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The Current Status of Major Chronic Disease Prevention and Control in County-Level Hospitals and Factors Influencing Capacity Building from the Perspective of Healthcare Workers: A Mixed-Methods Study

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Abstract

Background

Major chronic diseases (cardiovascular disease, cancer, chronic respiratory diseases, and diabetes) have become a significant public health issue affecting national economic and social development. As a hub connecting provincial and municipal hospitals with primary healthcare institutions, the service capacity of county-level hospitals directly impacts the level of health protection for residents.

Methods

This study employed a mixed-methods research design. Thirty county-level hospitals were selected, and a questionnaire survey was conducted among 611 healthcare professionals in departments related to major chronic diseases. Additionally, semi-structured interviews and focus group discussions were conducted with a subset of these healthcare professionals.

Results

Quantitative findings revealed that, according to ordered logistic regression analysis, AI-assisted diagnosis and treatment, participation in surgical procedures, and measures to enhance major chronic disease prevention and control capabilities (such as advanced training, provision or upgrading of diagnostic and therapeutic equipment, and other relevant measures) all significantly influenced the extent to which healthcare workers' capabilities in managing major chronic diseases improved. Qualitative results showed that county-level hospitals have established a relatively comprehensive service chain covering core aspects such as early screening, standardized diagnosis and treatment, health education, and follow-up care. However, significant obstacles remain, including a shortage of development funds, weak research capabilities, a lack of specialized personnel, a weak information technology infrastructure, constraints imposed by medical insurance policies, and a low level of awareness regarding the integration of medical and preventive care.

Conclusion

County-level hospitals have achieved phased results in building their capacity for the prevention and control of major chronic diseases, but significant shortcomings remain. It is recommended to optimize top-level design and resource allocation by prioritizing the development of the talent pool, upgrading diagnostic and treatment equipment, improving information systems, coordinating medical insurance policies, strengthening financial support, and enhancing healthcare professionals' awareness of the integration of medical and preventive care, thereby promoting the enhancement of county-level hospitals' capacity for the prevention and control of major chronic diseases.

Introduction

According to the World Health Organization, noncommunicable diseases—also known as chronic diseases—are typically long-term conditions resulting from a combination of genetic, physiological, environmental, and behavioral factors. Among deaths caused by noncommunicable diseases, cardiovascular diseases account for the largest proportion, followed by cancer, chronic respiratory diseases, and diabetes; these four categories account for 80% of all premature deaths from noncommunicable diseases [1]. Therefore, these four categories are referred to as major chronic diseases.

Major chronic diseases pose a serious threat to public health and have become a major public health issue affecting a country's economic and social development. The prevalence of cardiovascular disease in China continues to rise, with an estimated 330 million patients; it accounts for 48.98% of deaths in rural areas and 47.35% of deaths in urban areas [2]. The total number of cancer cases in China stands at 4,824,703, accounting for 24.2% of global cancer cases, and the cancer burden is showing a progressive upward trend [3]. Both the number of deaths and the age-standardized mortality rate from chronic respiratory diseases in China are at high levels, with Chinese patients accounting for 27.3% of global deaths [4]. In addition to cardiovascular diseases, cancer, and chronic respiratory diseases, diabetes accounts for over 70% of the overall disease burden in China, placing a significant economic burden on the country's healthcare system [5].

In addition to treatment, prevention is also a cost-effective health strategy. Lifestyle changes in primary prevention (such as exercise and a healthy diet) can reduce the risk of cardiovascular disease and alleviate the disease burden [6]. One-third to one-half of all cancers are preventable, making prevention a particularly effective and potentially cost-effective approach to combating cancer [7]. Chronic obstructive pulmonary disease (COPD) is one of the most common chronic respiratory diseases [8]. Most cases of COPD are preventable, and preventive measures at all three levels can effectively reduce the incidence, disability, and mortality associated with COPD [9]. Preventing type 2 diabetes in primary health care settings is feasible, and public health and health care systems play a crucial role in preventing and managing diabetes-related complications [10]. Lifestyle modifications can effectively prevent the onset of type 2 diabetes in high-risk populations, and various medications can also prevent or delay the onset of T2DM [11].

In China, the healthcare infrastructure is divided into primary, secondary, and tertiary levels. Primary care is provided by community health service centers, while tertiary care is primarily provided by provincial or municipal hospitals [12]. County-level hospitals serve as hubs connecting provincial and municipal healthcare institutions with primary-level facilities. They act as key nodes for two-way referrals, undertaking core responsibilities such as the prevention, diagnosis, treatment, and rehabilitation of major chronic diseases within their regions. These hospitals function as technical support centers for primary care and as reception centers for services extended by tertiary hospitals. China has 2,860 county-level administrative divisions, including approximately 2,000 rural counties, with about three-

quarters of the population residing in rural areas [13]. The service capacity of county-level hospitals directly impacts the health security of hundreds of millions of rural residents in China. However, there remains a significant gap between the capabilities of county-level hospitals and those of provincial and municipal-level hospitals, and the development levels of county-level hospitals vary widely [14]. Therefore, enhancing the capacity of county-level hospitals to prevent and treat major chronic diseases is of great significance for improving the quality of medical services in rural areas and mitigating the threat that major chronic diseases pose to residents' health.

This study aims to explore, from the perspective of medical personnel, the current practical status of county-level hospitals in the prevention and control of major chronic diseases, analyze the key factors influencing the enhancement of their prevention and control capabilities, and provide a scientific basis for formulating targeted policy measures and improvement strategies. Consequently, it seeks to promote a more effective pivotal role for county-level hospitals within the major chronic disease prevention and control system, thereby contributing to the realization of the Healthy China strategic goals.

