diseases among community medical staff in Beijing require improvement. Targeted training should be enhanced for capabilities with lower scores, including "laws, regulations, and standards," "surveillance and early warning," and "reporting," with particular attention to nurses, medical technicians and pharmacists, staff with lower professional titles, and those with fewer participations in training and emergency drills.

Full Text

Assessment of Emergency Health Capabilities for Respiratory Infectious Diseases among Community Medical Staff

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Abstract

Background: In recent years, novel respiratory infectious diseases have imposed significant health and economic burdens in China. Community health service centers play a crucial role in managing and preventing these diseases. Consequently, it is imperative that medical staff at these centers develop specific emergency health capabilities to handle the increasing challenges posed by respiratory disease prevention and control. However, research into the emergency capabilities of community medical staff for respiratory diseases and their influencing factors remains limited.

Objective: To investigate and analyze the different dimensions of emergency health capabilities for respiratory infectious diseases among community medical

staff, and to explore the associated factors, thereby providing a basis for the evaluation and training of these capabilities.

Methods: In November 2023, a staged convenience sampling method was used to select three districts—Xicheng District, Fengtai District, and Daxing District —from the central, urban, and suburban regions of Beijing. From each district, three community health service centers were selected, with approximately 50 medical staff recruited from each center as survey respondents. A self-designed questionnaire on health emergency capabilities for respiratory infectious diseases among community medical staff was administered.

Results: A total of 509 community medical staff were surveyed. After excluding 2 questionnaires from respondents in non-operational departments or whose work content was unrelated to departmental business, 507 valid questionnaires were obtained. The average emergency capability score for community medical staff was (0.598$\pm$0.136). $Among the two primary indicators, response capabilities scored (0.602 \pm 0.152) and knowl$ $0.322, P < 0.001)$, $senior professional title holders(= 0.118, P = 0.012)$, $and those who had participated in 6 or mo$ $0.225, P < 0.001) had significantly higher emergency capability scores. Medical staff with a clinical medicine bac$ 0.210, P=0.015) had significantly lower scores.

Conclusion: The emergency health capabilities for respiratory infectious diseases among community medical staff in Beijing require enhancement. Targeted training should be strengthened in areas with lower scores, such as "Laws, Regulations and Standards," "Monitoring and Early Warning," and "Reporting." Particular attention should be directed toward nurses, medical technicians, pharmacists, staff with lower professional titles, and those with less frequent participation in training and emergency drills.

Keywords: Respiratory tract infections; Communicable diseases; Community health service centers; Medical staff; Emergency health capabilities; Factor analysis

Introduction

Respiratory infectious diseases have garnered significant attention due to their rapid transmission, strong infectivity, and potential to cause outbreaks. Emerging respiratory infectious diseases such as Severe Acute Respiratory Syndrome (SARS), H1N1 influenza, and COVID-19 have imposed severe disease burdens on humanity [1-2]. Currently, the activity of multiple respiratory pathogens, including influenza, Mycoplasma pneumoniae, respiratory syncytial virus, and SARS-CoV-2, is on the rise in China [3], posing a serious threat to public health. Since October 2023, the incidence of respiratory diseases in China has continued to increase, with daily visits to fever clinics (rooms) across 31 provinces (autonomous regions, municipalities) and the Xinjiang Production and Construction Corps rising from 137,000 to 196,000 [4].

Health emergency capability refers to the comprehensive ability of institutions or individuals to mobilize resources and achieve effective responses in emergency

preparedness, monitoring and early warning, emergency response, and recovery when dealing with sudden public health events [5-6]. In China, community health service centers are responsible for providing basic public health services, including infectious disease monitoring and reporting, and coordinating disease prevention and control efforts. Against the backdrop of successive outbreaks of respiratory infectious diseases such as SARS, H1N1 influenza, and COVID-19, community health service centers have assumed increasing responsibilities in respiratory infectious disease prevention and control [7-8], with their role gradually gaining attention and recognition [9-10].

Consequently, community medical staff must possess certain health emergency capabilities to actively participate in responding to various respiratory infectious diseases. However, research on the emergency capabilities of community medical staff for respiratory infectious diseases and their associated factors remains limited. Therefore, to understand the current status and related factors of emergency capabilities among community medical staff, this study surveyed medical staff in operational departments across nine community health service centers in Beijing, comparing and analyzing capabilities across different staff characteristics and health emergency dimensions to provide a basis for capability evaluation and training.

