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Reflective Practice in Hemodialysis Specialist Nurses: Latent Profile Analysis and influencing factors

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Article

Keywords: Hemodialysis, Specialist Nurses, Reflective Practice, Latent Profile Analysis, Influencing Factors

Posted Date: November 3rd, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10542667/v1

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Additional Declarations: No competing interests reported.

Abstract

Aims

This study sought to explore latent categories of reflective practice among hemodialysis specialist nurses and analyse its influencing factors.

Methods

From January to May 2026, 334 hemodialysis specialty nurses from secondary and tertiary hospitals in Guizhou Province, were recruited using a convenience sampling method. A general information questionnaire and the Reflective Practice Questionnaire Scale were used to collect their socio-demographic information and reflective practice.

Results

Three latent categories were identified: basic reflective type (19.5%), advanced reflective type (48.2%), and in-depth reflective type (32.3%). Logistic regression analysis showed that educational level, hospital grade, experience of further study outside the hospital, regular organization of reflective discussions on difficult cases in the department, frequency of reflective journaling, average daily number of dialysis procedures, work task load, nurses' perceived professional benefits, and knowledge sharing willingness were significant influencing factors for the latent categories of reflective practice ability (all $P < 0.05$).

Conclusion

The overall reflective practice of specialty nurses is at a medium-high level. These findings highlight the heterogeneity of reflective practice in hemodialysis specialty nurses.

Introduction

The global incidence and prevalence of end-stage kidney disease are increasing significantly[1]. Hemodialysis(HD) remains the predominant method for renal replacement therapy[2]. Vascular access (VA), including arteriovenous fistula (AVF) or arteriovenous graft (AVG), is the preferred method for establishing HD access due to its reduced risk of infection and central venous stenosis when compared to catheters[3]. Several factors influence the longevity of a VA, encompassing surgical decisions and techniques, monitoring and surveillance methods, patient self-care practices, and cannulation techniques[4, 5]. Hemodialysis nurses play a vital role in patient care by directly monitoring and managing VA during treatments[6], which typically occur two to three times per week. Their vigilant assessment is critical for the early identification of complications, thereby directly influencing VA patency and long-term functionality[4].

Reflective practice, critically reflecting on your actions or attitudes to engage in the process of continuous adaptation and learning, has proven to be an effective strategy for improved patient care[7]. Furthermore, Lachman et.al[8] indicated that applying reflective practice for professional growth in medical providers. The ability to reflect in real time to determine what happened (performing a critical review of the incident) and what can be done differently in the future (how this will change future practice) is essential as hemodialysis nurses work through professionalism missteps. Previous research has demonstrated that reflective practice helps to examine the care activities that are taken for granted and prevents nurses from getting caught in the trap of assumption, ritualization, habituation and routine[9]. Lichun Xu et.al[10] has been demonstrated that specialist nurses' reflective practice scores were heterogeneous and moderately high overall. Reflective

practice is regarded as a mandatory skill for nurses, with courses related to reflective practice being offered for nursing trainees in more western countries. The integration of reflective practice in domestic nursing education lacks a standardized framework for both training and assessment. Compounding this issue is a widespread, yet superficial, understanding of the concept among practitioners, often leading to its oversimplified application.

Reflective practices have been applied to educate doctors, nurses, physiotherapists, occupational therapists, and other allied health students in higher education, to assist in bridging the gap between theory and practice. There is limited published literature on the use of reflective practice in hemodialysis nurse[11]. Traditional variable-centered analysis often overlooks the heterogeneity and combined effects of these characteristics. Latent Profile Analysis (LPA) is a person-centered technique designed to uncover unobserved subgroups within a population by analyzing patterns of heterogeneity, particularly when clear a priori classifications are lacking[12]. By analyzing the scores across various items on the questionnaire, LPA identifies latent traits and determines the proportion of individuals within each subgroup. Therefore, this study adopted the LPA method to investigate the categories and characteristics of reflective practices in hemodialysis specialist nurse, and compare the influencing factors of reflective practices in different categories of these nurse, with the aim of devising personalized intervention strategies.