Methods

Study Design

In April 2022, the National Health Commission issued the "Work Plan for Enhancing the Comprehensive Capabilities of County Hospitals under the 'Thousand Counties Project' (2021–2025)" (hereinafter referred to as the "Thousand Counties Project") and announced the list of county hospitals included in the initiative. These hospitals are considered to possess a certain foundation and potential, enabling them to rapidly enhance their service capabilities through the "Thousand Counties Project." The year 2025 marks the completion deadline for the "Thousand Counties Project." To comprehensively understand the progress in building the capacity of county-level hospitals for the prevention and treatment of major chronic diseases under this policy framework, this study selected county hospitals participating in the "Thousand Counties Project" as its research subjects. This study employed a random sampling method to select a total of 30 county-level hospitals from Zhejiang, Hebei, Heilongjiang, Qinghai, Yunnan, and Hainan provinces. A survey was conducted among medical staff in departments related to major chronic diseases at the selected county-level hospitals, resulting in the collection of 611 completed questionnaires.

Survey Content

To ensure the comprehensiveness and depth of the study, a mixed-methods design was adopted, combining quantitative and qualitative research. Data for the quantitative component were collected using a self-designed structured questionnaire (see Supplementary File 1 for details). The questionnaire covered healthcare workers' basic information, the implementation of medical services related to the prevention and control of major chronic diseases, self-assessments of their capabilities, and their needs

for enhancing prevention and control capabilities. Its purpose was to quantitatively describe the current status and influencing factors of major chronic disease prevention and control in county-level hospitals at the individual level. The qualitative component involved conducting semi-structured interviews and focus group discussions using a designed interview guide (see Supplementary File 2) to collect data. The study selected healthcare workers involved in the management of major chronic diseases as respondents to gain an in-depth understanding of the specific challenges they encounter in their daily work, as well as their views and suggestions for enhancing prevention and control capabilities. This approach aims to reveal the underlying causes of the observed phenomena, supplement and interpret the quantitative research findings, and thereby present the research questions in a more comprehensive and objective manner.

Data Analysis

Quantitative Data Analysis

The collected questionnaire data were organized and cleaned, with invalid questionnaires excluded to ensure data integrity and accuracy. Data analysis was performed using SPSS 25.0 software; continuous variables were described as mean $\pm$ standard deviation ($\bar{x} \pm$ s), and categorical variables as n (%). An ordered logistic regression model was constructed to identify statistically significant influencing factors, ultimately clarifying the impact of each factor on the extent to which healthcare workers' capabilities in the prevention and control of major chronic diseases are enhanced. A p-value of < 0.05 was considered statistically significant.

Qualitative Data Analysis

Nvivo 15 was used to analyze the qualitative data. A six-step inductive thematic analysis method was employed to examine the current status of major chronic disease prevention and control in county-level hospitals, as well as the obstacles faced in enhancing their prevention and control capabilities. This study followed the six steps of thematic analysis: familiarization with the data, preliminary coding, identification of themes, review of themes, definition and naming of themes, and report generation [15]. Two researchers conducted the coding independently; in cases of disagreement, a third researcher made the final determination, and the final coding was established through joint discussion.

Results

Quantitative Results

Sociodemographic Characteristics of Study Participants

A total of 611 healthcare workers from departments related to major chronic diseases participated in the questionnaire survey. Among them, 36.5% were male and 63.5% were female. The average age was 38.46 years (standard deviation ± 8.50 years), and the average years of service was 13.98 years (standard deviation ± 9.11 years). Regarding marital status, 84.0% were married, and 16.0% were unmarried. In terms of educational attainment, bachelor's degree holders constituted the largest group (82.5%), while those with a high school/vocational school diploma or lower, an associate's degree, and a master's degree or higher accounted for 1.6%, 9.0%, and 6.9%, respectively. Regarding professional titles, 3.9% had no title, 28.3% held a junior-level title, 37.0% held an intermediate-level title, and 21.3% and 9.5% held associate senior and senior-level titles, respectively (Table 1).

Table 1
Socio-demographic characteristics of study participants (N = 611)

Variable	Category	Frequency/Mean ± Standard Deviation	Percentage (%)
Gender	Male	233	36.5
	Female	388	63.5
Age	-	38.46 ± 8.50	-
Marital Status	Married	513	84.0
	Single	98	16.0
Level of education	High school or vocational school and below	10	1.6
	Associate's degree	55	9.0
	Bachelor's degree	502	82.5
	Master's degree or higher	42	6.9
Professional Title	No professional title	24	3.9
	Junior	193	28.3
	Intermediate	226	37.0
	Associate Senior	130	21.3
	Senior	58	9.5
Years of experience	-	13.98 ± 9.11	-

Current Status of Major Chronic Disease Prevention and Control in County-Level Hospitals

An analysis of the major chronic disease prevention and control activities conducted in county-level hospitals yielded a total of 2,130 responses from 611 survey participants. Among these, “implementing standardized diagnosis and treatment, and providing appropriate medication guidance” was selected 558 times (accounting for 91.3% of cases), making it the most frequently reported activity; “Conducting early screening and diagnosis of major chronic diseases” was selected 535 times (87.6% of cases); “Issuing health prescriptions and providing guidance on healthy lifestyles” was selected 520 times (85.1% of cases); “Conducting regular follow-up services for patients with major chronic diseases” was selected 510 times (83.5% of cases); 1.1% of respondents added other work activities (Table 2). The results indicate that the prevention and control of major chronic diseases in the sample county-level hospitals has been widely implemented across the four core components of early screening, standardized diagnosis and treatment, health education, and follow-up, with standardized diagnosis and treatment having the highest prevalence.

