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RESEARCH ARTICLE

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Construction of haemodialysis nursing-sensitive quality indicators based on Donabedian theory: A Delphi method study

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Abstract

Aims: To establish a sensitive, scientific and practical evaluation system for haemodialysis nursing and to provide a reference for the evaluation of haemodialysis nursing quality.

Design: Through a literature review and Delphi method.

Method: According to the literature review, a preliminary nursing-sensitive quality indicators for haemodialysis were established, and an expert survey questionnaire was designed. Finally, the evaluation system for the nursing-sensitive quality indicators was determined using the Delphi method.

Results: Thirteen nursing-sensitive quality indicators for haemodialysis were finally constructed, including two structural indicators, three process indicators and eight outcome indicators. The effective recovery rate of the two rounds of expert survey questionnaires was 100%, the coefficient of judgement basis is 0.956, the coefficient of familiarity is 0.833, the coefficient of authority is 0.895, and the Kendall's harmony coefficients of the two rounds of expert consultation were 0.158 ~ 0.307 and 0.170 ~ 0.315, respectively, with statistical significance ($p < .05$).

Clinical relevance: In this study, the nursing-sensitive quality indicators for haemodialysis were developed by the Delphi method and included structural indicators, outcome indicators and process indicators, which made up for some deficiencies noted in previous studies. The authors have provided a more reliable and comprehensive basis for evaluating the quality and safety of haemodialysis nursing in the future.

KEYWORDS
Delphi method, haemodialysis, nursing-sensitive quality indicators

Lin Chen and Yingjun Zhang are co-first authors, they have contributed equally to this work, and their contributions are the same.

1 | INTRODUCTION

Chronic kidney disease (CKD) has become a serious global public health problem (Lv & Zhang, 2019). From 2013–2016, the prevalence rate of CKD in the United States was 14.8% (Zelnick et al., 2017), and in China, its prevalence has been increasing (Yang et al., 2021). According to the World Health Organization (WHO), global mortality due to CKD is projected to increase by approximately 14% by the year 2030 (WHO, 2018). As the disease progresses, approximately 2% of patients with CKD will develop end-stage renal disease (ESRD). ESRD refers to patients with stage 5 and end-stage CKD, at which time the kidney has undergone substantial and irreversible functional damage (Chrifi Alaoui et al., 2022; Fischer et al., 2021). Haemodialysis has become the main treatment for ESRD (Zhang, Wang, et al., 2021). According to the Chinese National Renal Data System, the number of patients with ESRD receiving haemodialysis has increased year by year, from approximately 270,000 in 2011 to approximately 700,000 in 2020. There are 40,000 to 50,000 new dialysis patients every year. With the continuous development of medical technology, haemodialysis can prolong the life of patients, but there are still various complications and uncomfortable symptoms experienced during dialysis that affect patients' quality of life (Alencar et al., 2020; Lee et al., 2020). Nurses are the major caregivers of dialysis patients, and good quality of care can reduce the risk of haemodialysis-related complications and improve the quality of life of patients receiving haemodialysis (Arreguy-Sena et al., 2018; Harwood et al., 2020; Nobahar & Tamadon, 2016; Thomas et al., 2016). Thus, improving haemodialysis centres' nursing quality evaluation system, improving the effectiveness of nurse managers, and ensuring the safety of the nursing care provided are the key points of nursing management.

2 | BACKGROUND

In hospital management, nursing quality is an important part of hospital quality. In the context of "big data" in hospital management, sensitive indicators of nursing quality can guide nurse managers and clinical nurses in identifying problems in nursing work and in taking corresponding measures to improve the quality of nursing care provided. In July 2016, the practical Manual of Nursing Sensitive Quality Indicators (2016 edition) (Li, 2016), organized and compiled by the nursing Center of Hospital Management Institute of National Health and Family Planning Commission of China, was officially published, which clearly proposed 12 sensitive indicators of hospital nursing quality monitoring and became the focus of hospital nursing quality managers nationwide. Nursing-sensitive quality indicators (NSQIs) are the procedures and outcomes of nursing services provided to patients, as assessed by using nursing data and quantitative evaluation methods and by monitoring various functional qualities that affect patient outcomes, including nursing management and clinical practice. NSQIs are a scientific tool to objectively evaluate the quality of clinical nursing and the effectiveness of nursing activities (Harwood et al., 2020; Oner et al., 2021).