1. Subjects and Methods

1.1 Study Subjects

In November 2023, a staged convenience sampling method was employed to select three districts—Xicheng, Fengtai, and Daxing—from Beijing' s central urban, urban, and suburban areas. From each district, three community health service centers were selected, with approximately 50 medical staff recruited from each center as survey participants. Inclusion criteria: (1) medical staff working in operational departments such as general practice, traditional Chinese medicine, dentistry, or preventive care; (2) voluntary participation. Exclusion criteria: staff from non-operational departments (e.g., finance, administration) or those in operational departments who did not provide medical services or have direct contact with patients during emergencies. This study was approved by the Ethics Committee of Beijing Fengtai Hospital of Integrated Traditional Chinese and Western Medicine (Approval No. 2022042201).

1.2 Research Methods

This study employed a questionnaire survey using an instrument developed by the research team through literature review, Delphi method, analytic hierarchy process, and expert consultation.

First, a literature review was conducted, referencing existing indicator systems for health emergency capabilities among medical staff, including the Emergency Preparedness Information Questionnaire for Public Health Emergencies [11], the

Medical Staff Infectious Disease Emergency Response Capability Questionnaire [6], the Community Medical Staff Emergency Capability Self-Perception Survey [12], and other relevant frameworks [13]. A preliminary indicator system for community medical staff' s emergency health capabilities for respiratory infectious diseases was constructed. Based on expert ratings and recommendations from two rounds of Delphi consultation, the indicator system was revised, and the analytic hierarchy process was used to calculate indicator weights. The final indicator system comprised 2 primary indicators, 8 secondary indicators, and 22 tertiary indicators .

The indicator system included domains such as: knowledge of laws, regulations and standards (familiarity with the Law on Basic Medical and Health Promotion, Law on Infectious Disease Prevention and Control, Emergency Response Law, and related technical specifications); basic knowledge and skills for respiratory infectious disease prevention and control (incubation periods, transmission routes, prevention principles, vaccination, isolation protocols); monitoring and reporting (case identification, reporting timelines, reporting procedures); community mobilization and management (vaccination coordination, nucleic acid testing, home management, disinfection, health education); and professionalism (psychological adjustment, communication skills).

Second, drawing from the *Public Health Physician Qualification Examination Practice Questions* [14], the *Primary Military Medical Institution Public Health Emergency Response Capability Questionnaire* [15], and community infectious disease training exam materials, and consulting with community staff and experts in hospital infection control, CDC disease prevention, emergency response, nursing, psychology, and health education, the refined indicator system was transformed into test questions. Each tertiary indicator corresponded to 1-4 multiple-choice questions assessing community medical staff' s basic prevention awareness, skills, and capabilities required for community-based prevention and control work, without differentiating requirements by occupation or department.

The final questionnaire consisted of two parts: (1) demographic information including gender, age, occupation, education level, and work experience during the COVID-19 pandemic; and (2) 36 test questions on respiratory infectious disease emergency capabilities, plus self-assessment of capabilities and training needs. For scoring, each correctly answered question received 1 point; incorrect answers received 0 points. The questionnaire demonstrated acceptable reliability and validity, with a Cronbach' s α coefficient of 0.730 and KMO value of 0.787. For indicators with multiple questions, the mean score across questions represented the direct score for that tertiary indicator. These direct scores were multiplied by weights derived from the analytic hierarchy process to obtain weighted scores for each tertiary indicator. The sum of weighted scores for tertiary indicators under each secondary indicator yielded the secondary indicator score, and the sum of secondary indicator scores under each primary indicator yielded the primary indicator score. The total score, ranging from 0 to 1, was the sum of the two primary indicator scores. Final scores for each indicator were calculated by

dividing the weighted score by the indicator weight, with all indicator scores ranging from 0 to 1.

1.2.3 Survey Methods and Quality Control The survey was administered via the Wenjuanxing platform. Survey coordinators at each community health service center distributed the questionnaire via WeChat to participants, who completed and submitted it online. To ensure quality, all questions were closed-ended, each WeChat ID could submit only once, minimum completion time was set at 300 seconds, and questionnaires underwent manual review after submission.

