

Hospital Management Team Characteristics and Hospital Rankings: An Upper Echelons Theory Perspective

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Hospital Management Team Characteristics and Hospital Rankings: An Upper Echelons Theory Perspective

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Abstract

Background: Hospital management teams may shape organisational decision-making and performance, but evidence concerning the composition of management teams in Chinese tertiary hospitals remains limited. This study examined the associations between management-team characteristics and hospital rankings.

Methods: From the perspective of Upper Echelons Theory, this study analyzed publicly available management-team data for 730 managers from 87 hospitals across China between 2020 and 2022. Team-level demographic characteristics, professional experience, professional-background heterogeneity, and selected hospital characteristics were examined in relation to the 2022 Fudan hospital ranking. Continuous team-level predictors were dichotomised at their sample medians and entered into a multivariable ordinary least-squares regression model. Lower numerical ranking values indicated better hospital rankings.

Results: The average age of the 730 managers was 53.95 years, with female administrators accounting for 22%. Only 8% of leaders were externally recruited, and 11% possessed prior government work experience; medical professionals constituted 68% of the total sample. The Blau index of professional-background heterogeneity reached 0.43, indicating moderate diversity within management cohorts. Nearly half (49%) had multi-functional department working experience, and 42% had previously served as heads of clinical or technical medical departments. In the multivariable regression model, higher proportions of managers with cross-departmental experience ($B = -22.81, P < 0.001$) and participation in provincial- or national-level talent programmes ($B = -14.83, P = 0.004$) were associated with better hospital rankings. A higher proportion of externally appointed managers ($B = 86.10, P < 0.001$) and specialty-hospital status ($B = 18.36, P = 0.005$) were associated with poorer numerical rankings.

Conclusions: Greater representation of managers with cross-departmental experience and participation in high-level talent programmes was associated with better hospital rankings, whereas greater reliance on externally appointed managers and specialty-hospital status was associated with poorer numerical rankings. These findings should be interpreted as associations rather than causal effects.

Keywords: Hospital Management Teams; Background Characteristics; Hospital Performance; Upper Echelons Theory

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Introduction

In 1984, American scholars Hambrick and Mason proposed the “Upper Echelons Theory”^[1], which posits that top executives’ personal background characteristics shape their interpretation of external operational environments and embedded value judgements. Executives’ life experience, personality traits and value systems are inherently embedded into strategic decision-making procedures, ultimately translating individual managerial traits into organisational strategic choices and overall performance. Since then, this theoretical framework has been widely applied across diverse organisational contexts, ranging from industrial corporations and universities to public healthcare institutions.

Existing scholarship predominantly focuses on how clinical professional backgrounds of hospital leaders shape medical service quality and financial performance. For example, F. Sarto et al.^[2] illustrated that clinical managers suppress short-term financial returns but substantially lift clinical service quality. Bloom et al.^[3] further documented that a larger proportion of clinician leaders correlates with standardised, mature hospital management systems. Clay-Williams et al. conducted a systematic literature review on the relationship between leaders’ medical backgrounds and management indicators. Prasetyo et al.^[4] revealed that the top management team (TMT)’s heterogeneity exerts a positive effect on hospital performance, whereas demographic features including age, female representation, leadership tenure, educational attainment and specialisation have no significant correlation with institutional operational outcomes.

Despite scholars have conducted valuable explorations of hospital senior executives from isolated dimensions, systematic empirical research examining the integrated structural traits of TMT, especially within the unique institutional backdrop of China’s public healthcare system—remains insufficient and fragmented.

In 2018, national health regulatory authorities in China issued official guidance mandating collective deliberation by hospital management teams for all major institutional decisions. The hospital management team is not only the driving force of organizational innovation but also the fundamental impetus for improving the overall service level. This paper selects hospital management teams as the research subjects and, guided by Upper Echelons Theory, comprehensively estimating the association of their background characteristics, heterogeneity and hospital performance.