Table 2
Scope of Work on the Prevention and Control of Major Chronic Diseases at County-Level Hospitals

Prevention and Treatment of Major Chronic Diseases at County-Level Hospitals	**Response**		
	Number of cases	**Percentage (%)**	**Percentage of cases (%)**
Implement early screening and diagnosis for major chronic diseases	535	25.1	87.6
Implement standardized diagnosis and treatment, and provide appropriate guidance on medication use	558	26.2	91.3
Issuing health prescriptions and providing guidance on healthy lifestyles	520	24.4	85.1
Provide regular follow-up care for patients with major chronic diseases	510	23.9	83.5
Other	7	0.3	1.1
Total	2130	100.0	348.6

In an analysis of measures taken to enhance the capacity of medical staff at county-level hospitals to prevent and treat major chronic diseases, a total of 2,317 responses were collected from 577 survey participants. Most county-level hospitals have systematically addressed the enhancement of prevention and treatment capabilities through multiple avenues, including collaborative mechanisms, technical support, talent development, and hardware configuration. Only 0.9% of respondents cited “other” measures, indicating that the five listed measures largely encompass current mainstream practices. Specifically, establishing multidisciplinary collaboration mechanisms (accounting for 89.4% of cases) and receiving support from senior experts (85.1% of cases) were the two most widely adopted strategies; IT-enabled interconnectivity within medical consortia (82.5% of cases) and regular full-time training (77.1% of cases) also achieved high adoption rates; in contrast, the proportion of cases involving

equipment procurement or upgrades was relatively low at 66.6% (Table 3). The findings suggest that county-level hospitals tend to rely on organizational collaboration and the introduction of external resources to enhance their prevention and treatment capabilities, but there remains room for further expansion in terms of hardware investment.

Table 3
Measures to Enhance the Capacity of County-Level Hospitals to Prevent and Treat Major Chronic Diseases

Measures to Enhance the Capacity of County-Level Hospitals to Prevent and Treat Major Chronic Diseases	Response		
	Number of cases	Percentage (%)	Percentage of cases (%)
Establish a multidisciplinary collaboration mechanism	516	22.3	89.4
Assistance and guidance from provincial and municipal experts	491	21.2	85.1
Interoperability of Healthcare Consortium Information Systems	476	20.5	82.5
Regular full-time training	445	19.2	77.1
Procurement or upgrading of relevant medical equipment	384	16.6	66.6
Other	5	0.2	0.9
Total	2317	100.0	401.6

Analysis of Factors Influencing the Improvement in the Capacity of Medical Staff at County-Level Hospitals to Prevent and Treat Major Chronic Diseases

As the most critical healthcare resource in county-level hospitals, the extent to which medical staff improve their own capabilities directly determines the overall service level of these hospitals in the prevention and treatment of major chronic diseases. This study used healthcare personnel's self-assessed improvement in major chronic disease prevention and control capabilities as the dependent variable. Relevant variables, including sociodemographic characteristics, prevention and control initiatives implemented by the hospital, and existing capacity-building measures, were incorporated into an ordered logistic regression model for analysis. A parallelism test was conducted on the model, yielding a p-value>0.05, indicating that the data were suitable for analysis using an ordered multinomial logistic regression model. The likelihood ratio test to determine whether the partial regression coefficients of all independent variables in the model were all zero yielded a value of 2 = 99.882, with p<0.001, indicating that the model is valid overall and fits the data well. The variable codes are as follows: Age (as reported), gender (0 = female, 1 = male), marital status (0 = unmarried, 1 = married), educational attainment (1 = high school/vocational school or below, 2 = associate's degree, 3 =

bachelor's degree, 4 = master's degree or higher), AI-assisted diagnosis and treatment (0 = no, 1 = yes), participation in surgical procedures (0 = no, 1 = yes), multidisciplinary collaboration mechanisms (0 = no, 1 = yes), expert guidance (0 = none, 1 = yes), medical consortium information system interoperability (0 = none, 1 = yes), continuing education (0 = none, 1 = yes), provision or upgrade of diagnostic and therapeutic equipment (0 = none, 1 = yes), and other relevant measures (0 = none, 1 = yes).

The results of ordered logistic regression analysis show that(Table 4), after controlling for other factors, AI-assisted diagnosis and treatment, participation in surgical procedures, and measures to enhance the capacity for the prevention and control of major chronic diseases (further training, provision or upgrading of diagnostic and therapeutic equipment, and other relevant measures) all significantly influence the degree of improvement in healthcare professionals' capacity for the prevention and control of major chronic diseases. Specifically, healthcare professionals without AI-assisted diagnosis and treatment demonstrated a lower degree of improvement in their capacity to prevent and treat major chronic diseases compared to those with such assistance. The probability of their capacity improving by at least one level was 0.392 times that of those with AI-assisted diagnosis and treatment (OR = 0.392, $p < 0.001$); Healthcare professionals who do not participate in surgical procedures demonstrate a lower degree of improvement in their ability to prevent and treat major chronic diseases compared to those who do. The probability of their ability improving by at least one level is 0.598 times that of those who participate in surgical procedures (OR = 0.598, P = 0.009); Healthcare professionals who did not participate in advanced training demonstrated a lower degree of improvement in their ability to prevent and treat major chronic diseases compared to those who did. The probability of their ability improving by at least one level was 0.379 times that of those who participated in advanced training (OR = 0.379, $p < 0.001$); Healthcare professionals in county-level hospitals without medical equipment or equipment upgrades demonstrated a lower level of improvement in their ability to prevent and treat major chronic diseases compared to those in hospitals with such equipment. The likelihood of their ability improving by at least one level was 0.641 times that of those in hospitals with equipment (OR = 0.641, p = 0.032); Medical staff at county-level hospitals that did not implement other relevant measures showed a lower improvement in their capacity to prevent and treat major chronic diseases compared to those at county-level hospitals that did implement such measures (OR = 0.179, p = 0.043).

