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ORIGINAL RESEARCH

Construction and Application of a Comprehensive Evaluation and Assessment System for Clinical Nurses Based on the Support of an Information Technology Platform

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Objective: To explore the establishment of an objective, standardised and operable comprehensive evaluation and assessment system for clinical nurses based on the support of an information technology platform and to realise the assessment management of tier nurses before and after promotion.

Methods: By reviewing the literature and combining the findings with the actual situation of nursing work in hospitals, the clinical nurse comprehensive evaluation assessment criteria were designed and assessed for nurses at different levels in terms of their medical ethics, attendance, performance, theoretical study, professional skills and teaching and then supported by the information technology platform to achieve timely and quick assessment.

Results: In 2021, 999 nurses out of the 1037 clinical nurses in our institution completed the assessment. Overall, 888 passed the assessment, 111 failed, and 38 did not complete the assessment due to various reasons. Moreover, 367 nurses were promoted based on the comprehensive evaluation assessment results, and the 111 nurses who failed the assessment had their promotion delayed in accordance with the regulations.

Conclusion: The assessment indexes of the clinical nurse comprehensive evaluation assessment system are objective, scientific and operable. They could be used as the basis for nurse promotion and assessment management after promotion and could become a powerful aid for nurse promotion management to realise closed-loop management of nurse hierarchy. The support of information platform makes the operation of the assessment system faster and more convenient and improves the management efficiency.

Keywords: information platform, nurse hierarchy, evaluation and assessment system, nursing management

Introduction

Hierarchical employment of nursing manpower and professional nursing competence progression is a way to promote nursing professional development, encourage nursing echelon growth, enhance nursing staff job satisfaction and stabilise the nursing echelon.[1–3] Nurse hierarchical appraisal is a process of checking, measuring, evaluating and giving feedback on nursing staff's performance based on certain criteria.[4–6]

In order to guarantee fulfilment of the standard of care, performance evaluation is a necessary activity in healthcare companies. This process employs techniques to provide staff members with the details they need to assess whether they are performing up to expectations or need to improve.[7] The objectives of nurse appraisal may be as follows: to determine professional competence, to enhance staff development, to inspire staff to achieve more, to improve communication between managers and staff and to promote better relationships among nurses.[8] However, productivity is not always

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increased by performance reviews. The reviews may be untruthful, prejudiced or not well liked by those being evaluated. A rise in unhappiness, lack of motivation and resistance, particularly on the side of the appraiser/employees, have sometimes been connected to performance assessment systems. These issues are brought on by biases in the assessment process, inaccuracies in the substance of the evaluation, conflict between the requirements of the employees and the objectives of the appraisal, or a lack of distinct and independent performance aspects.[9]

Our hospital has been trying to implement a nurse hierarchy since 2010, but lacks of scientific, objective, comprehensive and hierarchical evaluation and assessment criteria. Therefore, this study attempts to design a set of comprehensive evaluation assessment criteria for clinical nurses by reviewing the literature and combining the findings with the actual situation of nursing work in hospitals. Then, the results will be used as a basis for nurse promotion and assessment management during promotion, and the effects will be verified during clinical practice.

Material and Methods
Study Design
This study was a prospective, single-centre study that explored the effects of a newly developed evaluation system for nurses in clinical practice. The main components included the following: 1) the indicators for evaluation were designed and given weights with a scoring rule; 2) the effects and problems of the system in the actual operation process were assessed; 3) the evaluation system was optimised based on the feedback given during the trial operation; and 4) data on the clinical nurses' satisfaction with the evaluation system and willingness to use it were collected via questionnaire.

Evaluation and Assessment Index Design
Index Design
By reviewing the literature and combining the findings with the actual situation of the nursing work in the hospital to design the comprehensive evaluation and assessment criteria for clinical nurses, the work tasks and objectives, job responsibilities and core competency development of the nurses were decomposed into the evaluation and assessment indexes of the nurses, and the assessment items were given different weights for different nursing levels. From January to February 2021, to ensure the rationality and operability of the evaluation and assessment indexes, the departments of neurology, cardiothoracic surgery, nephrology, urology and critical care medicine were selected for the pre-evaluation, and the indicators were revised according to the pre-evaluation results. In the end, there were six primary indicators, as follows: I) medical ethics, II) attendance, III) performance of duties, IV) theoretical study, V) professional skills and VI) teaching. There were 18 secondary indicators, as follows: ① receiving praise letters and pennants; ② medical ethics assessment results; ③ receiving/refusing red envelopes and gifts; ④ taking sick leave (including late arrival and early departure); ⑤ number of night shifts taken; ⑥ quality of nursing work; ⑦ participation in training; ⑧ performing nursing ward round; ⑨ nursing defects and errors; ⑩ completion of nursing medical records; ⑪ solving difficult problems; ⑫ theory assessment; ⑬ basic and specialised techniques; ⑭ new techniques and projects; ⑮ teaching new nurses and nursing students; ⑯ teaching advanced students; ⑰ participation in academic activities; and ⑱ guiding a graduation thesis. There were also six tertiary indicators, as follows: ① department management, ② staff deployment, ③ public emergencies, ④ rewards, ⑤ scientific research and ⑥ instrument management. Each index was quantified in terms of points (see Table 1). This study was approved by the institutional review board (W2022028), and all participants provided their signed informed consent.