In 1966, Avedis Donabedian, a famous American scholar, proposed the theoretical model of a "three-dimensional quality structure" (that is, medical quality should be classified into three dimensions, as structure, process and outcome) (Donabedian, 1992), which has become the main framework for constructing sensitive indicators of nursing quality. David (McIntyre et al., 2019) et al. constructed 26 sensitive indicators of haemodialysis nursing quality through four rounds of Delphi expert letter consultation, including four structural indicators, eight process indicators and 14 outcome indicators. However, due to cultural differences, some indicators are not suitable for the nursing management of haemodialysis centres in China. Li Yi (2019) constructed a set of 13 sensitive quality indicators for the specialized care of blood purification, including three structural indicators and 10 outcome indicators. Gao et al. (2018) determined 11 sensitive indicators of haemodialysis nursing quality through two rounds of letter consultation. However, these two studies did not include process indicators, and because process quality is an important link to ensure nursing quality through the implementation of oversight in the nursing process, it should be included in the index system. Although there are relevant reports on sensitive indicators in haemodialysis nursing, there is not yet a complete, calculable evaluation index that can objectively reflect the safety and quality of nursing in haemodialysis centres. Therefore, based on a large literature review, a statistical analysis of clinical patient data, and an analysis and summary of nursing adverse events, this study aims to establish sensitive quality indicators for haemodialysis nursing based on the "Donabedian three-dimensional quality structure" model by combining expert consultation with Delphi expert letter consultation. The goal is to improve the quality of clinical care and to provide the basis for future research on the safety and quality management of haemodialysis nursing.

3 | METHODS

3.1 | Design

3.1.1 | Establishment of research group

The research group consisted of eight members. The group leader was the head nurse of the haemodialysis centre at the hospital. She has been engaged in haemodialysis management for 15 years. The team consisted of three blood purification specialist nurses, one deputy head nurse, one chief physician and two postgraduate students. The members of the research team were mainly responsible for the literature review, the questionnaire development and consultation with experts. Through the evaluation and statistical analysis of the results of our consultation correspondence, a system of sensitive quality indicators for haemodialysis nursing was established.

3.1.2 | Literature retrieval and review

The research group searched a large number of relevant studies at home and abroad and traced back the references of the included literature. English language literature was found through searches of PubMed, Web of Science and Embase database (from inception until May 2021). Chinese language literature was searched on WEip.cn, CNQI and Wanfang database (from inception until May 2021). The keywords included haemodialysis, dialysis, quality index and Delphi method. Relevant nursing indicators were selected as evaluation terms from the retrieved literature. Using "Donabedian three-dimensional quality structure" Framework and Medical Quality Control Indicators of Nephropathy (2020) released by The National Health Commission of China as theoretical basis, the research team sorted and screened the 12 retrieved studies, cross-checked them, discussed and studied them together and finally obtained 16 indicators, including three structural indicators, four process indicators and nine outcome indicators, as shown in Figure 1.

3.1.3 | Delphi method

The Delphi method is also known as the expert opinion method or expert letter inquiry investigation method. It usually involves 2–3 rounds of consultation, and the interval between the 2 rounds is generally 4–5 weeks. This method was applied in this study, which included drafting Delphi survey questionnaires, collecting expert feedback and establishing nursing-sensitive quality indicators through expert evaluation and discussion. The quality indicators were to be evaluated and discussed by the expert panel in two successive Delphi surveys until consensus was reached.