Table 4
Analysis of Improvements in Healthcare Professionals' Capacity to Prevent and Treat Major Chronic Diseases

Variable	β	SE	Wald χ^2	P	OR(95%CI)
Age	−0.009	0.010	0.819	0.365	0.991(0.971 ~ 1.011)
Gender					
Female	−0.190	0.171	1.230	0.267	0.827(0.592 ~ 1.157)
Male (reference group)	1.000	-	-	-	-
Marital Status					
Single	−0.171	0.235	0.530	0.466	0.843(0.532 ~ 1.335)
Married (reference group)	1.000	-	-	-	-
Educational Attainment					
High school/vocational school or below	0.465	0.669	0.482	0.487	1.592(0.429 ~ 5.912)
Associate's degree	0.423	0.407	1.078	0.299	1.527(0.687 ~ 3.394)
Bachelor's degree	0.428	0.321	1.787	0.181	1.534(0.819 ~ 2.878)
Master's degree or higher (reference group)	1.000	-	-	-	-
AI-assisted diagnosis and treatment					
None	−0.937	0.214	19.225	0.000	0.392(0.258 ~ 0.596)
Yes(reference group)	1.000	-	-	-	-
Participation in surgical procedures					
None	−0.515	0.197	6.832	0.009	0.598(0.406 ~ 0.879)
Yes(reference group)	1.000	-	-	-	-
Multidisciplinary collaboration mechanism					
None	−0.490	0.299	2.688	0.101	0.613(0.341 ~ 1.101)

Variable	β	SE	Wald χ^2	P	OR(95%CI)
Yes(reference group)	1.000	-	-	-	-
Expert Assistance and Guidance					
None	−0.002	0.259	0.000	0.994	0.998(0.600 ~ 1.659)
Yes(reference group)	1.000	-	-	-	-
Interoperability of Healthcare Consortium Information Systems					
None	−0.173	0.273	0.398	0.528	0.841(0.493 ~ 1.438)
Yes(reference group)	1.000	-	-	-	-
Training and Professional Development					
None	−0.970	0.243	15.967	0.000	0.379(0.236 ~ 0.610)
Yes(reference group)	1.000	-	-	-	-
Procurement or Upgrade of Medical Equipment					
None	−0.444	0.207	4.589	0.032	0.641(0.427 ~ 0.963)
Yes(reference group)	1.000	-	-	-	-
Other Relevant Measures					
None	−1.723	0.851	4.102	0.043	0.179(0.034 ~ 0.946)
Yes(reference group)	1.000	-	-	-	-

Qualitative Findings

The qualitative findings of this study complement the quantitative results. The qualitative section includes in-depth interviews with medical staff from relevant administrative departments and clinical departments specializing in major chronic diseases at county-level hospitals. Through qualitative analysis, we gained a deeper understanding of the measures implemented by county-level hospitals for the prevention and control of major chronic diseases, as well as the obstacles they face in enhancing their capacity in this area, thereby laying the groundwork for proposing policy recommendations.

Measures for the Prevention and Control of Major Chronic Diseases in County-Level Hospitals

Medical Services for Major Chronic Diseases

County-level hospitals primarily provide medical services to patients with major chronic diseases through disease screening, diagnosis and treatment, and follow-up care. In accordance with national requirements, these hospitals conduct early screening for hypertension, diabetes, cancer, and chronic obstructive pulmonary disease (COPD). Screening is mainly carried out at township health centers under medical consortiums, with high-risk individuals referred to county-level hospitals for diagnosis and treatment.

“Our hospital also runs several public health initiatives, such as screening for colorectal cancer and early-stage gastrointestinal cancers. We’ve moved the screening process forward by delegating chronic disease screening to community health centers; if high-risk individuals are identified, they are referred to us for further diagnosis via gastrointestinal endoscopy.” (Interview 1)

“Our hospital has achieved notable results in screening high-risk populations for cardiovascular diseases. These high-risk patients receive examination and treatment at our hospital, which helps improve our hospital’s treatment standards.” (Interview 16)

The diagnosis and treatment of major chronic diseases are the core responsibilities of county-level hospitals. Building on foundational diagnostic and treatment services such as coronary intervention procedures and standardized diabetes care, county-level hospitals fully leverage their strengths to innovate treatment approaches for major chronic diseases and improve the quality of medical services. Through initiatives such as mobile clinics and multidisciplinary consultations, they have opened up more avenues for treating major chronic diseases.

“We have a system of mobile medical services. Doctors dispatched to our branch hospitals join the family physician teams. These doctors work alongside family physicians at the grassroots level, and if they encounter particularly challenging medical issues, they can request assistance from specialists at the main hospital.” (Interview 15)

“Generally, when a patient is admitted and the doctor determines during diagnosis that the condition is critical or complex, we implement an MDT (Multidisciplinary Team) and conduct a hospital-wide consultation.” (Interview 9)

After treating patients, doctors continue to follow up through telephone and in-person visits, implementing closed-loop management for the treatment of major chronic diseases.

