

Analysis of the change trend of the structure of health technicians in Tianjin hospitals

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Abstract. Objective: To analyze the overall development trend and internal structure changes of health technicians in Tianjin hospitals from 2011 to 2022, and to provide suggestions for promoting the better development of health technicians in Tianjin hospitals. Methods: Descriptive analysis and structural change analysis were used to study the development of health technicians. Results: In terms of overall development, the number of health technicians in Tianjin hospitals increased year by year, reaching 85,215 in 2022, with a growth rate of 59.15%. From the perspective of structural change, the structural change value of practicing (assistant) physicians and registered nurses showed a positive change, and the overall structural change showed a trend of first decreasing and then increasing, reaching the highest value of 4.41% in 2021 and the smallest structural change of only 0.38% in 2018. In terms of the contribution rate of structural change, the structural change rate of registered nurses among the health technicians in Tianjin hospitals was relatively active, with an average of 26.88%. Conclusion: The total number of health technicians in Tianjin hospitals is insufficient, and it is necessary to expand the talent pool. The structure of registered nurses is actively changing, and it is necessary to consider controlling the quality of practitioners from the source; The structure of pharmacists and technicians is unstable, and attention should be paid to the professional development of physicians.

Keywords: Tianjin; hospital health technicians; Structure; fluctuation

1. Introduction

As an important support for health services, health human resources have a profound impact on the healthy development of medical and health services. With the growth of the social population and the development of the health industry, the society's expectations and demand for health services are also increasing. This study uses the structural change analysis method to explore the trend of structural changes of health technicians in Tianjin hospitals, analyzes the current development situation and existing problems, and provides a reference for optimizing the structure of health human resources in Tianjin hospitals.

2. Information and Methodology

2.1.Data source

Based on the data in the Tianjin Statistical Yearbook from 2011 to 2022, this study collected and collated data on hospital health technicians, including licensed (assistant) physicians, registered nurses, pharmacists, technologists and other personnel.

2.2.Research Methods

Descriptive analysis was used to analyze the overall development of health technicians in Tianjin hospitals from 2011 to 2022. The structural change analysis method was used to analyze the internal structural changes of health technicians in Tianjin hospitals from 2011 to 2022, and the structural change value (VSV), structural change degree (DSV) and structural change contribution rate (CSV) were calculated and compared, as shown in Equation 1-3.

$$VSV=X_{i1}-X_{i0} \quad (1)$$



$$DSV=\sum|X_{i1}-X_{i0}| \quad (2)$$

$$CSV=\frac{|X_{i1}-X_{i0}|}{DSV} \times 100\% \quad (3)$$

Where: i represents the serial number of each component of human resources, 0 represents the beginning of the period, 1 represents the end of the period, and X_i represents the composition ratio of the i th component of the human resources component to the total at the end of the period (%); X_{i0} represents the ratio (%) of the human resources component of item i th to the total at the beginning of the period.

3. Results and Analysis

3.1.The basic situation of the composition of health technicians in Tianjin hospitals

From the perspective of the total number of health technicians in Tianjin hospitals, the total number of health technicians has been growing in the past 12 years, with a growth rate of 59.15% in 2022 compared with 2011. From the perspective of different types of health technicians in Tianjin hospitals, the number of technologists increased from 2011 to 2022 far more than the remaining four types of health technicians. The number of registered nurses followed closely behind, with a growth rate of 76.48%, and it can also be seen that registered nurses account for the largest proportion of hospital health technicians. The number of other personnel increased significantly between 2011-2015, and showed a downward trend year by year from 2016, with a decrease of 21.16% in 12 years, see Figure 1.