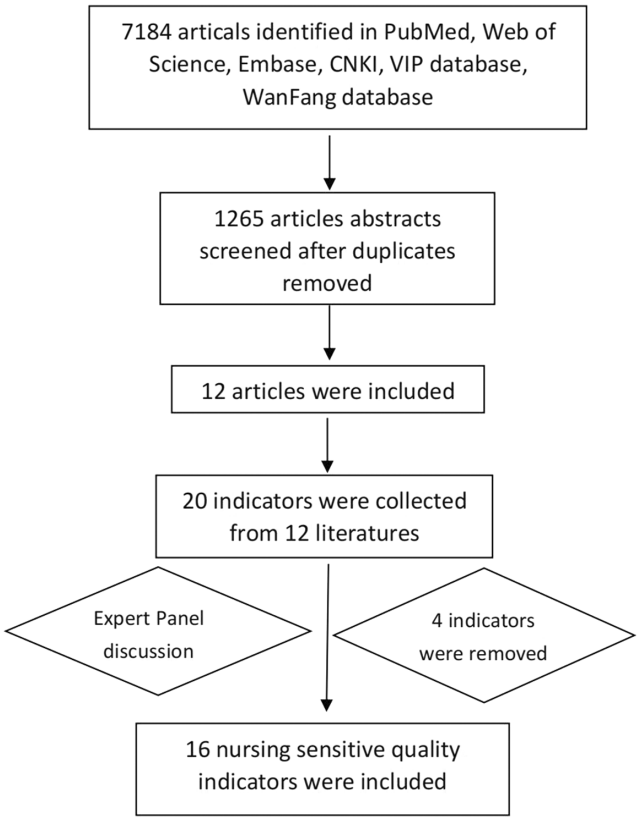

FIGURE 1 Screening process of nursing-sensitive indicators

The expert survey questionnaire consisted of five parts: (i) the preface informed the experts about the purpose of the study, its content and matters needing special attention;(ii) the basic personal information of the expert, including gender, age, professional title, years of work; (iii) the expert's familiarity with the consulting project; (iv) the judgement basis for the expert's selection index, including theoretical analysis, practical experience, reference to domestic and foreign literature and intuitive feeling; (v) the expert opinion table of sensitive indicators for haemodialysis nursing.

The first round of survey questionnaires included three structural indicators, four process indicators, nine outcome indicators. Questionnaires were distributed to the experts through WeChat, email and face-to-face to explain in detail the matters needing attention when filling out the form. The experts relied on their own experience and knowledge, considered each group of indicators according to the meaning of the indicators and scored the importance of each indicator as follows: 5 points = "very important," 4 points = "relatively important," 3 points = "important," 2 points = "general," and 1 point = "not important." If the expert thought that an indicator was inappropriate, they could modify it in the column labelled "Suggestions for Modification"; if there were additional indicators the expert wanted to include, they could be written into the "Add item" column. After the first round of questionnaires was collected, the research group deleted and modified the indicators according to the experts' opinions. The index deletion standard was a significance mean <3.50 points or the coefficient of variation >0.25 (Huang et al., 2021; Ye et al., 2022). The indicators were modified, and a second-round questionnaire was formed. After two rounds of consultation, experts' opinions tend to reach a consensus, so the consultation is ended.

3.2 | Participant

The selected experts must be professionals with academic authority, high levels of theoretical knowledge and clinical practice experience in the relevant research field. According to the research content and actual needs, 15 doctors and nurses with rich haemodialysis experience from Sichuan, Chongqing, Hubei, Gansu and other places were finally invited to participate in this study. The research direction included nursing management, nursing instruction and clinical nursing. The selection criteria for the consulting experts included the following: (i) a Bachelor's degree or above; (ii) an intermediate-level professional title or higher; (iii) ≥10 years of working experience; (iv) a rich experience in the field of haemodialysis, familiar with the process and new developments in the sensitive quality indicators of haemodialysis nursing; (v) a willingness to participate in several rounds of expert consultation.

3.3 | Statistical methods

SPSS 23.0 and Excel software were used for data entry and statistical analysis. The significance score of indicators at all levels was expressed as the mean ± standard deviation (x ± s), and the coefficient of variation and the authority of experts were calculated. Nonparametric tests were used to calculate the degree of coordination of two rounds of expert consultation.

3.4 | Ethical considerations

The Institutional Review Board approved the study as a quality improvement study and waived the need for informed consent by issuing a statement of no objection.

4 | RESULTS

4.1 | Participants' characteristics

A total of 15 experts aged between 38–50 participated in the first round and 15 in the second round (100% response rate), including four doctors (26.7%) and 11 nurses (73.3%).Table 1 summarized the characteristics of participants.

4.2 | Enthusiasm and authority of experts

The enthusiasm of experts is reflected by the recovery of the questionnaires. In this study, 15 questionnaires were distributed in each of the two rounds of expert consultation, and 15 were effectively recovered. The positive coefficients of the experts in both rounds were 100%. In the first round of consultation, eight experts put forward 20 suggestions for revising the text. In the second round of consultation, experts did not propose any further suggestions for modification. Expert authority was jointly determined by the expert judgement basis coefficient (Ca) and familiarity coefficient (Cs) (Schlieper et al., 2016). In this study, the two rounds of consulting experts were the same, and the coefficient of judgement basis is 0.956, the coefficient of familiarity is 0.833, and the coefficient of authority is 0.895.