Theoretical Analysis

1. Managerial cross-department work experience and organisational performance

Managerial work experience refers to prior service as heads of hospital functional administrative departments or clinical/medical technology divisions before appointment to senior hospital leadership roles. Some hospital leaders accumulate successive appointments across multiple functional departments, while others are promoted directly from frontline clinical and technical departments. Cumulative vocational experience constructs unique knowledge architectures and practical expertise, which further mould cognitive frameworks and value priorities throughout

decision-making workflows, and ultimately steer administrative judgements^[5]. In addition, multi-department working backgrounds streamline cross-divisional communication, enhance coordination efficiency and information exchange quality, thereby generating favourable spillover effects on hospital operational performance.

2. Professional-background heterogeneity of management teams and organisational performance

Group heterogeneity constitutes a core construct within sociological research, defined as inter-member disparities in inherent traits, behavioural patterns, attitudes and value orientations. Such differences reflect group diversity and embody the complexity of social organisations. Hospital senior management teams similarly display varying degrees of functional background heterogeneity. Evidence from non-healthcare sectors reveals that low team heterogeneity generates high interpersonal similarity, facilitating the formation of shared group identities and unified behavioural norms, and consequently strengthening internal team cohesion. Conversely, highly heterogeneous TMTs aggregate diversified knowledge reserves and expanded external resource networks. Nevertheless, pronounced cognitive divergence stemming from disparate professional origins may trigger internal conflicts and coordination frictions, which could exert adverse impacts on collective organisational performance^[6].

3. Specialised occupational backgrounds and organisational performance

Specialised occupational backgrounds cover three core dimensions: overseas study experience, external institutional recruitment, and prior government administrative employment. Hospitals operate as knowledge-intensive public welfare organisations. Executives with overseas academic training possess cutting-edge specialised expertise and globalised perspectives, rendering them more adept at absorbing and adapting international mature management paradigms. Externally recruited administrators introduce novel institutional insights, external industry resources and innovative managerial logic; however, misalignment with established organisational culture may impede operational efficiency and performance. Leaders with prior government work experience maintain extensive inter-agency relational capital, enabling hospitals to more readily secure fiscal resources, policy support and institutional concessions, which delivers tangible positive benefits to comprehensive hospital performance.

1 Data Sources and Methods

1.1 Data Sources

This study targets hospitals listed in the Fudan University Hospital Management Institute's China Best Hospital Ranking. TMT resume data were extracted from official hospital websites and authoritative public personnel disclosure platforms. Initial screening excluded hospitals with incomplete leadership biographical information and military-affiliated medical institutions, yielding a final analytical sample of 87 tertiary hospitals. We assume relative stability of hospital leadership cohorts; partial turnover of individual executives does not fundamentally alter institutional decision-making

norms. Biographical information for 730 senior administrators across the 87 sampled hospitals from 2020 to 2022 was systematically collated, covering age, educational attainment, prior career trajectories and other demographic indicators.

1.1.1 Dependent Variable

We adopt the 2022 Fudan China Best Hospital Ranking as the proxy indicator for comprehensive hospital performance. Launched in 2010 by the Hospital Management Institute of Fudan University, this ranking represents China's first third-party independent hospital evaluation system developed by professional academic institutions. Its assessment framework draws upon the peer-review mechanism of the U.S. News & World Report Best Hospitals ranking system: specialist reputational scores are first aggregated to generate discipline-specific rankings, which are then integrated with clinical research metrics to calculate overall hospital standings. The evaluation framework serves dual purposes: benchmarking institutional comprehensive strength and clinical discipline capacity, while providing transparent reference standards for hospital disciplinary development and patient healthcare-seeking decisions^[7]. A larger numerical ranking value corresponds to weaker comprehensive institutional performance.

1.1.2 Independent Variables

Thirteen predictor variables were constructed at the hospital level from individual-level biographical information on management-team members. These variables covered demographic composition, professional and managerial background, professional-background heterogeneity, academician-team status, and hospital type.

The hospital management team was defined as comprising the hospital director and vice-directors, along with the secretary and deputy secretaries of the hospital's Party committee. For proportion-based variables, the numerator was the number of management-team members with the relevant characteristic, and the denominator was the total number of members of the management team.

Demographic composition: Three demographic variables were included: the proportion of female managers, mean age, and age heterogeneity. The proportion of female managers was calculated as the number of female management-team members divided by the corresponding total number of management-team members in each hospital. Mean age was calculated as the arithmetic mean age of management-team members within each hospital. Age heterogeneity was measured using Blau's index,

rather than the coefficient of variation, calculated as follows: $H = 1 - \sum_{i=1}^n P_i^2$.