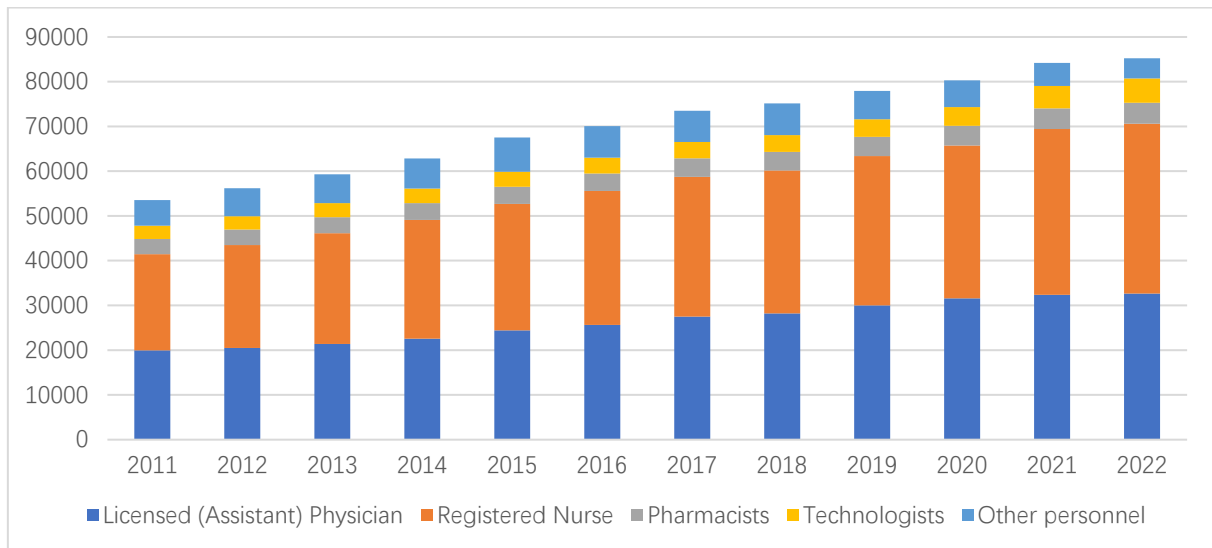


Figure 1. The development of health technicians in Tianjin hospitals from 2011 to 2022

3.2.Analysis of structural changes of health technicians in Tianjin hospitals

3.2.1. Structural change value and structural change degree of health technicians in Tianjin hospital

From the point of view of the mean, the structural change of licensed (assistant) physicians and registered nurses showed a positive change, and the mean structural change value of registered nurses was much higher than that of licensed (assisted) physicians, reaching 0.40%. In 2020 and 2017, respectively, the structural change values of pharmacists and technicians changed from negative to positive, but the average value of structural change of pharmacists remained negative and showed negative changes. The structural change value of other personnel was positive only in 2012 and 2015, and negative in the rest of the years. From 2011 to 2022, it can be seen that the structural change of hospital health technicians showed a trend of first decreasing and then increasing, reaching the highest

value of 4.41% in 2021 and the smallest structural change of only 0.38% in 2018, as shown in Table 1.

Table 1. Value and degree of change in the structure of health technicians in Tianjin hospitals from 2011 to 2022[%]

Year	Licensed (Assistant) Physician	Registered Nurse	Pharmacist	Technologists	Other personnel	Structural Variability
2012	-0.85	0.81	-0.17	-0.24	0.44	2.51
2013	-0.34	0.81	-0.13	-0.06	-0.28	1.61
2014	-0.18	0.52	-0.08	-0.06	-0.19	1.04
2015	0.26	-0.43	-0.27	-0.23	0.67	1.85
2016	0.42	0.91	-0.10	0.03	-1.25	2.70
2017	0.86	-0.25	0.07	-0.05	-0.63	1.86
2018	0.14	-0.02	-0.10	0.05	-0.07	0.38
2019	0.95	0.36	-0.04	0.01	-1.27	2.63
2020	0.82	-0.29	-0.05	0.20	-0.68	2.04
2021	-0.89	1.47	0.03	0.70	-1.32	4.41
2022	-0.12	0.49	0.03	0.43	-0.83	1.90
average	0.09	0.40	-0.07	0.07	-0.49	2.08

3.2.2. Contribution rate of changes in the structure of health technicians in Tianjin hospitals

Through the analysis of structural contribution rate, it can be seen that the contribution of different types of health technician changes to the overall health technician change is different, and the personnel change does not show a regular change trend. The contribution rate of structural change of practicing (assistant) physicians only decreased significantly in 2022, and the rest of the contribution rate did not change much. The contribution rate of pharmacists to structural change increased slightly, but increased significantly in 2015 and 2018, and decreased significantly to 0.73 in 2021, while the contribution rate of structural change of other personnel gradually increased from 17.66% in 2012 to 43.56% in 2022. According to the analysis of the mean contribution rate of structural change, the structural change rate of registered nurses in Tianjin hospital health technicians was more active, with an average of 26.88%, followed by licensed (assistant) physicians, and pharmacists had the least impact on the structural change of health technicians in Tianjin hospitals, which was 6.99%, as shown in Table 2.