Scoring Rules
The appraisal and evaluation criteria were designed based on a system of adding and deducting points; the specific scoring criteria are shown in Table 2, focusing on the weight distribution of nursing work quality, professional skills assessment, thesis supervision and emergencies.

Assessment Frequency
An evaluation assessment was completed by the nursing department. Different assessment items were assessed at different frequencies. The items recorded in the assessment at any time included nursing defects and errors and

Table 1 Clinical Nurse Comprehensive Assessment Evaluation Indexes and Scores

Appraisal and Evaluation Indicators		Nurse Level				
Primary Indicators	Secondary Indicators	N0 Level	N1 Level	N2 Level	N3 Level	N4 Level
Medical ethics	Receiving praise letters and pennants	10	10	10	10	10
	Medical ethics assessment					
	Receiving/refusing red envelopes and gifts					
Attendance	Sick leave (including late arrival and early departure)	20	10	10	10	20
	Number of night shifts	–	15	15	10	–
Performance of duties	Quality of nursing work	18	18	18	18	18
	Participate in training	5	5	5	2	2
	Nursing ward round	2	2	2	5	5
	Nursing Defects Errors	5	5	5	5	5
	Reviewing nursing medical record					
	Solving difficult problems	–	–	–	5	5
Theoretical study	Theoretical assessment	20	17	17	17	12
Professional Skills	Basic and specialized techniques	20	17	17	17	12
	New technologies, new projects	–	–			
Teaching	Teaching new nurses and nursing students (new nurses, nursing students)	–	1	1	1	1
	Teaching advanced students	–	–			
	Participation in academic activities	–	–	–		
	Guiding graduate thesis	–	–	–	–	10
Department Management	Participating in the management of the department	–				
Staffing	Participating in internal and external staff deployment					
Public emergencies	Emergency group members	–				
	Participate in emergencies	–				
Rewards	Awards by Level					
Scientific Research	Projects, papers, patents					
Instrument Management	Dress and grooming meet the requirements					

instrument management. The items recorded in the monthly assessment included medical ethics, attendance, nursing work quality, participation in training, staff deployment and nursing department examination results. The items recorded in the annual assessment included departmental theory, skill examination results, awards, scientific research, nursing ward rounds and completion of nursing medical records.

