

## Assessment of Intrinsic Capacity and Influencing Factors among Elderly Patients in a Medical Consortium in Beijing Based on Integrated Care for Older People: A Postprint Study

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### Abstract

Background: As China rapidly enters a deeply aging society, the medical needs of elderly patients are becoming increasingly diverse and complex. Assessing the intrinsic capacity of elderly patients can facilitate early identification of frailty risks and provide a critical basis for refined health management of the elderly population. Objective: Based on the concept of Integrated Care for Older People (ICOPE), this study aims to assess the intrinsic capacity of elderly patients in different medical institutions within a medical alliance and analyze its characteristics and influencing factors. Methods: Using a stratified random sampling method, 890 elderly patients (455 from a tertiary hospital, 135 from a secondary hospital, and 300 from community health service centers) who visited the geriatric department of a tertiary hospital, the general internal medicine (geriatrics) department of a secondary hospital, and community health service centers in a medical alliance in Beijing from November 2024 to March 2025 were selected. The Integrated Care for Older People-Intrinsic Capacity Screening Tool (ICOPE-Q18) was used to assess the intrinsic capacity of the elderly patients. The characteristics of intrinsic capacity among elderly patients in different levels of medical institutions were compared, and multiple linear regression was used to analyze the influencing factors of ICOPE-Q18 scores. Stratified analysis of ICOPE-Q18 scores was conducted for elderly patients of different genders and ages, using multivariate analysis of variance, independent samples t-tests, and Cohen's  $d$  coefficients to analyze the sources of differences in ICOPE-Q18 scores between genders. Results: The average ICOPE-Q18 scores of elderly patients in the tertiary hospital, secondary hospital, and community health service centers within the medical alliance were  $(31.25 \pm 4.30)$ ,

( $26.67 \pm 4.98$ ), and ( $32.11 \pm 3.10$ ), respectively, with a statistically significant difference among the three ( $P < 0.001$ ). Multiple linear regression analysis showed that gender, age, and the number of chronic diseases were influencing factors for the ICOPE-Q18 scores of elderly patients ( $P < 0.05$ ). There was a statistically significant difference in ICOPE-Q18 scores between male and female elderly patients aged 60–69 years [( $33.37 \pm 2.92$ ) vs. ( $32.36 \pm 3.37$ ),  $P < 0.01$ ], with differences mainly reflected in vision, mobility, mood, cognition, number of falls, and BMI. There was also a statistically significant difference in ICOPE-Q18 scores between male and female elderly patients aged  $\geq 80$  years [( $27.88 \pm 4.85$ ) vs. ( $26.18 \pm 4.69$ ),  $P < 0.05$ ], with differences mainly reflected in mobility and mood. Conclusion: Gender, age, and the number of chronic diseases are the primary influencing factors of intrinsic capacity in elderly patients. Intrinsic capacity shows a declining trend with increasing age and number of chronic diseases, and male patients generally have higher intrinsic capacity scores than female patients. Gender differences in intrinsic capacity are primarily observed in the 60–69 and  $\geq 80$  age groups.

## Full Text

### Preamble

## Assessment of Intrinsic Capacity and Its Influencing Factors Among Elderly Patients in a Beijing Medical Alliance Based on Integrated Care for Older People

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### Abstract

**Background:** As the global population ages, the World Health Organization (WHO) has proposed the concept of Intrinsic Capacity (IC) as a core component of healthy aging. Understanding the status of IC and its influencing factors among elderly patients within a medical alliance is crucial for implementing the Integrated Care for Older People (ICOPE) framework.

**Objective:** To evaluate the intrinsic capacity of elderly patients in a Beijing medical alliance and to analyze the factors influencing IC decline, providing a scientific basis for personalized interventions and integrated care.

**Methods:** A cross-sectional study was conducted among elderly patients (aged  $\geq 60$  years) who visited or were hospitalized in a medical alliance in Beijing from October 2022 to June 2023. Intrinsic capacity was assessed using the WHO ICOPE screening tool across five domains: locomotion, sensory (vision and hearing), nutrition, cognition, and psychological (mood). Demographic data, clinical characteristics, and lifestyle factors were collected. Logistic regression analysis was used to identify independent risk factors for IC decline.

**Results:** A total of [Number] elderly patients were included in the study. The prevalence of IC decline in at least one domain was [Percentage]%. The most frequently affected domains were [Domain 1] and [Domain 2]. Multivariable logistic regression analysis revealed that age, educational level, number of chronic diseases, and [Other Factors] were significantly associated with IC decline ( $P < 0.05$ ).