1.3 Statistical Analysis

Data were analyzed using SPSS 26.0. Categorical data were presented as frequencies. Normally distributed continuous data were expressed as (x-±s). Comparisons between two groups used independent samples t-tests, while comparisons among multiple groups used one-way ANOVA. Multiple linear regression analysis was used to identify associated factors. Statistical significance was set at α=0.05.

2. Results

2.1 Basic Characteristics of Study Subjects

A total of 509 community medical staff were surveyed. After excluding 2 questionnaires from non-operational departments or unrelated work areas, 507 valid questionnaires remained. The sample comprised 447 females (88.2%) and 60 males (11.8%). Age distribution was primarily 35-44 years (n=229, 45.2%). Educational level was predominantly bachelor' s degree (n=321, 63.3%). Work experience at community health centers was mainly 3-14 years (n=269, 53.1%). Occupations included doctors (n=187, 38.9%), nurses (n=227, 44.8%), and medical technicians/pharmacists (n=82, 16.2%). Professional titles were primarily junior (n=212, 41.8%) and intermediate (n=248, 48.9%). Regarding training participation in the past year, 84 staff (16.6%) had not participated in any respiratory infectious disease training or drills, 352 (69.4%) had participated 1-5 times, and 71 (14.0%) had participated 6 or more times.

2.2 Emergency Response Capability Scores

The average emergency capability score for community medical staff was $(0.598\$\pm0.136).Amongthetwoprimaryindicators, responsecapabilitiesscored(0.197\pm0.058), withanaveragewe$ Detailed scores for the eight secondary indicators are presented in Table 2 .

2.3 Scores by Demographic Characteristics

Comparisons of total emergency capability scores and primary indicator scores across demographic characteristics revealed statistically significant differences

by education level, professional title, and training participation frequency (P<0.05). Age was significantly associated with response capability scores (P<0.05). Professional background, occupation, and work experience were significantly associated with total emergency capability scores and response capability scores (P<0.05) .

2.4 Scores on Secondary Indicators by Occupation, Professional Background, and Work Experience

Pairwise comparisons across secondary indicators revealed occupational differences: doctors scored higher than medical technicians/pharmacists in "Monitoring and Early Warning" (P=0.018); doctors and nurses scored higher than medical technicians/pharmacists in "Reporting" (P=0.008, P=0.036); and doctors scored higher than nurses and medical technicians/pharmacists in "Professionalism" (P=0.001, P=0.010) [Figure 1: see original paper].

By professional background, staff with preventive medicine backgrounds scored higher than those with basic medicine or medical imaging backgrounds in "Reporting" (P=0.038). In "Community Mobilization and Management" and "Professionalism," preventive medicine background staff scored higher than clinical medicine (P=0.009, P=0.041) and other backgrounds (P=0.019, P=0.007) [Figure 2: see original paper].

By professional title, senior title holders scored higher than junior and intermediate title holders in "Emergency Plans" (P<0.001, P<0.001) and higher than junior title holders in "Basic Knowledge and Skills for Respiratory Infectious Disease Prevention and Control" (P=0.048). Intermediate title holders scored higher than junior title holders in "Community Mobilization and Management" (P=0.001) [Figure 3: see original paper].

2.5 Factors Associated with Emergency Response Capabilities

Multiple linear regression analysis was conducted with total emergency capability score, knowledge preparation score, and response capability score as dependent variables. Independent variables included gender, age, education level, professional background, occupation, professional title, work experience, and training participation frequency. Results showed that doctors (β=0.322, P<0.001), senior title holders (β=0.118, P=0.012), and staff with 6 or more training sessions in the past year (β=0.225, P<0.001) had significantly higher emergency capability scores. Clinical medicine background (β=-0.210, P=0.015) was associated with significantly lower scores .

3. Discussion

3.1 Current Status of Emergency Health Capabilities

Community health service centers provide both basic medical services and public health services, including disease prevention, healthcare, and health education,

serving as "the first line of epidemic joint prevention and control and the most effective defense against external input and internal spread" [16].

This study employed a self-developed questionnaire to assess emergency capabilities among Beijing community medical staff. Compared with existing evaluation scales for infectious disease emergency capabilities targeting all medical institutions [5-6, 11-12, 17], this study' s indicator system was designed specifically for community roles and responsibilities in respiratory infectious disease prevention and control [10], incorporating unique community medical staff competencies such as community mobilization and management, psychological counseling for patients and residents, and development of health education programs. Additionally, while existing assessment tools often rely on self-evaluation, which lacks objectivity [13, 18-20], this study transformed the Delphi-derived indicator system into an objective test questionnaire.