Professional and managerial background: Seven variables were included: the proportions of managers participating in provincial- or national-level talent programmes, having a medical professional background, being appointed from outside the hospital, having overseas experience, having prior government employment, having

cross-departmental experience, and having previously served as heads of clinical or medical-technical departments.

High-level talent participation was defined as participation in talent programs sponsored by government authorities at the provincial/ministerial level or above. A medical professional background was defined as having a background in clinical medicine and holding the relevant professional qualification. External appointment referred to recruitment from outside the focal hospital. Overseas experience was defined as overseas visiting experience of six months or longer, and government background referred to prior employment in a government department. Cross-departmental experience referred to previous appointments in more than one hospital department. Clinical-department leadership referred to prior service as the head of a clinical or medical-technical department.

Professional-background heterogeneity: reflected the diversity of professional backgrounds among members of a hospital management team. It was measured using

Blau's index: The calculation formula is: $H = 1 - \sum_{i=1}^n P_i^2$, where P_i is the proportion of management team members belonging to the i -th professional-background category, and n is the total number of professional-background categories. The value of H ranges between 0 and 1. A value closer to 1 indicates a higher degree of heterogeneity. The categories used in the calculation were professional backgrounds (clinical medicine, basic research, engineering, pharmacy, nursing, economics, etc.).

The academician-team indicator was coded as 1 when at least one member of the management team was an academician, and 0 otherwise. Hospital type was coded as 1 for specialty hospitals and 0 for general hospitals, following the classification of hospitals into general and specialized categories under the Implementing Rules for the Regulations on the Administration of Medical Institutions issued by the National Health Commission of the People's Republic of China, which distinguishes hospitals by the scope of their clinical departments and disciplinary layout.

1.2 Statistical Methods

Statistical analyses were conducted using Python version 3.13. Continuous variables were summarised using means and standard deviations and medians with interquartile ranges. Categorical variables were summarised using counts and percentages. Pairwise correlation analyses were conducted to describe the associations among the predictor variables. Multicollinearity in the multivariable regression model was assessed using variance inflation factors (VIFs).

Correlation between binary and continuous variables: Pairwise correlations among predictor variables were calculated using their original measurement scales before median dichotomisation. Pearson correlation coefficients were used for pairs of continuous variables, point-biserial correlation coefficients for pairs comprising one

continuous and one binary variable, and Phi coefficients for the association between the two binary variables: academician-team status and specialty-hospital status. A chi-square test was used to assess the statistical significance of the association between the two binary variables.

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Multivariable Regression analysis: A multiple ordinary least-squares linear regression model was fitted with the 2022 Fudan hospital rank as the dependent variable. All 13 prespecified predictor variables were entered simultaneously into the model. Before regression analysis, continuous team-level characteristics, including proportions, mean age, and heterogeneity indices, were dichotomized at their sample medians. Values at or above the median were coded as 1 (high group), whereas values below the median were coded as 0 (low group). Because the median proportion of externally appointed managers was zero, this variable was coded as 1 when at least one externally appointed manager was present (proportion > 0) and 0 when no externally appointed manager was present (proportion = 0). The indicators for the presence of an academician team and for specialty-hospital status were retained as binary variables (1 = yes, 0 = no). Each regression coefficient represents the adjusted mean difference in the 2022 numerical hospital rank between the two coded groups, holding the other predictors constant. Because a lower numerical rank indicates a better ranking position, a negative coefficient denotes an association with a better ranking, whereas a positive coefficient denotes an association with a poorer ranking. Hospitals with missing information for any variable included in the regression model were excluded using complete-case analysis, resulting in a final analytical sample of 87 hospitals. Multicollinearity was assessed using variance inflation factors (VIFs). All VIF values were below 10, indicating that none of the predictors met the prespecified criterion for severe multicollinearity.

2 Results

2.1 Demographic Characteristics Analysis

Among the 87 sampled hospitals, 71 (81.61%) were general hospitals. Twelve hospitals (13.79%) had management teams that included at least one academician. The 730 senior administrators had a mean age of 53.95 years with limited inter-hospital age variation. Female leaders constituted merely 22% of all management personnel. Externally recruited executives and leaders with government backgrounds accounted for 8% and 11% respectively. Medical clinicians represented 68% of TMT members and constituted the largest professional-background group. The Blau index of professional-background heterogeneity stood at 0.43, reflecting moderate diversity in professional trajectories across management teams. In total, 49% of administrators held successive cross-department leadership roles, and 42% previously directed clinical departments (Table 1).