“For high-risk patients, we conduct telephone follow-ups after treatment concludes. If they lack sufficient understanding of their condition or are unwilling to continue treatment, we will choose to communicate with their family members.” (Interview 8)

Support from Higher-Level Hospitals

The capacity of county-level hospitals to prevent and treat major chronic diseases has significantly improved with targeted support from higher-level hospitals. The most common form of support involves the deployment of experts: county-level hospitals submit requests, and higher-level hospitals dispatch relevant specialists to provide outpatient services, typically for a period of six months to one year. Interview participants generally noted that these experts introduced advanced diagnostic and treatment concepts and technologies, helping the hospitals fill multiple technical gaps.

"Provincial hospitals dispatch experts to our hospital every year for targeted support. The number and specialties of the experts are requested by our hospital, and the provincial hospital determines the specifics after careful consideration." (Interview 27)

Sending doctors from county-level hospitals to higher-level hospitals for advanced training is also a key measure to enhance the hospital's overall capacity for the prevention and treatment of major chronic diseases. Trainees are mostly departmental backbone staff or young and middle-aged doctors with outstanding professional potential. Their training covers core specialties related to major chronic diseases, such as cardiovascular medicine, endocrinology, and oncology, with training periods typically lasting 3 to 12 months. This paired assistance model, which combines "bringing in" and "sending out," has fostered a positive environment of resource complementarity and collaborative development in practice, providing a steady impetus for county-level hospitals to continuously enhance their capacity for the prevention and treatment of major chronic diseases.

"Led by hospital leadership, we identify areas for disciplinary development and professional gaps within the hospital and dispatch relevant clinicians to higher-level hospitals for training. Over the past three years, the Endocrinology, Cardiology, and Respiratory Departments have collectively sent 24 medical staff members to higher-level hospitals for training." (Interview 21)

Interconnectivity within Medical Communities

County-level hospitals serve as hubs connecting higher-level healthcare institutions with primary-care facilities. While receiving expert support from higher-level hospitals, they also assist primary-care facilities in enhancing their capabilities for the diagnosis, treatment, and management of major chronic diseases through medical communities. Currently, interconnectivity within medical communities is primarily manifested in two aspects: information sharing and the decentralization of resources.

"The hospital's Information Technology Department has established a telemedicine platform primarily serving township health centers. We currently have 16 health centers within the medical consortium. If they require a consultation, they can input the patient's medical history into the system and contact the department head to review the chief complaint and make a diagnosis. Additionally, ECG readings from each health center can be uploaded in real time to the ECG department, allowing the on-call physician to provide a diagnostic report." (Interview 25)

"We implement the principle of starting cancer prevention and control at the grassroots level by dispatching experts to primary healthcare centers to train relevant medical staff." (Interview 19)

Health Education

Most patients at county-level hospitals come from rural areas, where health awareness is relatively low. Therefore, health education is also a crucial component of the prevention and control of major chronic diseases.

“The hospital has nearly 100 types of health education booklets on chronic diseases. We have set up dedicated health information racks in the outpatient waiting areas to display these booklets, and there are also health bulletin boards in the inpatient wards, making it convenient for patients to pick them up and consult them at any time.” (Interview 2)

“Our hospital operates a live-streaming channel where doctors from different departments conduct health education sessions for patients each week. For example, Saturdays are reserved for the Endocrinology Department, where the department head uses vivid food models to explain diabetes-related knowledge and remind patients to pay attention to their diet.” (Interview 8)

“We primarily conduct health education by establishing WeChat groups for patient communication. Once patients or their family members join the relevant group, two dedicated nurses regularly share information on the prevention and treatment of major chronic diseases and answer questions.” (Interview 18)

Improving Service Quality

County-level hospitals are enhancing the quality of major chronic disease prevention and treatment services through technological advancements, IT infrastructure development, the procurement of medical equipment, and the recruitment of talent.

“In recent years, the hospital’s technical capabilities have significantly improved, and our leading departments in chronic disease management have gradually developed.” (Interview 5)

“As a next step, our hospital has developed an IT plan for chronic disease management. We plan to advance tiered diagnosis and treatment through the construction of a chronic disease management system, enabling functions such as data collection and centralized management of electronic health records.” (Interview 13)

“In terms of resource allocation, under the leadership of the county government and the Health Commission, our hospital has purchased a significant amount of medical equipment for clinical use and established a multidisciplinary team encompassing cardiology, oncology, endocrinology, and pulmonology to facilitate communication.” (Interview 28)

“Our hospital has systematically recruited high-level talent to build relevant departments, particularly in the field of oncology. Currently, the director of the Oncology Department is one of the talents we have recruited.” (Interview 16)

Obstacles to Enhancing the Capacity of County-Level Hospitals to Prevent and Treat Major Chronic Diseases

Shortage of Development Funds

Due to relatively low national funding and limited local fiscal resources, county-level hospitals generally face a shortage of development funds. In chronic disease prevention efforts, primary-level health centers receive public health funding from the government, whereas county-level hospitals do not receive such funding.

“There are no funds allocated under the ‘Thousand Counties Project.’ Our local government’s finances are also quite strained; aside from funds for equipment purchases, there is no support in other areas.” (Interview 6)

Hospitals face significant pressure regarding their own operating revenues and must prioritize covering daily operational expenses, leading to the temporary suspension of long-term investment plans related to chronic disease prevention and control.

“Compared to previous years, the hospital’s revenue from medical services has declined significantly. The government is also facing economic difficulties. We cannot rely on external sources, and we cannot generate sufficient funds internally. The hospital’s financial operations are actually in great difficulty; it is hard enough just to maintain daily medical services.” (Interview 14)

Weak Research Capacity

County-level hospitals submit few research project proposals in the field of major chronic disease prevention and control, and those that are submitted are of low level. At the same time, the hospitals’ research equipment and laboratory conditions are limited, making it difficult to meet the basic requirements for conducting research.