TABLE 1 Participants' characteristics ($N = 15$)

Items	N (%)
Gender	
Male	5 (33.3%)
Female	10 (66.7%)
Age (Years, Mean ± SD)	43.07 ± 4.23
Years of working	
14–20	8 (53.3%)
21–31	7 (46.7%)
Education level (%)	
Bachelor's degree	13 (86.6%)
Master's degree	1 (6.7%)
Doctor's degree	1 (6.7%)
Vocation (%)	
Nurse	11 (73.3%)
Doctor	4 (26.7%)

4.3 | Degree of coordination of expert opinions

In this study, Kendall's harmony coefficients of the two rounds of expert consultation were 0.158–0.307 and 0.170–0.315, respectively, both $p < .05$, as shown in Table 2. Although Kendall's W was not high, the second round was higher than the first round, indicating that expert opinions tended to be consistent. See Table 2 for details.

4.4 | Expert consultation results

The mean importance of items <3.5 points or with a coefficient of variation >0.25 was taken as the standard. After the first round of expert consultation results was collected, corresponding items were deleted or modified based on the standard and the opinions of the project group. Structural indicators removed the "vascular access nurse configuration ratio." The process indicator "hand hygiene execution rate" was changed to "hand hygiene execution accuracy rate." The "steady fixation rate of catheter" was changed to "standard fixation rate of catheter/puncture needle." We deleted "hemodialysis nurse assessment standard rate." The "Timing test completion rate of blood test index" was deleted from the result indicators. "Incidence of adverse events during dialysis" was changed to "incidence of unplanned extubation"; "emergency dialysis rate of outpatient dialysis patients" was deleted, and we added "hemodialysis patient falls incidence." Finally, 13 indicators entered the second round of consultation, and the second round of expert consultation had no modified opinions. See Tables 3 and 4 for the indicators.

5 | DISCUSSION

Through two rounds of expert consultation, this study finally formed sensitive indicators for haemodialysis nursing, including two structural indicators: nurse–patient ratio and blood purification specialist nurses to general nurse composition ratio; three process indicators: the correct rate of hand hygiene, standard fixation rate of catheter/puncture needle, and puncture execution rate of AVF rope ladder; eight result indicators: central venous catheter infection incidence, dialysis period weight control success rate, incidence of extracorporeal circulation in the process of coagulation, unplanned extubation incidence, the incidence of hypotension in haemodialysis, urea

TABLE 2 Degree of coordination of expert opinions

	Importance			Rationality of calculation formula			Feasibility of check frequency		
	Kendall W	χ^2	*p*	Kendall W	χ^2	*p*	Kendall W	χ^2	*p*
1 round	0.208	46.890	<.001	0.158	35.487	.002	0.307	69.076	<.001
2 rounds	0.279	50.183	<.001	0.170	30.637	.002	0.315	56.639	<.001

clearance index (Kt/V) success rate, incidence of falls and patient satisfaction.

Structural indicators express the impact of the environment on nursing, including material resources, human resources and organizational structure (Waltering et al., 2020). Among the structural indicators, the most basic and important indicator is the nurse–patient ratio, which has been confirmed in the studies of McIntyre et al. (2019) and Gao et al. (2018). In haemodialysis units, the ratio of nurses to patients can affect the prognosis of patients, and having fewer nurses directly affects the treatment compliance of patients, resulting in an increased hospitalization rate and mortality rate. These findings demonstrate the importance of a reasonable allocation of nurse manpower. All the experts in this study believed that the composition ratio of specialized nurses in blood purification was an important structural and sensitive indicator of haemodialysis nursing. Blood purification specialist nurses take blood purification patients as their focus and provide them with a series of professional nursing services, such as treatment, monitoring, support and help (Gao Yan et al., 2020). The specialized blood purification nurses have higher skills than ordinary nurses, and patient satisfaction is also higher than with ordinary nurses (Huang Ling et al., 2019). Specialized blood purification nurses in Hong Kong have played an important role in effectively reducing patient complications and in reducing patients' medical burden and also the financial and economic burden on the government (Zhang Jieting & Jialian, 2015). Therefore, increasing the proportion of blood purification specialist nurses plays a crucial role in improving the quality of haemodialysis nursing.