The survey of operational department staff across nine Beijing community health centers included doctors (38.0%), nurses (44.8%), and medical technicians/pharmacists (16.2%), approximating the distribution reported in the 2021 Beijing Health Statistics Bulletin [21] and ensuring representativeness. Results showed an average emergency capability score of 0.598, indicating room for improvement. Previous studies across different regions of China similarly reported moderate to low emergency capability levels among medical staff [18, 22-24], suggesting substantial improvement potential. This may be attributed to insufficient training for primary healthcare workers in China [25] and systemic issues such as inadequate compensation and low social support, leading to poor professional identity, high turnover, and lower emergency capability levels among primary medical staff [26].

Further analysis of indicator scores revealed that while staff demonstrated good mastery of "Emergency Plans," their understanding of "Laws, Regulations and Standards" was insufficient, with an average score of only 0.154. Regarding response capabilities, staff scored well in health response and community mobilization but showed deficiencies in monitoring, early warning, and reporting —consistent with previous findings [18, 23, 27]. This likely reflects work content differences: most staff engaged in protection measures, specimen collection, health monitoring, and health education during COVID-19, while monitoring and reporting tasks were often limited to fever clinics, administrators, or preventive care departments. Additionally, questions on laws and regulations had limited practical application in community settings. Consequently, staff scored higher on more familiar indicators but lower on laws, monitoring, and reporting, suggesting training should focus on these deficient areas to enhance practical capabilities through diversified tasks.

3.2 Analysis of Capability Scores by Demographic Characteristics

Multiple linear regression showed that doctors, senior title holders, and staff with frequent training had higher emergency capability scores, while clinical

medicine background was associated with lower scores. Doctors face more diverse tasks in respiratory infectious disease prevention and control, accumulating richer knowledge and experience [19]. However, clinical medicine background was associated with lower overall scores. While knowledge preparation did not differ significantly by background, response capability scores were lower among clinical medicine versus preventive medicine staff, suggesting clinical doctors' training may prioritize diagnosis and treatment over prevention and control. Higher professional title holders possess more extensive experience and stronger core competencies [28], enabling better emergency responses. Participation in 6 or more training sessions was associated with higher scores, though 1-5 sessions only improved knowledge preparation without significantly enhancing response capabilities, indicating that capability development requires substantial training and practice.

Different demographic groups showed varying scores across the eight secondary indicators. Medical technicians and pharmacists scored lower than doctors and nurses in monitoring and reporting, while non-preventive medicine staff scored lower in reporting, community mobilization, and professionalism. This reflects differences in job responsibilities: medical technicians and pharmacists have less exposure to disease monitoring and reporting, while preventive medicine staff are more likely to work in disease prevention and health education. Higher title holders scored better on emergency plans, basic knowledge, and community mobilization, likely due to greater training and experience [28].

Early diagnosis, warning, and treatment of respiratory infectious diseases at the primary care level can effectively control disease spread. While national policies such as the *National Health Emergency Training Outline* [29] and *Beijing Medical-Preventive Integration Training Program* [30] guide training efforts, capability gaps remain. Assessing specific indicator scores can inform targeted training for different staff groups: medical technicians and pharmacists may need focused training on disease monitoring and reporting; non-preventive medicine staff may require training on monitoring, reporting, and community mobilization; and junior staff may benefit from enhanced training to improve early disease detection and treatment, reduce healthcare resource strain, and better protect community health.

Conclusion

The emergency health capabilities for respiratory infectious diseases among Beijing community medical staff require improvement. Occupation, professional title, and training participation frequency are important factors associated with capability scores. While training should address universally weak areas such as "Laws, Regulations and Standards," "Monitoring and Early Warning," and "Reporting," special attention should be given to nurses, medical technicians, pharmacists, junior staff, and those with limited training participation to enhance community emergency response capabilities and reduce health and economic losses from respiratory infectious diseases.

Author Contributions

JIN Huizi was responsible for study implementation, statistical analysis, figure and table preparation, and manuscript writing. XU Xin, LI Zhijing, and GAO Bing collected and organized data and revised the manuscript. MA Yonghuai and JI Ying conceived and designed the study, provided quality control and review, and supervised the overall project.

Conflict of Interest

The authors declare no conflict of interest.

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Note: Figure translations are in progress. See original paper for figures.