Table 2. Contribution rate of changes in health technology structure of hospitals in Tianjin from 2011 to 2022[%]

Year	Licensed (Assistant) Physician	Registered Nurse	Pharmacist	Technologists	Other personnel
2012	33.79	32.34	6.76	9.45	17.66
2013	21.37	50.00	8.10	3.45	17.09
2014	17.75	50.00	7.67	5.92	18.66
2015	13.95	23.02	14.70	12.28	36.05
2016	15.41	33.58	3.71	1.01	46.29
2017	46.37	13.40	3.63	2.75	33.85
2018	36.52	6.35	26.10	13.48	17.55
2019	36.03	13.57	1.54	0.39	48.46
2020	40.01	14.34	2.48	9.99	33.18
2021	20.18	33.34	0.73	15.93	29.82
2022	6.44	25.78	1.46	22.76	43.56
average	26.17	26.88	6.99	8.86	31.10

4. Discussion and Suggestions

4.1. Under the long-term development plan, the total number of health technicians is insufficient, and the talent team needs to be expanded

From the perspective of the total number of health technicians in Tianjin hospitals, the total number of personnel from 2011 to 2022 is increasing, but in the "14th Five-Year Plan for the Development of Health Undertakings in Tianjin", it is pointed out that at present, the total number of medical and health resources in Tianjin is still insufficient, and most of the health human resources indicators for 1,000 people lag behind those of other municipalities directly under the central government. The reasons are, on the one hand, there is a gap in health talents, and the high-quality development of talents needs to be improved; On the other hand, the discipline advantage is not strong, and the influence of the discipline leader is not large, which has affected the high-quality and sustainable development of the health talent team to a certain extent. In the future, it is necessary to vigorously strengthen the construction of the health talent team, improve the ability and quality of talents, optimize the allocation structure, and provide more high-quality and efficient medical services for the people of the city. In terms of policy, we will provide support to encourage high-quality training of health technicians, increase employment, focus on medical college training, and supplement on-the-job training and continuing education to meet the needs of medical and health talents.

4.2. Registered nurses are relatively sufficient and the overall structure is relatively active, so it is necessary to control the quality of practitioners from the source

From the growth rate of 2011~2022, registered nurses are also much higher than other types of personnel, which shows that the registered nurses in Tianjin Hospital are relatively sufficient. The reason for this is that there are a large number of colleges and universities that offer nursing majors, and at the same time, with the support of national policies, there is more possibility of in-depth research in nursing disciplines, which has promoted the academic progress of nursing and made the nursing team continue to grow and develop. In 2024, the Ministry of Education will adjust nursing to a nationally controlled distribution major, which has attracted widespread social attention, indicating that the improvement of its professionalism and quality assurance are of great significance to the development of national medical and health undertakings. In addition, the advancement of the aging process of society also makes the training quality of nursing staff particularly important. Moreover, in the process of diagnosis and treatment, the treatment plan of "three points of treatment, seven points of care" can predict that in the future, not only hospitals will need high-quality nursing staff, but also society and elderly care institutions. Therefore, the service field of nursing also needs to be continuously expanded, and colleges and universities should strengthen students' learning and practice of nursing theories and skills, so that students can receive more systematic and professional education and training, and improve the quality of students. At the same time, training institutions should achieve regular assessments, raise the entry threshold of the industry, and lay a solid foundation for the high-quality development of the nursing team in the future. In addition, registered nurses have an active contribution rate to structural changes, and should play a leading role in structural changes, pay attention to the construction of other types of personnel, and optimize the personnel structure.

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