Process indicators refer to the process that patients undergo or that nurses specifically implement, which can reflect the specific activities required in the provision of medical services (Niihata et al., 2018). The three process indicators in this study were different from the eight process indicators in McIntyre et al. (2019), which may be related to different national conditions and different care concerns of haemodialysis centres. The haemodialysis room is a high-risk department for nosocomial infection and a key department for nosocomial infection management. Haemodialysis nurses undertake most of the tasks in haemodialysis rooms. If hand hygiene is not up to standard, they will become carriers of various pathogenic microorganisms, which can easily lead to nosocomial infections (Luo Jia et al., 2021). Hand hygiene is the most basic and important means for haemodialysis patients to prevent nosocomial infection, so it is necessary to strengthen the monitoring and the rate of the correct hand hygiene execution. Arteriovenous fistula is the most ideal vascular access for haemodialysis patients. Currently, the commonly used puncture methods include rope ladder puncture, buttonhole puncture and regional puncture. As existing studies have confirmed that rope ladder puncture will result in fewer complications, many guidelines recommend rope ladder puncture as the preferred puncture method (Jin Qizhuang & Chaoyang, 2019; Lok et al., 2020). Therefore, unified management should be conducted for patients who can receive rope ladder puncture in clinical practice to improve the use of rope ladder puncture and reduce the occurrence of arteriovenous fistula complications.

Outcome indicators mainly included patient satisfaction and overall quality evaluation (Zhang, Chen, et al., 2021). Some outcome indicators identified in this study are directly related to process indicators. For example, there is a direct link between how well hand hygiene is performed and the occurrence of infection. Dialysis patients with indurated central venous catheters are prone to hospital-acquired infections, which can reduce the efficiency of haemodialysis, increase the economic burden of the patients and even endanger their lives. Dialysis catheters must be removed for serious infections. Therefore, medical staff should perform aseptic operations in strictly clinical settings and be thorough with their hand hygiene to prevent catheter infections. Study have reported that the incidence of unplanned extubation in haemodialysis patients is 23.3% (Hu Liping et al., 2016). Analysis of the reasons found that it is mainly caused by irregular catheter fixation, which can be reduced to 11.1% through nursing interventions. Therefore, regular inspection of the catheter and needle fixation can reduce the incidence of unplanned extubation.

The difference between this study and previous studies is that the achievement rate of weight control during dialysis was added as the outcome index. Water retention is a common clinical problem in haemodialysis patients. Approximately 30%~37% of haemodialysis patients have water retention, and excessive fluid volume is closely related to difficulty correcting haemodialysis-related complications and is a major factor affecting patient death (Fernandes et al., 2021; Keber et al., 2021). Interdialytic weight gain is an effective objective indicator to evaluate the fluid intake behaviour of haemodialysis patients. Studies have proven that health education can reduce interdialysis weight gain (Dawson et al., 2021; Perdana & Yen, 2021). Therefore, this indicator is included in this study. It is hoped that nurses can correctly guide haemodialysis patients to control their weight gain in the interdialysis period, formulate systematic health education intervention measures and adopt effective strategies to help patients self-monitor and control fluid intake, and thus better guide the treatment of haemodialysis patients and improve their quality of life.