Table 1 Demographic Characteristics and Professional Background Distribution of 87 Sample Hospitals

Variable	Mean	Std. Dev.	Min	25th percentile	Median	75th percentile	Max
Proportion of female	0.22	0.16	0.00	0.10	0.20	0.33	0.67
Average age	53.94	2.88	46.60	52.25	53.83	55.57	64.75
Age heterogeneity	0.09	0.03	0.00	0.07	0.09	0.11	0.25
Professional background heterogeneity	0.43	0.20	0.00	0.28	0.46	0.58	0.78
Proportion of talent program participants	0.49	0.20	0.00	0.33	0.50	0.63	1.00
Proportion of medical experts	0.68	0.20	0.20	0.50	0.75	0.83	1.00
Proportion of externally appointed	0.08	0.14	0.00	0.00	0.00	0.14	0.92
Proportion with overseas background	0.33	0.22	0.00	0.15	0.30	0.50	0.88
Proportion with government background	0.11	0.13	0.00	0.00	0.10	0.17	0.70
Proportion with cross-departmental work experience	0.49	0.34	0.00	0.13	0.50	0.78	1.00
Proportion of clinical department heads	0.42	0.23	0.00	0.29	0.40	0.60	0.88

2.2 Correlation Analysis of Independent Variables

Professional-background heterogeneity exhibits significant negative correlations with the share of clinical expert leaders, proportion of former clinical department directors and average team age ($r = -0.61$ to -0.31). Higher functional diversity corresponds to fewer clinician-origin managers, lower ratios of ex-clinical department heads and younger average leadership age. Teams with diversified professional backgrounds tend to be younger and display less concentration of clinical specialists within cohorts (Table 2).

The proportion of clinical experts in management correlates positively with the share of former clinical directors, provincial talent scheme participants and overseas-trained administrators ($r = 0.31$ to 0.42). Hospitals dominated by clinical leaders host higher volumes of talent programme recipients and overseas-experienced staff, indicating international academic exposure constitutes a core developmental pathway for elite clinical professionals. Participation in provincial or higher-level talent schemes positively correlates with overseas study experience ($r = 0.40$). Mean team age was positively correlated with cross-departmental experience and prior clinical-department leadership. The proportion of managers with prior government employment was positively correlated with the proportion with cross-departmental experience ($r = 0.30$).

Hospitals with academician teams display positive correlations with average leadership age, talent scheme participation, overseas academic experience and cross-department administrative experience ($r=0.21$ to 0.34). These correlations indicate that academician-team status co-occurred with several indicators of seniority, talent-programme participation, overseas experience, and cross-departmental experience.

Specialised hospitals show a significant positive correlation with female leadership ratios ($r = 0.34$), meaning women occupy a larger share of senior management positions within specialist medical institutions. Meanwhile, specialised hospital status negatively correlates with the proportion of ex-clinical department directors ($r = -0.37$), reflecting substantially fewer clinical-origin administrators in specialist hospital leadership teams.

Table 2 Correlation coefficients among background variables of hospital management

Management background variables	1. Female proportion	2. Mean age	3. Age heterogeneity	4. Professional background heterogeneity	5. Proportion of talent program recipients	6. Proportion of medical experts	7. Proportion of external appointment	8. Proportion with overseas background	9. Proportion with government background	10. Proportion of cross-departmental experience	11. Proportion of clinical department heads	12. Academician team
2. Mean age	-0.17											
3. Age heterogeneity	-0.04	0.03										
4. Professional background heterogeneity	0.13	-0.31**	-0.06									
5. Proportion of talent program recipients	-0.23*	0.11	0.05	-0.09								
6. Proportion of medical experts	-0.21*	0.01	-0.12	-0.61***	0.34***							
7. Proportion of externally appointed managers	0.04	0.21*	0.00	0.05	0.02	0.01						
8. Proportion with overseas background	0.05	0.21*	0.24*	-0.23*	0.40***	0.31**	0.24*					
9. Proportion with government background	0.01	0.06	-0.07	0.05	0.04	-0.01	0.30**	0.06				
10. Proportion of cross-departmental experience	-0.07	0.24*	0.03	-0.11	0.01	-0.07	0.12	0.23*	0.30**			
11. Proportion of clinical department heads	-0.20	0.24*	-0.06	-0.39***	0.07	0.42***	-0.03	0.06	0.10	-0.07		
12. Academician team	0.13	0.34**	0.201	-0.02	0.31**	-0.07	0.10	0.30**	0.12	0.215*	0.037	
13. Specialty hospital	0.34**	-0.21*	0.03	0.18	-0.17	-0.23*	-0.12	0.11	-0.109	-0.041	-0.37***	0.12