**Conclusion:** Intrinsic capacity decline is prevalent among elderly patients in the Beijing medical alliance. Early screening using the ICOPE framework and targeted interventions addressing modifiable risk factors are essential to maintain functional ability and promote healthy aging.

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## Introduction

The rapid aging of the global population presents significant challenges to health-care systems. In response, the World Health Organization (WHO) shifted the focus from disease-centered models to functional-centered models, introducing the concept of “Intrinsic Capacity” (IC) in 2015. IC is defined as the composite of all physical and mental capacities that an individual can draw upon. It comprises five key domains: locomotion, sensory (vision

## 背景

### Abstract

As China rapidly transitions into a deeply aging society, the medical needs of elderly patients are becoming increasingly diverse and complex. Assessing the intrinsic capacity of elderly patients allows for the early identification of frailty risks and provides a critical basis for the refined health management of the elderly population. This study, grounded in the Integrated Care for Older People (ICOPE) framework, evaluates the intrinsic capacity of elderly patients across different medical institutions within a medical consortium to analyze their characteristics and influencing factors.

Using a stratified random sampling method, 890 elderly patients who visited the geriatric department of a tertiary hospital, the general internal medicine (geriatrics) department of a secondary hospital, and a community health service center within a medical consortium in Beijing from November 2024 to March 2025 were selected. The sample included 455 patients from the tertiary hospital, 135 from the secondary hospital, and 300 from the community health service center. The intrinsic capacity of these patients was assessed using the Integrated Care for Older People-Intrinsic Capacity Comprehensive Assessment Questionnaire (ICOPE-Q18). The characteristics of intrinsic capacity were compared across different levels of medical institutions, and multiple linear regression was employed to analyze the factors influencing ICOPE-Q18 scores. Stratified analyses were conducted based on gender and age, utilizing multivariate analysis of

variance (MANOVA) and independent sample Cohen's *d* coefficients to identify the sources of differences in ICOPE-Q18 scores between genders.

The results showed that the mean ICOPE-Q18 scores for elderly patients in the tertiary hospital, secondary hospital, and community health service center were  $31.25 \pm 4.30$ ,  $26.67 \pm 4.98$ , and  $32.11 \pm 3.10$ , respectively. The differences between these groups were statistically significant ( $P < 0.001$ ). Multiple linear regression analysis indicated that gender, age, and the number of chronic diseases were significant factors influencing ICOPE-Q18 scores ( $P < 0.05$ ). Among patients aged 60–69 years, there was a statistically significant difference in scores between males and females ( $33.37 \pm 2.92$  vs.  $32.36 \pm 3.37$ ,  $P < 0.01$ ), with differences primarily manifesting in vision, mobility, mood, cognition, frequency of falls, and BMI. For patients aged  $\geq 80$  years, the difference between males and females was also statistically significant ( $27.88 \pm 4.85$  vs.  $26.18 \pm 4.69$ ,  $P < 0.05$ ), with differences mainly observed in mobility and mood.

In conclusion, gender, age, and the number of chronic diseases are the primary factors influencing the intrinsic capacity of elderly patients. Intrinsic capacity tends to decline as age and the number of chronic diseases increase, and male patients generally exhibit higher intrinsic capacity scores than female patients. Gender differences in intrinsic capacity are most prominent in the 60–69 and  $\geq 80$  age groups.

**Keywords:** Integrated Care for Older People (ICOPE); Intrinsic capacity assessment; Medical consortium; Hierarchical medical system; Influencing factors analysis

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## Background

China is rapidly entering a deeply aging society, which poses a severe challenge to the medical system. The medical needs of elderly patients are increasingly diverse and complex. The assessment of intrinsic abilities in elderly patients can identify the risk of frailty early and provide a key tool for refined health management of the elderly population.

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Chinese General Practice <https://doi.org/10.1016/j.chinaxiv.202603.00123> Objective Based on the ICOPE concept, this research evaluates the intrinsic capability of elderly patients in different medical institutions within the medical consortium, analyzes its characteristics and influencing factors.

## Methods

Using stratified random sampling method, 890 elderly patients within a medical consortium in Beijing from November 2024 to March 2025 were selected.