Methodology

Aims

This study aims to investigate the level of reflective practices among hemodialysis specialist nurses, identify the latent profiles of reflective practices, and explore the characteristics of different reflective practices profiles in terms of relative factors.

Design

A cross-sectional study design was adopted.

Participants

The hemodialysis specialty nurses from secondary and tertiary hospitals in Guizhou from January to May 2026, were selected using a convenience sampling method. The inclusion criteria were: a) registered nurses; b) Holding a hemodialysis specialty nurse qualification certificate; c) Currently engaged in hemodialysis-related work, including clinical care, education, and management; d) informed consent and willingness to participate in the study. Specialty nurses who were undergoing further education or serving as interns were excluded.

Ethical statement

This retrospective, anonymous questionnaire study was conducted in accordance with the ethical standards of the Declaration of Helsinki. The study involved no clinical intervention, no collection of biological samples, and no sensitive personal information, and all data were collected anonymously with no additional risks to participants. According to Article 32 of China's Ethical Review Measures for Life Sciences and Medical Research Involving Human Subjects (jointly issued by the National Health Commission, Ministry of Education, Ministry of Science and Technology, and National Administration of Traditional Chinese Medicine in 2023)[13], research using human information data that does not cause harm to human subjects, does not involve sensitive personal information, or commercial interests may be exempted from ethical review. In accordance with these national regulations and our institutional policy, formal ethics approval was not required for this study. All methods were performed in accordance with relevant guidelines and regulations. Informed consent was obtained from all participants through an online consent form presented on the first page of the questionnaire.

Sample size

According to the principle of calculating sample sizes for cross-sectional descriptive studies, a sample 5–10 times the number of independent variables was selected. Sample size was 334 taking into account the 10% dropout rate.

Data Collection

This study used an online questionnaire through the Questionnaire Star platform (Wenjuanxing, http://www.wjx.cn) for datallection. The text containing the questionnaire, informed consent, and instructions was imported into the Questionnaire Star platform to produce an electronic questionnaire and generate links and QR codes. After obtaining consent from the respective hospitals, we administered the questionnaire to potential participants. They were recruited only after reading the informed consent and selecting the “agree” option. The survey was conducted anonymously, with strict adherence to principles of confidentiality and voluntariness to ensure data reliability. The questionnaires were screened for further to ensure a high-quality study by excluding the following: 1) questionnaires with fast response time (< 3 mins) and regular or repeated answers (the pre-survey results showed that the minimum time required to complete the questionnaire was a little over 3 mins, and hence, < 3 mins was proposed as one of the censoring criteria for the questionnaire); 2) questionnaires with duplicate IP addresses; and 3) questionnaires with contradictory sociodemographic characteristics.

Measurements

General Information Questionnaire

The socio-demographic information consisted of two parts: the personal-contextual of the hemodialysis specialty nurses, including age, gender, marital status, educational level; and the work-contextual, including the hospital level, working years in hemodialysis specialty, professional title, hospital grade, participation in relevant scientific research, participation in relevant academic conferences, experience of further study outside the hospital, and whether being a preceptor for hemodialysis specialty nurses.

Reflective Practice Questionnaire (RPQ)

The Reflective Practice Questionnaire (RPQ)[14], was developed by Rogers et al., was used in this study with the Chinese version translated and validated by Wu Xue et al[15]. The assessment includes 33 items, encompassing five dimensions: pressures from reflective practice (three items), average job satisfaction (four items), self-confidence (seven items), reflective practice acumen (five items) and reflective practice skills and desire for improvement (14 items). A 6-point Likert scale was used for scoring, ranging from 1 (strongly disagree) to 6 (strongly agree), with a total score of 33–198, and the higher the score, the better the reflective practice. The Cronbach's coefficient of the total questionnaire was 0.950, and the Cronbach's coefficients of each dimension ranged from 0.750 to 0.949.