Table 2 Clinical Nurse Comprehensive Evaluation Assessment Scoring Rules

Level 1 / Level 2 Indicators	Plus Points Score Standard	Minus Points Score Standard
I-① I-② I-③	Individuals received a letter of commendation +0.5 points/time, received a pennant +1 point/time Medical ethics year-end assessment of excellent + 2 points, pass +1 point Satisfaction nomination, refusal to accept red envelopes or gifts +0.5 points / time	Being complained or criticized −1 point/time Medical ethics year-end evaluation failed −1 point Receiving red envelopes and gifts −0.5 point / time
II-④	Sick leave and personal leave accumulate minus points, no maximum deduction	
	No reduction in points for sick leave ≤ 3 days/year No reduction in points for leave of absence ≤ 3 days/year Overtime + 1 point/3h	>3 days for each additional 7 days off −1 point >3 days for each additional 1 days off −0.5 points Late arrival, early departure - 0.5 points/time Unexcused absences - 3 points/day
II-⑤	The night shift base was determined by the department, and the night shift base taken into account the nurse's hierarchy and age, with an upper limit of 5 additional points	
	+1 point for each additional 5 night shifts	−1 point for every 5 less night shifts
III-⑥	Discovering problems, defects, failures and other unsafe factors in the work, + 0.1 to 1 point / time depending on the specific situation	The quality of nursing work in the ward and department self-inspection was not up to standard −1 point/time
III-⑦	Organizing faculty training (lecture) + 1 point / time Organizing of section training (lecture) +1 point/5 times	Did not participate −1 point / time
III-⑧	Participating in departmental nursing rounds at least 10 times/year N2~N4 level nurses organized nursing rounds at least 1 time/year	Each time less −1 point Not organized −1 point
III-⑨		Occurrence of nursing defects - 1 point/time General errors - 5 points/time Serious errors - 20 points / time, and the year assessment does not meet the standard
III-⑩	N0~N2 level nurses completed at least 1 nursing medical history /year New nurses completed at least one nursing medical history for each rotation in a unit N3~N4 level nurses checked and revised nursing medical history as required	Incomplete - 1 point One less-1 point One less-1 point
III-⑪	Solving difficult problems in the hospital + 1 point/time Solving difficult out-of-hospital problems +2 points/time	
IV · ⑫	The examination results of the nursing department were recorded once a month, and the average results of the departmental examination were recorded once a year. Theoretical examination for 80 points to meet the standard	
	80~85 points + 1 point; 86~90 points + 2 points; 91~100 points + 3 points	<49 points - 5 points; 50 to 59 points - 3 points. 60~79 points-1 point; did not participate in the assessment-5 points/time
V-⑬	The nursing department assessment results were recorded once a month, and the average score of departmental assessment was recorded once a year. Skills assessment for 85 points to meet the standard	
	85~89 points + 1 point; 90~95 points + 2 points; 96~100 points + 3 points	<60 points - 3 points; 60 to 84 points - 1 point. Did not participate in the assessment - 5 points / time

(Continued)

Table 2 (Continued).

Level 1 / Level 2 Indicators	Plus Points Score Standard	Minus Points Score Standard
VI-⑭	Participating in new technology, new business learning training +1 point / time Carrying out new technologies, new business +2 points / item	
VI - 15	Leading theoretical lectures and skills training for new nurses and internship students +0.5 points/5 times	
VI - ⑯	Completing teaching advanced training staff (dedicated) + 1 point/time	
VI-⑰		1 point for each less academic activity attended
VI-⑱	N4 nurses supervised 2 theses/year, +5 points for one more	One less −5 points
Attachment-①	All kinds of administrators on record at the hospital level + 1 point, additional points could be accumulated	
Attachment-②	Upper limit 3 points	
	Intra-departmental deployment +0.1 point/time In-hospital deployment +0.2 points/time	
Attachment-③	Participating in emergencies in the hospital +2 points/time Participatiing in out-of-hospital emergencies +4 points/time acting bravely for a just cause +3 points / time "Emergency group members" assessment pass the year + 1 point	
Attachment-④	Various honors and awards + 0.5~10 points according to different levels	
Attachment-⑤	All levels and types of scientific research projects + 0.25~20 points according to different levels and rankings	
Attachment-⑥		Irregular dress code, −1 point / time Wearing jewelry, dyed nails, abnormal hair color, −1 point/time Failure to wear a mask during nursing operations, −1 point/time

Evaluation and Assessment Results

The appraisal cycle of the comprehensive evaluation and assessment system of clinical nurses took place from October 1, 2020 to September 30, 2021, and the evaluation and assessment were carried out by the nursing department and the clinical departments. The base score was 100, and the assessment was carried out via adding or deducting points to the base score. The assessment results were divided into three grades: ≥100 as excellent, 100–95 as qualified and <95 as unqualified. An appraisal result of one failure would delay the promotion for one year, two failures would delay the promotion for two years, and three failures would demote the grade level. Nurse promotion conformed to the standards for the promotion of N0–N4 nurses as stipulated in the Nursing Staff Hierarchy Management System. In the promotion of the nurses, the assessment result was the most basic index, and only those who had passed the comprehensive evaluation assessment results would be qualified for promotion. At the same time, one point would be deducted for nursing errors and accidents during the current level, and then, the chief nurse, section chief nurse and nursing department would approve the promotion level by level to complete the promotion. The assessment standard converted the behavioural and outcome goals of each work duty in the clinical nursing work into measurable quantitative and objective indicators. The assessment results could be used as the basis for the nurses' promotion and the assessment index utilised during promotion as well as the basis for the department's selection of star nurses and excellent nurses.

The Nursing Management System Platform Supports Informatisation

The information management office provided information technology support and established a comprehensive evaluation and assessment module for the clinical nurses on the nursing management system platform to realise the evaluation and assessment operations on the computer system. Authorised by the information management office, the nursing department evaluated and assessed all clinical nurses in the hospital; the nurse manager and department administrator could only evaluate and assess nurses in their departments, and ordinary nurses had access rights but not operation rights on the platform. From March to April 2021, the urology and nephrology departments were selected for the trial operation to further improve the operation process.