The sample included 455 patients from tertiary hospital, 135 patients from secondary hospital, and 300 patients from community elderly participants. A comparative analysis was conducted to examine the characteristics of intrinsic capacity among elderly patients across different levels of medical institutions. Multivariate linear regression was employed to analyze the influencing factors of ICOPE-Q18 scores in elderly patients. Stratified analysis was performed based on the gender and age of the participants to investigate the differences of ICOPE-Q18 scores. Multivariate analysis of variance (MANOVA), independent sample  $t$ -tests, Cohen coefficient were used to explore the sources of gender differences in ICOPE-Q18 scores.

## Results

In a certain district of Beijing, the ICOPE-Q18 scores of elderly patients in tertiary hospital, secondary hospital, and community health service center were  $(31.25 \pm 4.30)$ ,  $(26.67 \pm 4.98)$ , and  $(32.11 \pm 3.10)$ , respectively ( $p < 0.001$ ). The results of multiple linear regression analysis showed that age, gender, and the number of chronic diseases were the influencing factors of ICOPE-Q18 score ( $p < 0.01$ ).

There was a significant difference in ICOPE-Q18 scores between male and female patients aged 60-69 [ $(33.37 \pm 2.92)$  vs  $(32.36 \pm 3.37)$ ,  $p = 0.01$ ], mainly manifested in vision, mobility, emotions, cognitive Q18 scores between male and female patients over 80 years old [ $(27.88 \pm 4.85)$  vs  $(26.18 \pm 4.69)$ ,  $p = 0.05$ ], mainly manifested in terms of mobility and emotions.

## Conclusion

Age, gender, and the number of chronic diseases are the main influencing factors of intrinsic capabilities of elderly patients. As age and the number of chronic diseases increase, the intrinsic capabilities score decreases. Generally, the intrinsic capabilities score of male patients was better than that of female patients. The differences mainly manifest in the age groups of 60-69 years old and over 80 years old.

**Keywords:** Integrated care for older people; Intrinsic capacity assessment; Medical consortium; Hierarchical diagnosis and treatment; Root cause analysis

## Introduction

By the end of 2024, China's population aged 60 and above reached 310.31 million, accounting for 22.0% of the total population; meanwhile, the population aged 65 and above reached 220.23 million, representing 15.6% of the total. As the population ages, the demand for medical services is growing rapidly. The

increasing prevalence of frailty and multimorbidity among the elderly has placed higher demands on the delivery of healthcare services [?]. The core objective of establishing medical consortia is to achieve scientific patient diversion and the optimized allocation of medical resources through a hierarchical diagnosis and treatment system. High-quality advancement of these consortia serves as the foundation for constructing a healthcare system characterized by “primary diagnosis at the grassroots level, two-way referral, separate treatment for acute and chronic conditions, and upper-lower linkage.” Furthermore, it provides critical support for ensuring the continuity of care for elderly patients with chronic diseases.

However, the current diagnostic and treatment systems for elderly patients within medical consortia still exhibit certain deficiencies. Clinical decision-making relies excessively on single-disease models [?], often overlooking essential factors such as multimorbidity and disability. Furthermore, comprehensive geriatric assessments have not been universally integrated into medical consortia, leading to insufficient evaluations of treatment tolerance, patient preferences, and social support systems. The World Health Organization (WHO) defines intrinsic capacity (IC) as the composite of all the physical and mental capacities that an individual can draw upon. IC encompasses multiple dimensions, including locomotion, nutrition, cognition, psychology, and sensory functions, and serves as a comprehensive reflection of energy metabolism, neuromuscular function, and immune and stress response levels.

A decline in intrinsic capacity increases the risk of hospitalization and leads to higher mortality rates among elderly patients [?]. Conversely, higher levels of intrinsic capacity are generally associated with a lower risk of adverse outcomes. Currently, there is a lack of research regarding the characteristics and underlying causes of intrinsic capacity among elderly patients across different levels of medical institutions within medical consortia. Guided by the concept of Integrated Care for Older People (ICOPE), this study evaluates the characteristics of intrinsic capacity in elderly patients across various medical institutions. By analyzing the downward trends and influencing factors of intrinsic capacity, and exploring the correlation between intrinsic capacity and multimorbidity, this research aims to provide a theoretical foundation for the stratified diagnosis, treatment, and continuous medical service of elderly patients.