TABLE 3 Nursing-sensitive indicators for haemodialysis

The index type	The index name	Define	A formula to calculate	Statistical frequency
Structure indicators	Nurse–patient ratio	Refers to the ratio of the number of nurses on duty to the number of dialysis patients cared for during the statistical period	Number of dialysis patients in charge of care/number of nurses on duty in statistical period	Monthly
	Blood purification specialist nurses to general nurse composition ratio	Refers to the ratio of the total number of specialized blood purification nurses to the total number of haemodialysis centre nurses in the statistical period.	Number of specialized nurses in blood purification/Total number of nurses in haemodialysis centre in statistical period	Every half a year
Process indicators	Correct rate of hand hygiene execution	Refers to the ratio of the number of nurses who performed hand hygiene correctly to the total number of nurses who performed examination in a statistical period	Number of nurses who performed hand hygiene correctly/Total number of nurses examined in statistical period * 100%	Monthly
	Standard fixation rate of catheter/puncture needle	Refers to the ratio of the number of standardized catheter/puncture needle fixation cases to the total number of dialysis cases in the statistical period	Number of standardized fixation of catheter/puncture needle/Total number of dialysis patients in statistical period * 100%	Monthly
	Puncture execution rate of arteriovenous fistula rope ladder	Refers to the ratio of the actual number of patients with rope ladder puncture to the total number of patients with rope ladder puncture in the statistical period	Actual number of patients with rope ladder puncture/Total number of patients who should have rope ladder puncture in statistical period * 100%	Monthly
Outcome indicators	Incidence of central venous catheter infection	Refers to the ratio of the cases of central venous catheter infection to the total days of indwelling of central venous catheter patients within the statistical period (exit infection, tunnel infection and associated bloodstream infection were counted respectively)	Cases of central venous catheter infection/Total days of central catheter indwelling in statistical period * 1,000‰	Monthly
	Dialysis period weight control success rate	The proportion of maintenance haemodialysis patients with interdialysis weight gain of less than 5% per unit time	Number of maintenance haemodialysis patients with interdialysis weight gain of <5% / total number of maintenance haemodialysis patients within statistical period * 100%	Monthly
	Incidence of coagulation during extracorporeal circulation	Refers to the ratio of grade ii ~ iii coagulation to the total number of haemodialysis cases in the statistical period	Number of cases of grade ii ~ iii coagulation in CPB/Total number of dialysis cases in statistical period * 100%	Monthly
	Incidence of unplanned extubation	Refers to the ratio of the number of unplanned extubation cases to the total number of dialysis cases in the statistical period.	Number of unplanned extubation cases/ Total number of dialysis cases in statistical period * 100%	Monthly
	Incidence of hypotension in haemodialysis	Refers to the ratio of the number of cases of hypotension in haemodialysis and the total number of cases of dialysis within the statistical period.	Number of cases of hypotension in haemodialysis/Total number of dialysis cases in statistical period * 100%	Monthly
	Urea clear index (Kt/V) compliance rate	The proportion of patients with single-compartment Kt/V (spKt/V) > 1.2 and maintenance haemodialysis per unit time	SpKT/V > 1.2 maintenance haemodialysis patients/total number of maintenance haemodialysis patients within statistical period * 100%	Monthly
	Incidence of falls in haemodialysis patients	Refers to the number of fall patients/the total number of haemodialysis patients within the statistical period	Number of falls/total number of haemodialysis patients * 100%	Monthly
	Patient satisfaction	Refers to the ratio of the number of dialysis patients who answered satisfactorily to the total number of dialysis patients surveyed during the statistical period	Number of dialysis patients with satisfactory answers/total number of patients investigated in statistical period * 100%	Monthly

TABLE 4 Nursing-sensitive indicators for haemodialysis

Dimension	Indicators	Importance			Rationality of formula			Feasibility of check frequency		
		Scores ($\bar{x} \pm s$)	CV	Degree of recognition (%)	Scores ($\bar{x} \pm s$)	CV	Degree of recognition (%)	Scores ($\bar{x} \pm s$)	CV	Degree of recognition (%)
Construction indicators	Nurse–patient ratio	5.00 ±0.00	0	100	4.60 ±0.63	0.14	100	5.00 ±0.00	0	100
	Blood purification specialist nurses to general nurse composition ratio	5.00 ±0.00	0	100	4.93 ±0.26	0.05	100	4.60 ±0.63	0.14	93.33
Process indicators	Correct rate of hand hygiene execution	4.80 ±0.41	0.09	100	4.80 ±0.41	0.09	100	4.80 ±0.56	0.12	93.33
	Standard fixation rate of catheter/puncture needle	4.73 ±0.59	0.13	93.33	4.67 ±0.49	0.10	100	4.40 ±0.63	0.14	93.33
	Puncture execution rate of arteriovenous fistula rope ladder	4.40 ±0.63	0.14	93.33	4.47 ±0.64	0.14	93.33	4.73 ±0.46	0.10	100
Outcome indicators	Incidence of central venous catheter infection	5.00 ±0.00	0	100	4.87 ±0.35	0.07	100	4.27 ±0.70	0.16	86.67
	Dialysis period weight control success rate	4.53 ±0.52	0.11	100	4.73 ±0.46	0.10	100	4.53 ±0.52	0.11	100
	Incidence of coagulation during extracorporeal circulation	4.53 ±0.52	0.11	100	4.27 ±0.70	0.16	93.33	5.00 ±0.00	0	100
	Incidence of unplanned extubation	4.80 ±0.41	0.09	100	4.47 ±0.52	0.12	100	5.00 ±0.00	0	100
	Incidence of hypotension in haemodialysis	4.27 ±0.70	0.16	86.67	4.67 ±0.62	0.13	93.33	4.93 ±0.26	0.05	100
	Urea clear index (Kt/V) compliance rate	4.80 ±0.56	0.12	93.33	4.73 ±0.59	0.13	93.33	4.73 ±0.46	0.10	100
	Incidence of falls in haemodialysis patients	4.93 ±0.26	0.05	100	4.53 ±0.64	0.14	93.33	4.73 ±0.46	0.10	100
	Patient satisfaction	4.67 ±0.62	0.13	93.33	4.47 ±0.64	0.14	93.33	4.93 ±0.26	0.05	100