Clinical Applications

Evaluation and Assessment System Workflow

The workflow was summarised as follows (Figure 1):

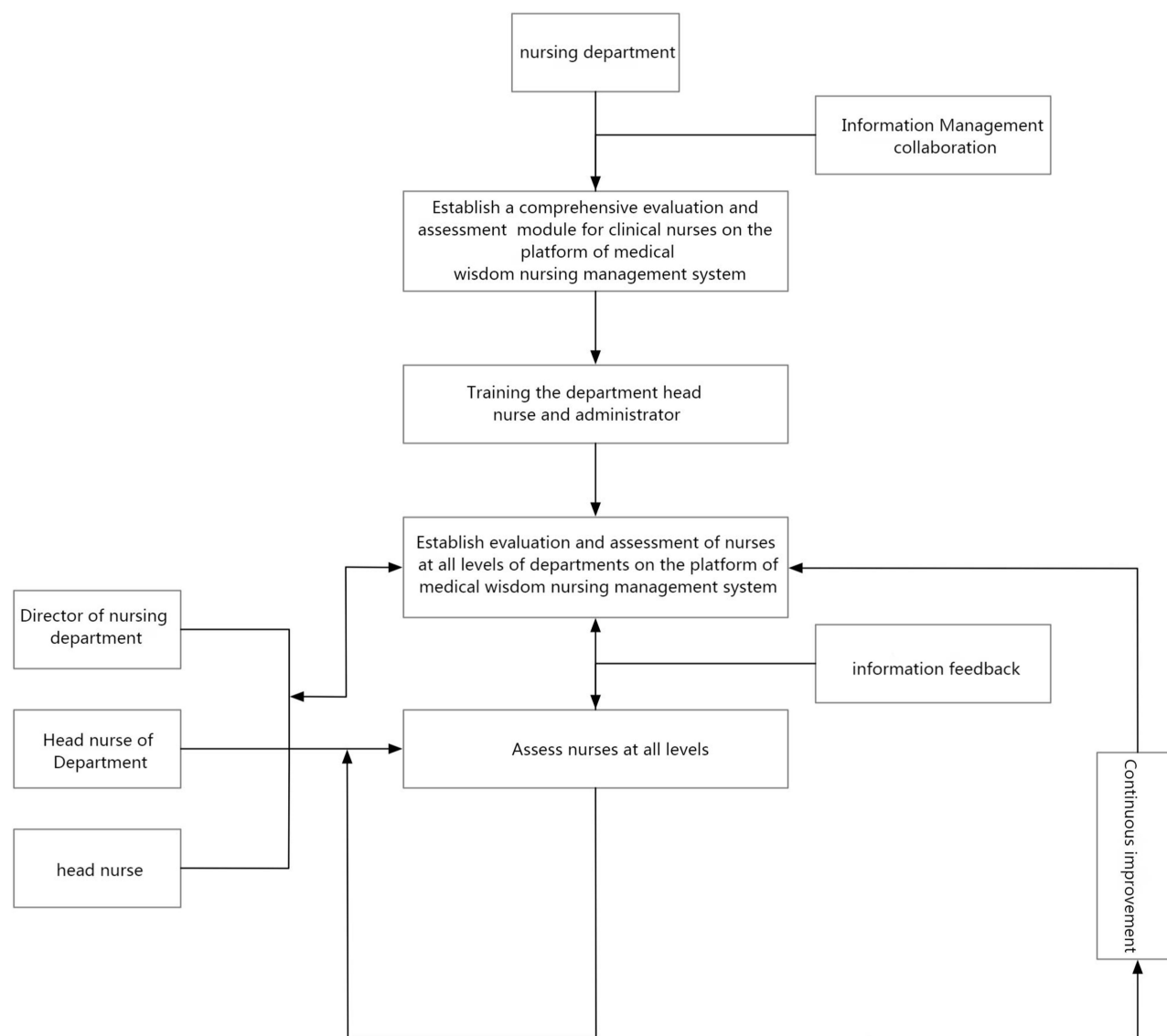1. The nursing department shall formulate comprehensive assessment standards and scoring rules.

Figure 1 Management flow chart of the comprehensive assessment and evaluation system for clinical nurses.