## 1.1 研究对象

This study employed a multicenter cross-sectional survey design conducted from November 2024 to March 2025. The research was carried out across three institutions within a single integrated healthcare system (medical alliance) in a district of Beijing: the geriatric department of a tertiary hospital, the general internal medicine (geriatrics) department of a secondary hospital, and a community health service center. Using a stratified random sampling method based on hospital level, the sample size for each institution was determined by referencing the actual number of patients served by each department in 2023 while consid-

ering research feasibility. The final sample included 890 participants, consisting of 455 cases from the tertiary hospital, 135 from the secondary hospital, and 300 from the community health service center.

The inclusion criteria for the study participants were as follows: (1) aged 60 years or older; and (2) the participants or their caregivers were able to clearly answer questions related to the study. The exclusion criteria were: (1) refusal by the patient or their caregiver to cooperate in answering study-related questions; and (2) withdrawal from the study by the patient or their caregiver for any reason.

This project was approved by the Institutional Review Board of Peking University People's Hospital (Approval No.: 2024PHB458-001). All included participants provided written informed consent.

### 1.2.1 老年人内在能力评估

The survey was conducted using the Integrated Care for Older People-Q18 (ICOPE-Q18) assessment questionnaire. This instrument was developed by the Department of Geriatrics at Peking University People's Hospital. The development process followed a rigorous sequence: initial draft preparation, internal expert review, first revision, external expert review, second revision, pilot testing for validation, third revision, and finalization. Based on the ICOPE framework proposed by the WHO, the ICOPE-Q18 is a patient-centered tool designed to screen the intrinsic capacity of elderly patients through questions related to daily life scenarios. It covers multiple core dimensions, including vision, hearing, nutrition, activities of daily living, cognition, and psychological well-being [?].

The scoring criteria are as follows: For questions 1-2, "frequently affected" is scored as 1 point, "occasionally affected" as 2 points, and "not affected" as 3 points. For questions 3-4, "frequently unable to hear" is scored as 1 point, "able to hear but not clearly" as 2 points, and "able to hear clearly" as 3 points. For questions 5-7, the Body Mass Index (BMI) and the rate of weight change over the past six months are calculated. The rate of weight change is determined by the formula:  $\text{Rate of weight change} = (\text{current weight} - \text{weight 6 months ago}) / \text{weight 6 months ago} \times 100\%$ .

### 2 计 2 分, BMI < 18.5 kg/m

A score of 1 is assigned if the BMI is between 18.5 and 24.0 kg/m<sup>2</sup>. Regarding weight fluctuations over the past six months, a change within the range of -5% to 5% is assigned 2 points, while any change outside this range is assigned 1 point. For Question 8, "no falls" is scored as 2 points, "1 to 3 falls" as 1 point, and ">3 falls" as 0 points. For Questions 9 through 14, a response of "difficult" receives 1 point, while "not difficult" receives 2 points. For Questions 15 through 18, "yes" is scored as 1 point and "no" as 2 points. The sum of the scores for

all the aforementioned items constitutes the total ICOPE-Q18 score. A higher total ICOPE-Q18 score indicates superior intrinsic capacity in the patient.

### 1.2.2 协变量

Covariates included sex, age, smoking history, alcohol consumption history, and the presence of chronic diseases (including hypertension, diabetes, hyperlipidemia, coronary heart disease, cerebrovascular disease, Alzheimer's disease, osteoporosis, and malignant tumors).

Smoking history was categorized as “none” for individuals who had never smoked or whose lifetime total consumption was fewer than 100 cigarettes. Similarly, alcohol consumption history was categorized as “none” for those who never consumed alcohol or who drank less than once per month on average (fewer than 12 times per year). Data regarding chronic diseases were retrieved from electronic medical record systems; a participant was considered to have a specific condition if a corresponding diagnostic record was present.

### 1.2.3 调查与质量控制

The survey content was uniformly coded, and data organization and analysis were performed using SPSS 26.0 and R 4.4.2 software. Categorical data are presented as frequencies and constituent ratios, and comparisons between groups were conducted using the  $\chi^2$  test.

## 2 检验; 呈正态分布的计量

Data are expressed as ( $\bar{x} \pm s$ ). Comparisons between two groups were performed using independent samples *t*-tests, while comparisons among multiple groups were conducted using one-way analysis of variance (ANOVA). A multiple linear regression model was employed to analyze the factors influencing the ICOPE-Q18 scores of the patients. Furthermore, Cohen's *d* coefficients were utilized to analyze the sources of differences in ICOPE-Q18 scores between genders. A *P*-value of  $< 0.05$  was considered to indicate a statistically significant difference.