“For county-level medical institutions, research is a weak link in enhancing technical capabilities for major chronic diseases. The hospital submits very few research proposals each year—only a handful at the provincial level or above—and few high-quality papers are published.” (Interview 1)

Medical staff lack sufficient time and energy to devote to research activities; heavy clinical workloads limit the development of their research mindset and innovative thinking.

“The research atmosphere in our region is lacking. High-level medical staff tend to be more hands-on, focusing primarily on daily clinical work, and remain relatively weak in terms of conducting research projects and writing papers.” (Interview 23)

Shortage of Specialized Talent

County-level hospitals face difficulties in recruiting high-caliber personnel, primarily manifested in the challenge of attracting and retaining highly educated, senior-level specialists in major chronic diseases. The talent shortage is particularly acute in core departments such as cardiology and oncology.

“County-level hospitals have few special policies, and the salaries they offer are insufficient to attract retired experts.” (Interview 7)

Due to factors such as remote locations and limited career advancement opportunities, some county-level hospitals struggle to attract outstanding talent from outside the region, while locally trained key physicians are also leaving for provincial and municipal-level hospitals.

“The ‘brain drain’ effect from higher-level hospitals prevents some talent from effectively being deployed to our county-level hospitals.” (Interview 8)

“The hospital’s recruitment situation is not very promising. Many undergraduate medical graduates are unwilling to work at county-level hospitals, which has also led to a talent gap among our clinical staff.” (Interview 9)

Weak IT Infrastructure

County-level hospitals lag significantly behind in IT infrastructure development related to the prevention and treatment of major chronic diseases. This is manifested in issues such as incomplete information system functionality, inadequate data-sharing mechanisms, and low levels of IT application.

“Currently, the information system is not very well-developed, making it difficult to conduct regular patient follow-ups through the system.” (Interview 15)

At the same time, data barriers between different departments and units have not been fully broken down, preventing real-time sharing of information such as patient test results and medical records.

“At present, our information systems are not interoperable; there is no unified information system across cities and counties, and hospitals cannot connect with one another.” (Interview 6)

Constraints of Medical Insurance Policies

Medical insurance policies have certain limitations in enhancing the capacity of county-level hospitals to prevent and treat major chronic diseases, primarily manifested in how these policies restrict the development of the tiered diagnosis and treatment system. Currently, there is no difference in medical insurance reimbursement rates across the provincial, municipal, and county levels. Patients do not receive higher reimbursement rates by being referred from primary-care hospitals, so they tend to seek treatment directly at provincial or municipal hospitals.

“The reimbursement rates themselves are quite similar; no matter which hospital a patient goes to, the reimbursement rate is the same. Patients believe that provincial and municipal hospitals have better

facilities, so they may be more willing to go there." (Interview 1)

"In the past, county hospitals had a reimbursement rate of 80%, while municipal hospitals had a rate of 20–30%. If a patient wanted to seek treatment at a higher-level hospital, they needed a referral from the county hospital and then had to file a claim with the medical insurance bureau to receive reimbursement. Now, patients do not need a referral from the hospital; they simply need to register on their mobile phones and complete the process themselves." (Interview 27)

Awareness of the Integration of Medical and Preventive Care Needs to Be Enhanced

Medical staff generally lack awareness of the integration of medical and preventive care. Most clinicians focus more on providing medical services and view preventive work as a burden.

"Disease prevention also requires manpower, but our department is already understaffed. Generally, when patients come to register for treatment, we focus on providing medical services, while prevention work mainly consists of verbal health education." (Interview 2)

"It is quite difficult to advance prevention efforts. Primarily, it is the local health centers that conduct screenings, with doctors from our hospital sent down to assist. However, due to the lack of effective incentive measures, many doctors are not very enthusiastic about carrying out prevention work." (Interview 15)

Discussion

This study employed a mixed-methods design to systematically assess the current status of major chronic disease prevention and control in county-level hospitals, as well as the factors influencing capacity building, from the perspective of healthcare professionals within the context of the "Thousand Counties Project." The quantitative results and qualitative findings corroborated and complemented one another, collectively revealing the true picture of capacity building for major chronic disease prevention and control in county-level hospitals and identifying directions for improvement.

The results indicate that county-level hospitals have established a comprehensive service chain covering early screening, standardized diagnosis and treatment, health education, and follow-up care. Quantitative data show that the four core components of major chronic disease prevention and control—standardized diagnosis and treatment, rational medication guidance, early screening and diagnosis of major chronic diseases, and the provision of health prescriptions and regular follow-up services—have been widely implemented. These findings align closely with the practical descriptions from qualitative interviews—such as "medical consortia leading primary-care screening, multidisciplinary team (MDT) diagnosis and treatment, and regular follow-ups"—fully demonstrating that county-level hospitals have acquired the foundational service capacity to undertake the prevention, diagnosis, treatment, rehabilitation, and health management of major chronic diseases within their counties, and are capable of effectively serving as a

hub for vertical coordination. Regarding the implementation of capacity-building measures, county-level hospitals have established a comprehensive improvement pathway centered on multidisciplinary collaboration, support from senior specialists, information sharing within medical consortia, professional training, and equipment upgrades.