2. The information management department shall provide information support, design and install evaluation and assessment modules in the nursing management system, and assist in solving technical problems in the evaluation and assessment system.
3. The nursing department shall conduct operation training for head nurses and administrators in all departments of the hospital.
4. Each department shall establish an evaluation form for each person in the department on the evaluation module of the nursing management system.
5. The head nurse of the nursing department, the head nurse of the department and the head nurse of various clinical departments shall evaluate and assess each nurse in accordance with the scoring rules according to their authority. Nurses can check their assessment at any time.
6. The assessment results will provide the basis for the promotion of nurses from October 1 to September 30 of the next year, and the promotion of nurses will be completed in the fourth quarter.

Hospital-Wide Trial Run
From May to September 2021, the nurse managers and evaluation administrators of all departments in the hospital were trained to establish evaluation and assessment forms for the nursing staff in their departments, to evaluate and assess the nursing staff on the nursing management platform and to optimise the assessment system based on feedback regarding problems during the trial run. The specific optimisation contents were as follows:

Optimisation of the Secondary Indicators of Primary Indicator II (Attendance)

Determination of the Night Shift Base for Each Level. Originally: it was determined by the nursing department based on the number of night shifts completed in each department in the previous year.
Optimised to: it was determined by the department on a section-by-section basis.
Adjustment of the Value of Sick Leave. Originally: there was a maximum deduction of 10 points: sick leave for each day off, –1 point; tardiness and early departure each time, –1 point; and absenteeism, –1 point/hour.
Optimised to: this was changed to a sick leave and personal leave accumulative points deduction, with no upper limit: sick leave ≤3 days/year, no points deduction; sick leave >3 days, –1 point for each additional 7 days of rest; personal leave ≤3 days/year, no points deduction; personal leave >3 days –0.5 points for each additional day of rest; overtime, +1 point/3 h; late, tardiness and early departure, –0.5 points/time; unexcused absences, –3 points/day.

Optimisation of the Secondary Indicators of Primary Indicator IV (Theoretical Learning)
Originally: ≥85 exam points, + 1 point; ≥90 exam points, + 2 points; <80, – 1 point; 70 exam points, – 2 points; <60 exam points, – 3 points; did not participate in the assessment, –5 points/time.
Optimised to: 80 points in the theory exam to meet the standard; 80 to 85 exam points, + 1 point; 86 to 90 exam points, + 2 points; 91 to 100 exam points, + 3 points; 60 to 79 exam points, – 1 point; 50 to 59 exam points – 3 points; <49 exam points, – 5 points; did not participate in the assessment, –5 points/time.

Optimisation of the Secondary Indicators of Primary Indicator V (Professional Skills)
Originally: –1 point for each substandard item; did not participate in the assessment, –5 points/time.
Optimised to: 85 exam points in the skills assessment to meet the standard: 85 to 89 exam points, + 1 point; 90 to 95 exam points, + 2 points; 96 to 100 exam points, + 3 points; 60 to 84 exam points, – 1 point; <60 exam points, – 3 points; did not participate in the assessment, –5 points/time.

Willingness Survey
To further understand the satisfaction with and willingness of the nursing staff regarding participating in the comprehensive evaluation and assessment work, a questionnaire survey was conducted on 18 June 2021, and 945 questionnaires were collected from the nursing staff of the whole hospital. Approximately 75.4% of the nurses were satisfied with this work, and 82.7% were willing to regulate their behaviour according to the evaluation and assessment content.

Results

In 2021, a total of 1037 nurses in the hospital were evaluated through the comprehensive evaluation and assessment system of clinical nurses; among them, 38 nurses did not participate in the assessment due to resignation, job transfer, support the hospitals in remote regions, etc. Among the 999 nurses who completed the assessment, 888 passed the assessment, and 111 failed. The pass rate of the comprehensive evaluation assessment was 88.89% (see Table 3). The hierarchical distribution of unqualified nurses in the assessment and the reasons why they were unqualified are shown in Table 4. Based on the comprehensive evaluation and assessment results from 2022, 367 nurses received a promotion, and among the 259 who were promoted, 118 had excellent assessment results, accounting for 45.56%, and 141 had qualified assessment results, accounting for 54.44%. The number and hierarchy of the newly promoted nurses are shown in Table 5.