### 2.1 不同级别医疗机构老年患者的基本情况

Among the 455 elderly patients from tertiary hospitals, 217 (47.7%) were female and 238 (52.3%) were male, with a mean age of ( $72.1 \pm 8.9$ ) years. Of the 135 elderly patients from secondary hospitals, 71 (52.6%) were female and 64 (47.4%) were male, with a mean age of ( $77.1 \pm 10.3$ ) years. Among the 300 elderly patients from community health service centers, 169 (56.3%) were female and 131 (43.7%) were male, with a mean age of ( $71.5 \pm 7.6$ ) years.

There were no statistically significant differences in gender, smoking history, or the prevalence of hypertension among elderly patients across different levels of medical institutions ( $P > 0.05$ ). However, statistically significant differences

were observed in age, alcohol consumption history, number of chronic diseases, and the prevalence of diabetes, hyperlipidemia, coronary heart disease, cerebrovascular disease, Alzheimer' s disease, osteoporosis, and malignant tumors ( $P < 0.05$ ), as shown in .

The mean ICOPE-Q18 scores for elderly patients in tertiary hospitals, secondary hospitals, and community health service centers within the Medical Alliance were ( $31.25 \pm 4.30$ ), ( $26.67 \pm 4.98$ ), and ( $32.11 \pm 3.10$ ), respectively. The differences between these three groups were statistically significant ( $F = 88.465$ ,  $P < 0.001$ ). The scores for each item of the ICOPE-Q18 among elderly patients in different medical institutions within the Medical Alliance are presented in .

A multiple linear regression analysis was conducted using the ICOPE-Q18 score as the dependent variable (entered as measured values) and gender, age, smoking history, alcohol consumption history, number of chronic diseases, and BMI as independent variables. The results indicated that gender, age, and the number of chronic diseases were significant factors influencing the ICOPE-Q18 scores of elderly patients ( $P < 0.05$ ), as shown in . The Variance Inflation Factor (VIF) for each variable was less than 3.0, suggesting that there were no serious multicollinearity issues within the model.

Statistically significant differences were found in ICOPE-Q18 scores between male and female elderly patients in the 60-69 and  $\geq 80$  age groups ( $P < 0.05$ ). However, no statistically significant difference was observed between male and female patients in the 70-79 age group ( $P > 0.05$ ), as shown in .

The gender differences in ICOPE-Q18 scores among elderly patients of different ages were further analyzed. For patients aged 60-69, gender differences in ICOPE-Q18 scores were primarily reflected in vision (Q1, Q2), mobility (Q9, Q12, Q14), mood (Q15, Q16), cognition (Q17), frequency of falls, and BMI, as shown in . For patients aged  $\geq 80$ , gender differences were mainly observed in mobility (Q9, Q11, Q12, Q14) and mood (Q16), as shown in .

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## 2.6 不同医疗机构和慢性病数量老年患者

### Stratified Analysis of ICOPE-Q18 Scores

The stratified analysis of ICOPE-Q18 scores revealed statistically significant differences ( $P < 0.05$ ) among elderly patients seeking care at different levels of healthcare institutions, regardless of whether they suffered from  $\leq 2$ , 3-4, or  $\geq 5$  chronic conditions. These results are detailed in .

## Bubble Map Analysis of Chronic Disease Burden and ICOPE-Q18 Patient Categories across Healthcare Institutions

Based on the median ICOPE-Q18 scores observed across different healthcare levels (32 points for tertiary hospitals and community health centers; 27 points for secondary hospitals), patients were categorized into three groups: scores  $< 28$ ,  $28-32$ , and  $> 32$  points. A bubble map was constructed to visualize the relationship between the number of chronic diseases and ICOPE-Q18 scores across various institutional levels. The results indicate that the population served by community health centers primarily consists of individuals with fewer chronic diseases and higher intrinsic capacity. In contrast, secondary hospitals mainly serve patients with a higher burden of chronic diseases and lower intrinsic capacity. Tertiary hospitals primarily serve a population characterized by fewer chronic diseases and higher intrinsic capacity, while also treating patients with multiple chronic conditions and lower intrinsic capacity; however, the latter group represents a relatively small proportion of the overall patient population in tertiary hospitals, as shown in [Figure 1: see original paper].

### 3.1 老年患者内在能力特点

The ICOPE-Q18 scores encompass multiple domains, including vision, hearing, nutrition, and activities of daily living (ADL).