The other outcome indicators of this study were similar to those of Gao Ju Lin. During haemodialysis, minor external coagulation may affect the adequacy of dialysis, while severe coagulation may even lead to dialysis interruption and anaemia. The establishment of this indicator can help reduce and prevent the incidence of blood clotting during haemodialysis and improve the ability of nursing staff to manage haemodialysis-related emergencies by strengthening responsibility and implementing standardized operating procedures in clinical practice. Haemodialysis can improve the quality of life of patients by removing inflammatory factors and uremia toxins. At present, the urea clearance index (Kt/V) is commonly used to evaluate the dialysis adequacy for haemodialysis patients (Hasan et al., 2021), so in this study, the compliance rate of Kt/V was included as an outcome indicator. The incidence of intradialytic hypotension (IDH) in dialysis is high, and it occurs in approximately 20–30% of dialysis patients. IDH is closely related to the quality of life and long-term survival time of MHD patients (Chou et al., 2018). Haemodialysis nurses are the closest contacts of haemodialysis patients and can be the first to observe the changes in patients' condition during dialysis. Therefore, this indicator is included to monitor the incidence of hypotension during haemodialysis to reduce the risk factors related to IDH as much as possible, to improve dialysis quality, to reduce the hospitalization rate and to improve the survival rate. Dialysis patients with fragile bones are prone to renal anaemia, mineral metabolism disorders, malnutrition, dizziness, fatigue and other symptoms affecting their ability to exercise. Compared with the general population, haemodialysis patients have a higher incidence of accidental falls and related fractures. In addition, these patients are often associated with cardiopulmonary dysfunction, such as arrhythmias and postdialysis orthostatic hypotension, all of which led to a higher propensity for cardiogenic syncope, leading to falls. Therefore, the incidence of falls among haemodialysis patients is an important nursing-sensitive quality indicator. Nurses can improve patients' balance and prevent falls and related injuries through effective health education methods and consider adding exercise to the dialysis process.

6 | CONCLUSIONS

In conclusion, based on a literature search and Donabedian's theory, this study successfully constructed 13 sensitive quality indicators for haemodialysis nursing through two rounds of the Delphi method. These indicators are scientific, reliable and practical in their application, and they can be used as an evaluation tool for patient outcomes and as a quantitative assessment tool for the provision of haemodialysis nursing services.

6.1 | Relevance to clinical practice

The nursing quality indicator is a quantitative measurement of nursing quality, a tool used to evaluate nursing quality and nursing activities, and an important means of nursing quality management. In this study, the sensitive quality indicators of haemodialysis developed by the Delphi method included structural indicators, outcome indicators and process indicators, which made up for some deficiencies of previous studies and provided a more reliable and comprehensive basis for evaluating the quality and safety of haemodialysis nursing in the future.

6.2 | Limitations

First, due to time and space reasons, this study selected experts from only five provinces and cities in China for consultation. At a later stage, stratified sampling can be carried out among experts nationwide to improve the representativeness of the experts. Second, this is a preliminary investigation using NSQIs to evaluate the nursing quality of haemodialysis. The full application of sensitive indicators in nursing work and the establishment of a cross-regional and hierarchical database of sensitive quality indicators in haemodialysis nursing will be the focus of future research.

AUTHOR CONTRIBUTIONS

All authors have agreed on the final version and meet at least one of the following criteria (recommended by the ICMJE [http://www.icmje.org/recommendations/]): Substantial contributions to the conception or design of the work, or the acquisition, analysis or interpretation of data for the work; Drafting the work or revising it critically for important intellectual content; Final approval of the version to be published; Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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