Discussion

In this study, we explored establishing a comprehensive evaluation system and validating it in clinical practice. The main findings can be summarised as follows: 1) a nurse evaluation system based on multiple indicators was constructed after

Table 3 Results of Comprehensive Evaluation Assessment Results of Nurses in 2021

Appraisal Results	Number of People	Percentage (%)
Excellent (≥100 points)	392	39.24
Qualified (95–100 points)	496	49.65
Unqualified (<95 points)	111	11.11

Table 4 Distribution of Nurses Who Failed the Evaluation Assessment Hierarchy and Reasons for Failure in 2021 (Percentage and Person-Time)

Levels	Number of People	Examination Results Failed to Meet the Standard (Person-Time)	Sick Leave (Person-Time)	Personal Leave (Person-Time)	Work Errors (Person-Time)	Number of Night Shifts Failed to Meet the Standard (Person-time)	Nursing Quality Control Failure (Person-Time)
N4 level	2	0	2	0	0	0	0
N3 level	7	2	6	0	0	0	0
N2 level	21	3	13	1	1	3	1
N1 level	29	20	8	3	2	0	2
N0 level	52	50	3	1	1	0	1
Total (percentage %)	111	75 (61.98%)	32 (26.45%)	5 (4.13%)	4 (3.31%)	3 (2.48%)	4 (3.31)

Table 5 Tier and Number of Newly Promoted Nurses, 2022

Levels	N4 Level	N3 Level	N2 Level	N1 Level	N0 Level	Total
Number of promoted nurses	2	93	87	77	108	367
Excellent (percentage)	2 (0.77%)	55 (21.24%)	43 (16.60%)	18 (6.94%)	5	118 (45.56%)
Qualified (percentage)	0 (0)	38 (14.67%)	44 (16.99%)	59 (22.78%)	103	141 (54.44%)

a literature review was conducted and the findings combined with clinical work, resulting in a large amount of data being collected. 2) In the trial operation of some departments, information was collected through the evaluation system, and the system was improved. 3) After the use of this evaluation system, the nurses' satisfaction with the assessment and willingness to regulate their behaviour reached a good level. The present study provided a powerful aid for nurse promotion management, and this platform made the assessment more convenient and, thus, could be translated into potential clinical benefit.

The Significance of the Comprehensive Evaluation Assessment of Clinical Nurses

The purpose of the comprehensive evaluation and assessment of clinical nurses was to cultivate and create a high-quality and skilled nursing team to provide high-quality and efficient nursing services to patients.[10–12] The system realised a quantitative evaluation assessment, which made it clear what nurses at each level should achieve and accomplish so that the nurses could correctly assess their work, see their strengths and weaknesses and continue to improve their weaknesses and grow while giving full play to their strengths; this offered positive guidance for the improvement of nurses' comprehensive quality.[13–15] At the same time, the evaluation standard objectively evaluated and assessed the clinical nurses comprehensively, continuously improved the nurses' motivation through rewarding diligence and punishing laziness, promoted their initiative to accomplish their work goals and created an atmosphere of active learning and mutual learning, which played a positive role in improving nursing quality and helping nursing staff to seek future development.[16]

Evaluation Indicators Shall Be Given Different Weights According to Different Levels

The evaluation and assessment standards gave different weights to different levels, with strict requirements for nurses at lower levels in terms of attendance, performance and theoretical skills learning and high requirements for nurses at higher levels in terms of management, scientific research and teaching. The adoption of different assessment standards for different levels was conducive to guiding the nurses at lower levels to focus on the improvement of theoretical knowledge and nursing skills, perform their duties conscientiously according to the standard requirements and eliminate nursing defects and errors; it guided the nurses at higher levels to play the role of "passing on, helping and leading" in clinical work[17,18] and to take an active role in departmental management, teaching and scientific research, which is conducive to the career growth of nursing staff.[19,20]

The Results of the Comprehensive Evaluation and Assessment of Clinical Nurses Provide the Basis for Nurse Promotion and Become a Powerful Aid to Nursing Management