### 2 值

The ICOPE-Q18 scale encompasses multiple dimensions, including mobility, cognition, and psychological well-being, providing a comprehensive reflection of the intrinsic capacity of elderly patients. Multiple linear regression analysis revealed that age, gender, and the number of chronic diseases are the primary factors influencing ICOPE-Q18 scores. Specifically, ICOPE-Q18 scores exhibited a downward trend as the number of chronic diseases increased. Overall, male patients achieved higher ICOPE-Q18 scores than female patients, a disparity most pronounced in the 60-69 and  $\geq 80$  age groups. In the 60-69 age group, gender differences in ICOPE-Q18 scores were primarily reflected in vision, physical function, weight management, mood, and cognition. For patients aged  $\geq 80$ , these differences were mainly concentrated in physical function and mood. Consequently, clinical interventions for elderly patients should incorporate comprehensive evaluations tailored to age, gender, and specific dimensions of intrinsic capacity.

A meta-analysis of 37 studies demonstrated that intrinsic capacity is inversely associated with mortality risk in the elderly, suggesting that intrinsic capacity serves as a critical indicator of healthy aging. Sanchez et al. utilized data from the China Health and Retirement Longitudinal Study (CHARLS) to show that adverse early-life factors can negatively impact health status in later life;

these effects are particularly evident in cognitive function, sensory function, and psychological well-being, and are further exacerbated by the accumulation of socioeconomic inequalities. Furthermore, Beard et al. conducted a cohort study comparing the intrinsic capacity of elderly populations in the United Kingdom and China. Their findings indicated that newer cohorts enter old age with higher levels of intrinsic capacity compared to earlier cohorts, with the most significant improvements observed in cognitive and locomotor functions. In summary, the intrinsic capacity of elderly patients across tertiary hospitals, secondary hospitals, and community health service centers varies significantly.

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## 2 值

Community Health Service Center. Q1: Are your daily activities (e.g., driving, crossing the street) affected by poor vision? ( $P < 0.001$ ). Q2: Are your daily activities (e.g., reading books, newspapers, or using a mobile phone) affected by poor vision? ( $P < 0.001$ ). Q3: Can you hear or clearly understand family members when they speak softly? ( $P < 0.001$ ). Body Mass Index (BMI):  $< 18.5 \text{ kg/m}^2$ ,  $18.5\text{--}24.0 \text{ kg/m}^2$ ,  $> 24.0 \text{ kg/m}^2$ . Weight change amplitude over the past 6 months. Q10: Do you have difficulty standing up from a chair by yourself? ( $P < 0.001$ ). Q11: Do you have difficulty walking fast or riding a bicycle?

Q12: Do you have difficulty mopping the floor or carrying heavy objects?

*Chinese General Practice* https (Table 2 continued). Note: ICOPE-Q18 = Integrated Care for Older People - Questionnaire for the Comprehensive Assessment of Intrinsic Capacity. Multivariate linear regression analysis of factors affecting the ICOPE-Q18 scores in elderly patients. Gender (Reference: Female).

Male: 1.42 (0.81–2.04),  $SE = 0.31$ ,  $\beta = 0.16$ ,  $t = 4.53$ ,  $P < 0.01$ .

Age (included as a continuous measured value):  $-0.24$  ( $-0.26\text{--} -0.21$ ),  $SE = 0.01$ ,  $\beta = -0.47$ ,  $t = -16.28$ ,  $P < 0.001$ .

Number of chronic diseases (included as a continuous measured value).

$-0.69$  ( $-0.84\text{--}0.54$ )  $0.08$   $-0.26$   $-9.10$   $<0.001$

Constant  $48.79$  ( $46.20\text{--}51.38$ )  $1.32$   $-36.90$   $<0.001$

Note: –indicates that the corresponding data is not available. ICOPE-Q18  
ICOPE-Q18

## 2 值

Stratified analysis of the scores of ICOPE-Q18 in elderly patients of different genders and ages

$\geq 80$  years old:  $n = 207$ ,  $26.18 \pm 4.69$ ,  $27.88 \pm 4.85$ ,  $t = -2.56$ ,  $P = 0.011$ .

The intrinsic capacity of elderly patients is influenced not only by factors such as age, gender, and the number of chronic diseases but is also closely related to adverse early-life factors, socioeconomic status, and the historical period in which they lived.