The study found that AI-assisted diagnosis and treatment, participation in surgical procedures, professional training, and the provision or upgrading of medical equipment all influence healthcare professionals' self-assessed improvement in their capacity to prevent and treat major chronic diseases. A randomized clinical trial demonstrated that the use of AI-based decision support tools can increase the rate of palliative care consultations in hospital specialties and reduce the number of hospitalizations [16]. Another literature review showed that AI technology is widely applied in the diagnosis and treatment of various cancers, and AI-assisted routine screening is a key step in reducing the incidence of colorectal cancer [17]. AI not only directly optimizes clinical diagnosis and treatment processes and improves disease prevention and control outcomes, but also complements and synergizes with the professional capabilities of healthcare professionals, continuously supporting their professional development. Furthermore, the role of continuing education in enhancing healthcare professionals' capabilities is supported by previous research. A review indicates that healthcare professionals gradually accumulate experience and knowledge through time-based learning and clinical practice, thereby continuously improving their competency levels [18]. Another cross-sectional study of doctors in remote areas of Vietnam showed that continuing medical education is crucial for improving doctors' knowledge levels [19]. Participation in surgical procedures has a positive impact on healthcare professionals' self-assessed ability to prevent and treat major chronic diseases. Participating in surgeries allows healthcare professionals to consolidate theoretical knowledge through practice, master procedural skills, accumulate clinical experience more quickly, and directly improve their clinical diagnostic and treatment capabilities. Meanwhile, the provision and upgrading of diagnostic and therapeutic equipment serve as the hardware foundation for standardized management of major chronic diseases. Advanced equipment enables healthcare professionals to identify disease risks earlier and assess conditions more accurately, thereby providing the necessary support for capacity building.

Furthermore, qualitative research has thoroughly revealed six core barriers currently hindering the enhancement of major chronic disease prevention and treatment capabilities in county-level hospitals. Among these, a shortage of specialized personnel and inadequate information technology infrastructure were cited most frequently as the primary obstacles to improving these capabilities. In a qualitative study on barriers within the diabetes care system, staff shortages and high workloads were identified as the primary obstacles to effective diabetes care, while inadequate medical information systems were also cited as a major systemic factor affecting glycemic control [20]. In another qualitative study, physicians reported that managing discharged patients required them to access multiple information systems, which increased their workload; furthermore, system failures and slow performance further exacerbated their time constraints and stress [21]. To address these two types of barriers, it is recommended that county-level hospitals implement a dual-track strategy combining flexible talent recruitment with in-house training. This approach would alleviate talent shortages by deploying experts

from medical consortia to local hospitals and providing remote mentoring, while simultaneously training specialized nurses for chronic disease management and hybrid IT professionals within the county. The government should take the lead in promoting the construction of an integrated information platform to consolidate disparate systems—such as HIS, LIS, and chronic disease management systems—thereby achieving seamless data interoperability across the entire patient care cycle and reducing the burden on physicians caused by switching between multiple systems.

Limitations

This study provides a relatively systematic examination of the current status of major chronic disease prevention and control in county-level hospitals under the “Thousand Counties Project” and the factors influencing capacity building; however, certain limitations remain. First, the data sources are subject to subjective bias. Quantitative data primarily rely on healthcare workers’ self-reported work status and self-assessments of their capabilities, lacking support from objective data such as patient treatment outcomes, institutional operational efficiency, and public health service indicators, which may introduce a degree of social desirability bias. Second, the study design is cross-sectional. It can only reflect the status of prevention and control and the association of factors at a specific point in time; it cannot reveal the long-term dynamic changes in capacity enhancement, causal relationships, or the effects of policy implementation, making it difficult to draw temporal inferences. Future research could expand the sample coverage, conduct multicenter, prospective cohort studies, and integrate objective institutional data, patient outcome data, and multi-stakeholder perspective data to further enhance the reliability, generalizability, and policy guidance value of the conclusions.

Conclusions

Since the implementation of the “Thousand Counties Project,” significant progress has been made in building the capacity of county-level hospitals to prevent and treat major chronic diseases; however, shortcomings and bottlenecks remain prominent. County-level hospitals have established a comprehensive service chain for the prevention and treatment of major chronic diseases, covering early screening, standardized diagnosis and treatment, health education, and follow-up care. Among these, standardized diagnosis and treatment have achieved the highest level of coverage, and the overall service system has a solid practical foundation. Nevertheless, efforts to enhance the capacity of county-level hospitals in the prevention and treatment of major chronic diseases face six major obstacles: insufficient development funding, weak research capabilities, a shortage of specialized personnel, inadequate IT infrastructure, constraints imposed by medical insurance policies, and a lack of awareness among medical staff regarding the integration of medical and preventive care. These areas represent key priorities for future policy support and resource allocation. It is recommended that efforts focus on building professional teams, upgrading diagnostic and treatment equipment, improving information systems, coordinating medical insurance policies, strengthening financial support, and raising healthcare professionals’ awareness of the integration of medical and preventive care. By optimizing top-level

design and resource allocation, we can promote the enhancement of major chronic disease prevention and control capabilities in county-level hospitals.

Declarations

Ethics approval and consent to participate

This study was conducted in accordance with the Declaration of Helsinki and relevant guidelines and regulations. This study has received ethical approval from the Medical Ethics Committee of Zhejiang Chinese Medical University (approval number: 20250124-1). Given that this study is a cross-sectional study and employs an anonymous data collection process, we obtained informed consent from all participants verbally or electronically prior to their completion of the questionnaire. We informed participants that completing and submitting the questionnaire would be considered voluntary consent to participate in the study.

Consent for publication

The data in this study have been anonymized and do not reveal any specific information about healthcare personnel; therefore, no specific consent is required for publication.

Competing interests

The author declares that there are no conflicts of interest.

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Author Contribution

SZ: Literature review, data collection, data analysis, drafting, Manuscript Revision; LY: Literature review, data collection, data organization, manuscript proofreading; SH: Literature search, manuscript review; CR: Manuscript Review and Revision.