The results of the comprehensive evaluation assessment provided the basis for nurse promotion and post-promotion assessment management. In 2021, 999 nurses completed the assessment through the comprehensive evaluation and appraisal system, and 888 passed, with a passing rate of 88.89%. Of these nurses, 392 were excellent, accounting for 39.24%, with a maximum score of 128 points. The main reasons for additional points were publication of journal articles, participation in scientific research, receipt of awards, deployment nomination for praise and receipt of praise letters or pennants. Moreover, 496 were qualified, accounting for 49.65%. These nurses reduced their scores within a range of five points; the range of points added and deducted was small and did not change much. Finally, 111 people (11.11%) failed; the main reasons for deduction of points were substandard theoretical achievements, sick leave, substandard number of night shifts taken, work errors and substandard nursing quality. Among the unqualified personnel, 61.98% of them were not up to standard; this was mainly reflected in N0- and N1-level nurses. The frequency of training and assessment of basic theory and basic skills for N0- and N1-level nurses was higher. Exams were held once a month for N0-level nurses, and exams were held once a quarter for N1-level nurses. Thus, the weight was greater for lower senior nurses. Sick leave and personal leave accounted for 26.45% and 4.13% of assessment failures, respectively; the points were calculated according to the specific number of days of sick leave and personal leave. Fewer points were deducted for nurses who took short leave ≤3 days/year without reducing points. More points were deducted for nurses who took long leave so that nurses could arrange their work and life reasonably, which was the main reason for the failure of N2-, N3- and N4-level examinations. The lowest score was 48.11 points, which was caused by taking sick leave throughout the year.

A low number of night shifts taken accounted for 2.48% of failures. Extra points were given to reward nurses who actively worked night shifts. For nurses who were not willing to work night shifts, they were given a points reduction and punishment to improve their enthusiasm to work night shifts and facilitate the scheduling management of nurse managers. Work errors and substandard nursing quality both accounted for 3.31% of failures. Daily nursing work required implementation in strict accordance with all operational standards and norms, and the evaluation and assessment constantly corrected deviations by adding points in the positive direction and subtracting points in the negative direction to effectively prevent the occurrence of nursing errors and improve the nursing management effect.[21–23] In December 2021, 367 nurses completed their promotion, of which 108 N0-level nurses were new nurses who were recently hired at the hospital. Moreover, 259 nurses completed their promotion based on the assessment results of the comprehensive evaluation and assessment system. The 111 nurses who failed the assessment had their promotion delayed according to the regulations. Through the comprehensive evaluation and assessment of the clinical nurses, the nurses took the initiative to find their shortcomings, made continuous improvements and worked actively and hard. The nurses were transformed from being passively managed to actively taking initiatives, which became a powerful aid for the chief nurse management.[24]

The Information Technology–Supported Evaluation and Assessment System is Easy and Fast to Operate

The evaluation assessment system was based on the support of the information technology platform, and the evaluation was conducted on the clinical nurse comprehensive evaluation and assessment module of the nursing management system, which was easy and fast to operate. The appraisees could also receive timely evaluation information; the evaluation results were transparent, and disputed evaluation results would be communicated promptly. In addition, when nurses transferred to another unit, it was sufficient to transfer the individual assessment forms to the new unit to continue the evaluation assessment, which greatly improved the efficiency of managers.[25,26]

Limitations

Since this system was only tried in our institution, the results of this study are not yet universal, and continuous improvement of these evaluation criteria is still needed in the future under the management framework. It is worth noting that the satisfaction level of the nurses with this assessment was at 75.4% and that their willingness to regulate their behaviour according to the evaluation assessment content was at 82.7%, which was still a low level. This may have been related to factors such as the inertia of traditional thinking and heavy clinical workload. Therefore, the next step should be to study how to focus on nursing staff and continue to rely on the data information system to realise the management and evaluation of nursing staff, promote the overall development of medical education and research of nursing teams and discipline and, finally, improve nurses' satisfaction and enhance nursing value.

Conclusion

In summary, this system can achieve an objective and quantitative evaluation and assessment of clinical nurses that is highly operable, and the validation results provide a management basis for the promotion and post-promotion assessment of nurses in the hierarchy.

Ethics Approval and Consent to Participate

This study was conducted in accordance with the Declaration of Helsinki and approved by the First Affiliated Hospital of Hebei North University review board (W2022028). All participants provided their signed informed consents.

Disclosure

The authors report no conflicts of interest in this work.