### Factors Influencing the Intrinsic Capacity of Elderly Patients

Age is a critical factor affecting the intrinsic capacity of elderly patients. In this study, calculations for the Integrated Care for Older People Screening Tool (ICOPE-Q18) were based on Question 5 ( “What was your weight 6 months ago?” ) and Question 6 ( “What is your current weight” ) at community health service centers. Body Mass Index (BMI) was calculated using Question 6 ( “What is your current weight” ) and Question 7 ( “What is your current height” ). Functional difficulty was defined as having difficulty in any single activity. Due to numerical rounding, the sum of some constituent ratios may not equal 100.0%.

Number of chronic diseases. Note: ICOPE-Q18 = Integrated Care for Older People - Intrinsic Capacity Comprehensive Assessment Questionnaire. Figure A represents tertiary hospitals, Figure B represents secondary hospitals, and Figure C represents community health service centers. On the horizontal axis, 1, 2, and 3 represent  $\leq 2$ , 3-4, and  $\geq 5$  chronic diseases, respectively. On the vertical axis, 1, 2, and 3 represent ICOPE-Q18 scores of  $< 28$ , 28-32, and  $> 32$  points, respectively.

[Figure 1: see original paper] Bubble chart showing the proportion of patients based on the number of chronic diseases and ICOPE-Q18 scores across different medical institutions.

Chinese General Practice. Comparison of ICOPE-Q18 scores between elderly patients aged 60-69 years of different genders.

Note: For the overall MANOVA test, Pillai's Trace = 0.188,  $F(17, 367) = 5.000$ ,  $P < 0.001$ .

Comparison of ICOPE-Q18 scores between elderly patients aged  $\geq 80$  years of different genders. An analysis of the trajectory of intrinsic capacity among elderly individuals in Chinese communities revealed that after a 4-year follow-up, 32.1% of the elderly experienced a decline in intrinsic capacity. Age was identified as an independent risk factor for this decline. These results are consistent with other domestic studies in the field. For instance, Zhou et al. found that age is a key variable influencing changes in intrinsic capacity. By observing these trajectories, elderly individuals can be categorized into different groups, providing data support for the implementation of holistic person-centered care and the delay of adverse outcomes.

As age increases, the functions of various human organs and systems gradu-

ally deteriorate, leading to a decline in physical performance and, ultimately, a reduction in intrinsic capacity. This is commonly manifested as decreased mobility, sensory impairment, and memory loss. Potential underlying mechanisms include mitochondrial dysfunction, DNA methylation drift, cellular and metabolic alterations, and systemic chronic inflammation [?, ?, ?, ?].

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## 分析

Stratified analysis of the scores of ICOPE-Q18 in elderly patients of different chronic disease number and medical institution level

≤ 2 types:  $32.24 \pm 3.86$ ,  $29.05 \pm 4.10$ ,  $33.17 \pm 2.56$ ,  $F = 13.436$ ,  $P < 0.01$

3-4 types:  $31.29 \pm 4.21$ ,  $27.63 \pm 4.80$ ,  $31.18 \pm 3.15$ ,  $F = 19.568$ ,  $P < 0.01$

≥ 5 types:  $28.30 \pm 4.49$ ,  $24.97 \pm 4.91$ ,  $30.07 \pm 3.45$ ,  $F = 15.210$ ,  $P < 0.01$

An increase in the number of comorbidities leads to a decline in intrinsic capacity (IC), and patients with a heavy burden of chronic diseases often exhibit low levels of IC. A cross-sectional analysis using the INSPIRE-T cohort demonstrated that, compared to individuals with IC scores above the 90th percentile, those with scores below the 10th percentile not only had a higher number of comorbidities but were also more prone to frailty and falls. It is evident that an increase in the number of comorbidities and a decline in intrinsic capacity interact with each other, easily forming a vicious cycle.

This study found gender differences in intrinsic capacity scores across different age groups. Specifically, in the domains of vision, physical function, body weight management, mood, and cognition, male patients generally performed better than female patients. A study by Yu et al. reached similar conclusions, indicating that women are less likely to be categorized into the group characterized by high baseline intrinsic capacity and a gradual decline. It is hypothesized that this phenomenon may be related to lower levels of social participation and exercise frequency among women. Conversely, research by Fuentealba et al. constructed an epigenetic prediction model for intrinsic capacity based on DNA methylation data; their results showed that men scored higher in the psychological domain, while women scored higher in the sensory domain. No statistically significant gender differences were found in cognitive or locomotor capacities. The causes of these gender differences may be related to immunosenescence and immune responses. The primary reason for the discrepancies in research conclusions may lie in the different age ranges of the study samples: both the present study and the study by Yu et al. focused on elderly patients aged 60 and above, whereas the participants in the study by Fuentealba et al. spanned a wider age range, covering individuals from 20 to 102 years old.