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Data Availability

The datasets generated and/or analysed during the current study are not publicly available due [REASON WHY DATA ARE NOT PUBLIC] but are available from the corresponding author on reasonable request.

References

1. Noncommunicable diseases. https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases. Accessed 25 April 2026.
2. Center For Cardiovascular Diseases The Writing Committee Of The Report On Cardiovascular Health And Diseases. China N. Report on Cardiovascular Health and Diseases in China 2023: An Updated Summary. Biomed Environ Sci. 2024;37(9):949–92. 10.3967/bes2024.162.
3. Wu Y, He S, Cao M, Teng Y, Li Q, Tan N, et al. Comparative analysis of cancer statistics in China and the United States in 2024. Chin Med J (Engl). 2024;137(24):3093–100. 10.1097/CM9.0000000000003442.
4. Long Z, Liu W, Qi JL, Liu YN, Liu JM, You JL, et al. [Mortality trend of chronic respiratory diseases in China, 1990–2019]. Zhonghua Liu Xing Bing Xue Za Zhi. 2022;43(1):14–21. 10.3760/cma.j.cn112338-20210601-00443.
5. Xu Y, Lu J, Li M, Wang T, Wang K, Cao Q, et al. Diabetes in China part 2: prevention, challenges, and progress. Lancet Public Health. 2024;9(12):e1098–104. 10.1016/S2468-2667(24)00251-2.
6. Stewart J, Addy K, Campbell S, Wilkinson P. Primary prevention of cardiovascular disease: Updated review of contemporary guidance and literature. JRSM Cardiovasc Dis. 2020;9:2048004020949326.
7. Vineis P, Wild CP. Global cancer patterns: causes and prevention. Lancet. 2014;383(9916):549–57.
8. GBD Chronic Respiratory Disease Collaborators. Prevalence and attributable health burden of chronic respiratory diseases, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet Respir Med. 2020;8(6):585–96. 10.1016/S2213-2600(20)30105-3.
9. de Oca MM, Perez-Padilla R, Celli B, Aaron SD, Wehrmeister FC, Amaral AFS, et al. The global burden of COPD: epidemiology and effect of prevention strategies. Lancet Respir Med. 2025;13(8):709–24. 10.1016/S2213-2600(24)00339-4.
10. Bergman M, Buysschaert M, Schwarz PE, Albright A, Narayan KV, Yach D. Diabetes prevention: global health policy and perspectives from the ground. Diabetes Manag (Lond). 2012;2(4):309–21.
11. Crandall JP, Knowler WC, Kahn SE, Marrero D, Florez JC, Bray GA, et al. The prevention of type 2 diabetes. Nat Clin Pract Endocrinol Metab. 2008;4(7):382–93. 10.1038/ncpendmet0843.
12. Cheng Y, Cao X, Zhang J, Xu L, Qin L. Comprehensive assessment of emergency departments in county-level public hospitals: a multicenter descriptive cross-sectional study in Henan province, China. Front Public Health. 2023;11:1301030. 10.3389/fpubh.2023.1301030.
13. Wang Z, Dong L, Xing X, Liu Z, Zhou Y. Disparity in hospital beds' allocation at the county level in China: an analysis based on a Health Resource Density Index (HRDI) model. BMC Health Serv Res.

2023;23(1):1293. 10.1186/s12913-023-10266-4. Published 2023 Nov 23.

14. Yin G, Ning J, Peng Y, Yue J, Tao H. Configurational Paths to Higher Efficiency in County Hospital: Evidence From Qualitative Comparative Analysis. Front Public Health. 2022;10:918571. 10.3389/fpubh.2022.918571. Published 2022 Jun 10.
15. Braun V, Clarke V. Using Thematic Analysis in Psychology. Qualitative Res Psychol. 2006;3(2):77–101. https://doi.org/10.1191/1478088706qp063oa.
16. Wilson PM, Ramar P, Philpot LM, Soleimani J, Ebbert JO, Storlie CB, et al. Effect of an Artificial Intelligence Decision Support Tool on Palliative Care Referral in Hospitalized Patients: A Randomized Clinical Trial. J Pain Symptom Manage. 2023;66(1):24–32. 10.1016/j.jpainsymman.2023.02.317.
17. Mitsala A, Tsalikidis C, Pitiakoudis M, Simopoulos C, Tsaroucha AK. Artificial Intelligence in Colorectal Cancer Screening, Diagnosis and Treatment. A New Era. Curr Oncol. 2021;28(3):1581–607. 10.3390/curroncol28030149. Published 2021 Apr 23.
18. Xu Y, Jiang Z, Ting DSW, Kow AWC, Bello F, Car J, et al. Medical education and physician training in the era of artificial intelligence. Singap Med J. 2024;65(3):159–66. 10.4103/singaporemedj.SMJ-2023-203.
19. Giang PN, Kelly M, Nhung NTT, Sarma H. Continuing medical education programs for primary care physicians from remote locations of Vietnam: a needs assessment. BMC Med Educ. 2022;22(1):279. Published 2022 Apr 13. 10.1186/s12909-022-03336-4
20. Romakin P, Mohammadnezhad M. Healthcare Providers' Perception of Healthcare System Factors Associated with Poor Glycemic Control among Type 2 Diabetes Patients in Fiji. Rev Diabet Stud. 2019;15:49–57. 10.1900/RDS.2019.15.49.
21. Foo KM, Sundram M, Legido-Quigley H. Facilitators and barriers of managing patients with multiple chronic conditions in the community: a qualitative study. BMC Public Health. 2020;20(1):273. 10.1186/s12889-020-8375-8.

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