Note: * indicates $P < 0.05$, ** indicates $P < 0.01$, *** indicates $P < 0.001$.

2.3 Associations between management-team characteristics and hospital rankings

The multivariable OLS regression model was statistically significant ($F(13, 73) = 7.464$, $P < 0.001$), with an R^2 of 0.548 and an adjusted R^2 of 0.474. After adjustment for the other predictors, hospitals in the high cross-departmental-experience group had numerical ranks that were, on average, 22.81 positions lower than those in the low group ($B = -22.81$, $SE = 4.51$, $P < 0.001$). Hospitals in the high

talent-programme-participation group also had better numerical rankings than those in the low group ($B = -14.83$, $SE = 4.98$, $P = 0.004$). The presence of at least one externally appointed manager was associated with a numerical rank that was, on average, 86.10 positions higher than that of hospitals without an externally appointed manager ($B = 86.10$, $SE = 8.25$, $P < 0.001$). Specialty hospitals also had poorer numerical rankings than general hospitals after adjustment ($B = 18.36$, $SE = 6.39$, $P = 0.005$). The proportion of former clinical or medical-technical department heads showed a borderline association with better rankings, but the association did not meet the prespecified significance threshold ($B = -9.44$, $SE = 4.83$, $P = 0.054$; Table 3).

Table 3 Multivariable regression of management-team characteristics and 2022 hospital rank

Variable	Coefficient	Standard Error	t-value	P-value	Significance
1 Female proportion	2.48	4.66	0.53	0.596	
2. Mean age	-5.65	5.14	-1.10	0.275	
3. Age heterogeneity	-6.61	4.81	-1.37	0.173	
4. Professional background heterogeneity	-4.89	5.19	-0.94	0.349	
5. Proportion of talent program recipients	-14.83	4.98	-2.98	0.004	**
6. Proportion of medical experts	-6.48	5.54	-1.17	0.246	
7. Presence of externally appointed managers	86.10	8.25	10.44	<0.001	***
8. Proportion with overseas background	-4.32	4.83	-0.89	0.374	
9. Proportion with government background	-3.65	4.62	-0.79	0.432	
10. Proportion of cross-departmental experience	-22.81	4.51	-5.05	<0.001	***
11. Proportion of clinical department heads	-9.44	4.83	-1.96	0.054	
12. Academician team	-4.92	7.97	-0.62	0.539	
13. Specialty hospital	18.36	6.39	2.88	0.005	**
Model Statistics					
Sample size			87		
R ²			0.5476		
Adjusted R ²			0.4742		
F-statistic			7.4644		
F-test P-value			<0.001		

Notes: B, unstandardised regression coefficient; SE, standard error. Continuous predictors with non-zero medians were dichotomised at their sample medians,

with values at or above the median coded as 1 and values below the median coded as 0. Because the median proportion of externally appointed managers was zero, this variable was coded as presence (> 0) versus absence ($= 0$). The academician-team and specialty-hospital indicators were coded as 1 = yes and 0 = no. Each coefficient represents an adjusted mean difference in numerical hospital rank between the two coded groups. Negative coefficients indicate better numerical ranking positions, whereas positive coefficients indicate poorer numerical ranking positions.

No statistically significant associations were observed for female representation, mean age, age heterogeneity, professional-background heterogeneity, medical professional background, overseas experience, prior government employment, or academician-team status (all $P > 0.05$). The observed association between the presence of externally appointed managers and poorer numerical rankings should be interpreted cautiously. The cross-sectional design does not establish the direction of the association, and reverse causality is possible; for example, lower-ranked hospitals may be more likely to recruit external managers as part of organisational reform.