## Reasons for Differences in Patient Intrinsic Capacity Across Different Medical Institutions

China's healthcare delivery system exhibits significant hierarchical differences, and the functional positioning of hospitals at different levels is closely related to the intrinsic capacity characteristics of the patients they serve.

Tertiary hospitals focus on acute-phase treatment and surgical interventions, and the intrinsic capacity of their patient population is highly variable. According to the *Evaluation Standards for Tertiary Hospitals (2025 Edition)* issued by the National Health Commission, the average length of stay is a core performance indicator. Current reforms in Diagnosis-Related Groups (DRGs) payment systems and hospital turnover requirements prompt tertiary hospitals to rapidly transfer patients who are clinically stable but have low intrinsic capacity and require long-term medical intervention to rehabilitation institutions or community hospitals. In contrast, community health service centers emphasize prevention and chronic disease management. These centers offer advantages such as high accessibility, strong capacity for age-appropriate services, and lower medical costs; their primary service population typically possesses good intrinsic capacity.

Notably, secondary hospitals currently exhibit a unique “sandwich layer” characteristic: they lack the prominent specialized technical advantages of tertiary hospitals and find it difficult to fully undertake the public health functions of primary-level institutions. Consequently, their service volume has continued to decline in recent years.

Against the backdrop of medical business transformation and upgrading, coupled with intensifying external pressures, some secondary hospitals are showing a trend toward transitioning into “rehabilitation hospitals,” “geriatric nursing homes,” or “integrated medical and elderly care institutions.” Their service targets are primarily focused on patients with multiple comorbidities and poor intrinsic capacity.

This dynamic interplay—driven by medical policy, institutional functional positioning, and patient medical needs and characteristics (especially intrinsic capacity)—has gradually formed a division of labor within medical alliances where each entity performs its specific role. Tertiary hospitals lead therapeutic referrals; after completing core treatments, they screen patients who are stable but have weak intrinsic capacity for transfer to lower-level hospitals for continued care. Community health service centers handle preventive management, focusing on the daily health needs of patients with stronger intrinsic capacity. Transforming secondary hospitals explore and practice transitional care, focusing on patients in stable phases who have multiple comorbidities and poor intrinsic capacity. Ultimately, through the collaborative operation and patient screening mechanisms within the medical alliance, a systematic differential distribution of patient intrinsic capacity levels has formed across the hierarchy of medical institutions.

## Strengths and Limitations of the Study

The ICOPE-Q18 used in this study is closely aligned with the actual lives of older adults, covering multiple dimensions such as vision, hearing, mobility, mood, and cognition. It is also simple, feasible, and highly operable, providing good reliability for the comprehensive assessment of intrinsic capacity in the elderly. The three medical institutions within the medical alliance are geographically adjacent, which effectively reflects the overall situation of elderly patients visiting medical institutions in this region. Taking the medical alliance as an entry point and based on the ICOPE concept, this study analyzes the characteristics and influencing factors of intrinsic capacity among elderly patients in different levels of medical institutions while also examining the service advantages and specialties of these institutions.

This study is a cross-sectional study of elderly patients, and there were many difficulties in collecting covariates; furthermore, the scope of the study is relatively limited. In the next stage, the research team will leverage the advantages of the medical alliance to integrate database resources within the alliance, incorporating more objective indicators such as laboratory data into the analysis. We plan to expand the scope of the research by conducting multi-center studies and selecting more medical alliances through multi-stage stratified random sampling to enhance the external validity of the findings. Additionally, prospective studies will be conducted, using healthy populations as the starting point of observation, to explore high-risk factors for comorbidities and declining intrinsic capacity and to investigate appropriate referral pathways for patients across different levels of medical institutions.

**Author Contributions:** Wang Shuchun was responsible for data organization and manuscript writing; Wei Yanan, Jia Chunling, and Liu Jie were responsible for coordinating different institutions and personnel to complete the investigation; Xue Qian, Li Menghan, Deng Lihua, Li Xia, Yang Guangyao, and Yan Lijuan were responsible for data collection, entry, and proofreading; Wang Jingtong was responsible for project design and execution and is overall responsible for the article.

The authors declare no conflicts of interest.

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