References

1. Song YY, Gu YM, Hu J. Evaluation of the effect of domestic specialist nurse training and its influencing factors. *Nurs J Chin People's Lib Army*. 2016;33(24):50–52+75.
2. Wu HH, Hu MH, Zhou ZJ. Role of nurse hierarchical management mode in improving the quality of nursing management. *China Modern Med*. 2020;27(5):187–189.
3. Wei H, Roberts P, Strickler J, et al. Nurse leaders' strategies to foster nurse resilience. *J Nurs Manag*. 2019;27(4):681–687. doi:10.1111/jonm.12736
4. Wang YL. Performance appraisal applicated in high quality nursing ward. *Chin Comm Doctors*. 2017;33(12):156–157+160.
5. Chen HY, Chen HY, Zhuang R, et al. Application of nurses' hierarchical management combined with performance appraisal mode in outpatient service. *Chin Health Std Manage*. 2020;11(9):161–163.
6. Flinkman M, Leino-Kilpi H, Numminen O, et al. Nurse competence scale: a systematic and psychometric review. *J Adv Nurs*. 2017;73 (5):1035–1050. doi:10.1111/jan.13183
7. Huber D. *Leadership and Nursing Care Management-e-Book*. Elsevier Health Sciences; 2017:26.
8. Tomey AM. Guide to nursing management and leadership. *Australian Nurs Midwifery J*. 2008;15(11):41.
9. Giangreco A, Carugati A, Sebastiano A, Tamimi HA. War outside, ceasefire inside: an analysis of the performance appraisal system of a public hospital in a zone of conflict. *Eval Program Plann*. 2012;35(1):161–170. doi:10.1016/j.evalprogplan.2010.11.004
10. Bai JP, Xia YY, Li SH. Theoretical discussion on nursing management mode of future sea rescue. *Nanfang J Nurs*. 2005;12(1):85–86.
11. Chen Q, Huang Y, He BQ, et al. Effect observation on improving clinical practice ability of new nurses guided by comprehensive ability assessment mode. *Med Forum*. 2021;25(12):1745–1747.
12. Vujanić J, Prlić N, Lovrić R. Nurses' self-assessment of caring behaviors in nurse-patient interactions: a cross-sectional study. *Int J Environ Res Public Health*. 2020;17(14):5255. doi:10.3390/ijerph17145255
13. He C. The achievements inspection manages in head nurse the application. *Nurs Res Pract*. 2008;5(2):42–43.
14. Wen JP, Li S, Xu ST, et al. The application of closed-loop management in the hierarchical core competence training for nurses in our department. *Contemp Nurse*. 2021;28(1):175–177.
15. Liang HY, Tang FI, Wang TF, et al. Evaluation of nurse practitioners' professional competence and comparison of assessments using multiple methods: self-assessment, peer assessment, and supervisor assessment. *Asian Nurs Res*. 2021;15(1):30–36. doi:10.1016/j.anr.2020.10.004
16. Chang IW, Shyu YI, Tsay PK, et al. Comparison of nurse practitioners' perceptions of required competencies and self-evaluated competencies in Taiwan. *J Clin Nurs*. 2012;21(17–18):2679–2689. doi:10.1111/j.1365-2702.2012.04186.x
17. Wu L. *Study on the Status and Factors of Knowledge-Attitude-Practice of Intensive Care Unit Acquired Weakness of Nurses in Intensive Care Unit*. Nanchang University; 2016.
18. Spiva L, Hart PL, Patrick S, et al. Effectiveness of an evidence-based practice nurse mentor training program. *Worldviews Evid Based Nurs*. 2017;14(3):183–191. doi:10.1111/wvn.12219
19. Cai QQ, Cai YA, Li JF, et al. Evaluation of application effect of hierarchical nursing management in department of hepatobiliary surgery. *Healthc Manage Forum*. 2018;35(4):52–54.
20. Katlen J, Crosby L, Singleton K, et al. Integration and standardization of clinical nurse specialists in a multihospital system: exemplars in practice. *Clin Nurse Spec*. 2020;34(6):270–275. doi:10.1097/NUR.0000000000000556
21. Fan Y, Qian ZP, Zheng Y. Development and application on clinical nurse hierarchical examine table. *Chin Hosp*. 2013;17(9):60–62.
22. Zhao HX, Zhang WG. Application effect of nurses hierarchical management model based on job competence. *Chin Nurs Res*. 2021;35 (11):2058–2061.
23. García-Sierra R, Fernández-Castro J. Relationships between leadership, structural empowerment, and engagement in nurses. *J Adv Nurs*. 2018;74 (12):2809–2819. doi:10.1111/jan.13805
24. Oblea PN, Berry-Caban CS, Dumayas JY, et al. Evaluation of clinical nurse transition program at US army hospitals. *Mil Med*. 2019;184(11–12):914–921. doi:10.1093/milmed/usz108
25. Jiao L, Sui Y, Yang G, et al. The construction of the evaluation system of nurses' post-training and the application of the system in 25 grade-A general hospitals in China. *Nurs Open*. 2020;8(1):482–497. doi:10.1002/nop2.651
26. Tharp-Barrie K, Williams TE, Howard PB, et al. DNP practice improvement initiative: staff nurse competency evaluation. *J Nurs Adm*. 2020;50 (1):22–27. doi:10.1097/NNA.0000000000000834