3 Discussion

3.1 Theoretical contributions: Novel empirical evidence linking hospital governance architecture to institutional performance

Optimising hospital governance frameworks to lift comprehensive organisational performance represents a core research agenda supporting high-quality development of China's public hospital system. Rooted in Upper Echelons Theory, the present study systematically dissects the pathways through which TMT background traits shape hospital operational outcomes. Leadership cohort composition constitutes a pivotal institutional resource that determines the capacity of hospitals to deliver high-quality clinical and research services. Based on a sample of 87 top-tier tertiary hospitals featured in the 2022 Fudan Best Hospital Ranking, this research pioneers a comprehensive quantitative assessment of how multi-dimensional professional-background characteristics of hospital senior management correlate with institutional comprehensive performance.

The analysis delivers two core theoretical contributions. First, it enriches the empirical application of Upper Echelons Theory within the Chinese public healthcare context. Prior international scholarship largely draws on Western market-oriented hospital systems, while this study contextualises the theory to China's unique public medical governance model featuring dual administrative and clinical leadership mechanisms. Second, it expands the multidimensional measurement framework of TMT characteristics in healthcare research. Instead of isolating single attributes such as clinical background or external recruitment, we integrate cross-department experience, professional-background heterogeneity and specialised occupational backgrounds into a unified analytical system, highlighting differences in hospital rankings associated with distinct management-team characteristics. Collectively, the findings advance theoretical understanding of healthcare leadership governance and may inform future research and discussions on hospital management-team composition.

3.2 Cross-departmental experience was associated with better hospital rankings

Our regression results showed that hospitals with higher proportions of managers with cross-departmental experience had better numerical rankings after adjustment for the other predictors. The proportion of former clinical or medical-technical department heads showed a borderline association with better rankings but did not meet the prespecified significance threshold ($P = 0.054$). One possible explanation is that executives with cross-departmental experience may develop broader organisational perspectives and more balanced decision-making capabilities, which could facilitate coordination across clinical and administrative functions.

Previous research in corporate settings has examined differences between internal cultivation and external recruitment in relation to organisational innovation [8]. In the hospital context, one possible explanation for our finding is that externally appointed managers may initially have less familiarity with the focal hospital's internal organisational routines and networks. However, reverse causality is also possible, as lower-ranked hospitals may be more likely to recruit external managers as part of organisational reform. No statistically significant association was observed between overseas experience and hospital ranking in the full model.

From the lens of information processing and decision-making theory, clinical and functional department tenures may provide leaders with greater first-hand familiarity

of frontline clinical workflows, institutional policy implementation mechanisms and hospital resource allocation logic. Such operational knowledge may support contextually grounded strategic judgements and the implementation of institutional reform. Consistent with prior organisational management research, multi-functional career trajectories expand managerial knowledge boundaries, broaden institutional strategic vision and streamline cross-divisional communication and coordination^[8]. The cumulative advantages of integrated cognition and efficient inter-department collaboration may contribute to more effective hospital management. For hospital human resource management, these findings suggest that experience across clinical and administrative departments may be relevant to the professional development of hospital leaders.

3.3 Talent-programme participation was associated with better hospital rankings

High-end academic talents may contribute to hospital development through clinical, research, and disciplinary activities. Our empirical results showed that a higher proportion of managers participating in provincial- or national-level talent programmes was associated with better numerical hospital rankings ($B = -14.83$, $P = 0.004$). The core competitive advantage of tertiary hospitals lies in clinical technology innovation and disciplinary construction, and high-level talents represent the primary drivers of original clinical research and frontier disciplinary breakthroughs^[9]. High-level academic talent may also contribute to diagnostic and research capacity, institutional reputation, resource mobilisation, and cross-institutional collaboration.

Furthermore, high-level talent may generate spillover benefits through mentoring junior professionals, supporting disciplinary teams, and facilitating the diffusion of clinical and research expertise. These potential mechanisms may partly explain the observed association between talent-programme participation and hospital rankings; however, they were not directly examined in the present study. For hospital administrators, the recruitment and retention of high-level talent may be relevant when considering management-team composition and institutional development strategies.

3.4 Distinct demographic and structural disparities between general and specialised hospitals

Correlation analysis reveals systematic structural differences between general and specialised hospitals in female representation and the professional backgrounds of management-team members. Specialised-hospital status was positively correlated with the proportion of female senior administrators ($r=0.34$, $P<0.01$). This finding may be considered in the context of global gender patterns in the health workforce according to the WHO, women account for approximately 70% of the global clinical workforce but remain underrepresented in senior leadership positions^[10]. The higher representation of women in specialties such as obstetrics, paediatrics and nursing disciplines may partly contribute to this pattern.

Specialised-hospital status was negatively correlated with the proportion of former clinical department heads ($r=-0.37$, $P<0.001$) and was associated with poorer numerical hospital rankings in the multivariable model ($B=18.36$, $P=0.005$). One possible explanation is that specialised hospitals have narrower disciplinary coverage than general hospitals, which suppresses their performance in reputation evaluation and clinical research output components of the Fudan ranking system^[11]. This finding raises an important policy question: whether current mainstream comprehensive hospital evaluation frameworks fully capture the unique disciplinary strengths of specialised hospitals. Future research should examine whether specialist-specific indicators could complement comprehensive rankings when evaluating specialised hospitals.

4 Research limitations and future directions

This study contains several methodological limitations worthy of acknowledgment. First, the cross-sectional research design cannot establish definitive causal relationships between TMT characteristics and hospital performance; only correlational associations can be inferred. Second, median dichotomisation of continuous variables may reduce statistical testing power and obscure subtle marginal effects of continuous leadership traits. Third, the sample is restricted to top-ranked tertiary hospitals listed in the Fudan ranking, limiting the generalisability of conclusions to municipal secondary hospitals, county-level hospitals and private medical institutions. Fourth, data accessibility constraints prohibited the inclusion of additional critical moderating variables, such as leadership tenure length, internal team communication mechanisms and formal hospital decision-making workflows. Fifth, the regression model included 13

predictors in a sample of 87 hospitals. Although the model could be estimated, the relatively small sample size in relation to the number of predictors may have reduced statistical precision and increased the sensitivity of the estimates to individual observations. Sixth, the Fudan hospital rank is a relative ordering of hospitals rather than a continuous measure with demonstrably equal intervals. The numerical difference between two adjacent ranking positions may not represent the same difference in underlying hospital performance across the ranking distribution. In addition, the ranking primarily reflects specialty reputation and research-related indicators and does not capture all dimensions of hospital performance, such as quality of care, operational efficiency, or patient outcomes. Seventh, complete-case analysis excluded hospitals with missing information, which may have introduced selection bias if the excluded hospitals differed systematically from those included in the analysis.

Future research can address these limitations via three extended approaches. First, longitudinal panel data covering multiple consecutive years could be adopted to examine temporal relationships and reduce, although not eliminate, concerns about reverse causality and endogeneity. Second, mixed-method research integrating quantitative regression analysis with semi-structured qualitative interviews with hospital leaders may provide a more detail understanding of the organizational processes potentially linking management-team characteristics to institutional decision-making and hospital rankings. Third, expanded sample coverage incorporating county-level and specialised private hospitals can generate comparative evidence across heterogeneous institutional types.

5 Conclusions

In this cross-sectional study of 87 tertiary hospitals in China, greater representation of managers with cross-departmental experience and participation in provincial- or national-level talent programmes was associated with better numerical hospital rankings. The presence of externally appointed managers and specialty-hospital status was associated with poorer numerical rankings. These findings describe associations and should not be interpreted as evidence of causal effects. Further research using longitudinal data, continuous predictor specifications, and broader measures of hospital performance is needed to assess the robustness and generalisability of these findings.

Authors' contributions

Z.L contributed to data collection, implementation of the study, and drafting of the manuscript. M.Y was responsible for statistical analysis, methodological support, and manuscript revision. J.X provided overall study supervision and guidance, and contributed to manuscript revision. All authors reviewed and approved the final version of the manuscript.

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Data availability

Hospital management data were sourced from the official websites of the affiliated hospitals, as well as from publicly available and authoritative online platforms that publish professional biographies.

Declarations

Ethics and Consent to Participate declarations: not applicable

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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