Nurses' Perceived Professional Benefits Scale

The Chinese perceived professional benefits questionnaire was adopted to measure nurses’ perceived professional benefits, which was advocated by Hu et al[16]. This questionnaire consists of 33 items across five dimensions: recognition from families and friends, sense of belonging to the work team, positive professional perception, good patient–nurse relationship and personal growth. Each item is rated on a 5-point Likert scale, ranging from 1 (“strongly disagree”) to 5 (“strongly agree”). The total score ranges from 33 to 165, and the score is positively correlated with professional benefits. The Cronbach's coefficient of the scale was 0.958, the split-half reliability was 0.938, and the content validity S-CVI/Ave was 0.97.

Intention to Share Knowledge

The Intention to Share Knowledge (ISK) was developed by BOCK et al.[17], this questionnaire was used to investigate the knowledge sharing willingness of hemodialysis specialty nurses. It includes two dimensions: explicit knowledge sharing willingness and tacit knowledge sharing willingness, with a total of 5 items. The questionnaire was scored on a 5-point Likert scale, with scores ranging from 1 to 5, from “strongly disagree” to “strongly agree”, with a total score of 5–25. Higher scores indicate stronger knowledge sharing willingness. The Cronbach's coefficients of the explicit knowledge sharing willingness dimension and tacit knowledge sharing willingness dimension were 0.924 and 0.933, respectively.

NASA Task Load Index (NASA-TLX)

Using the NASA Task Load Index (NASA-TLX) for hemodialysis specialty nurses, which was compiled by Hart et al[18]. to evaluate the level of work-related mental load. The Chinese version of the scale employed in this study was translated and culturally adapted by Liang Liling et al. [19] It includes 6 items: mental demand, physical demand, time pressure, performance, effort, and frustration. Each item is represented by a 20-point scale, with scores ranging from 0 to 20, indicating the intensity of load from low to high. The total score of the scale ranges from 0 to 120, and higher scores indicate higher individual work load. The Cronbach’s α coefficient of the NASA-TLX scale is 0.849.

Statistical Methods

Mplus 8.3 software was applied for latent profile analysis. The five dimensions of the RPQ were used as manifest variables, and the number of categories in the model was gradually increased until the model fit reached the optimal level. Model fit was evaluated using the following indices: (1) Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and adjusted Bayesian Information Criterion (aBIC); smaller values of these three indicators indicate better model fit. (2) Lo-Mendell-Rubin Test (LMRT) and Bootstrap Likelihood Ratio Test (BLRT) were used to evaluate the fit difference between the k-1 and k category models. When $P < 0.05$, it indicates that the fit of the k category model is better than that of the k-1 category model. (3) Entrop > 0.8, the higher value indicates the most accurate classification. SPSS 26.0 statistical software was used for data analysis. Measurement data conforming to normal distribution were expressed as (± s), and count data were expressed as frequency (%). One-way analysis of variance and χ^2 test were used for inter-group comparisons. Logistic regression analysis was used to screen variables with statistical significance and explore the influencing factors of reflective practice among hemodialysis specialty nurses. The test level $\alpha = 0.05$.

Results

Evaluation of Comprehensive reflective practice in hemodialysis specialty nurses

A total of 350 questionnaires were distributed, and 334 valid questionnaires were recovered, with an effective recovery rate of 95.43%. The total score of reflective practice among the 334 hemodialysis specialty nurses was (142.76 ± 28.46). The scores of each dimension were as follows: reflective practice skills and for improvement (60.57 ± 13.82), self-confidence (30.41 ± 6.94), job satisfaction (17.11 ± 4.33), reflective practice acumen (22.77 ± 4.40), and pressures from reflective practice (11.90 ± 3.05). Other general information is shown in **Table 1**.

LPA of reflective practice

The 5 dimensions of the Chinese version of the RPQ were used as manifest variables, and a total of 5 latent profile models were fitted starting from the initial model. The fit indicators of each model are shown in **Table 2**. With the increase in the number of profiles, the AIC, BIC, and aBIC values showed a decreasing trend, and the LMRT and BLRT test results indicated that the differences between the models were statistically significant (all $P < 0.05$). The Entropy value of Model 2 (0.941) was slightly higher than that of Model 3 (0.925), indicating slightly better classification accuracy. However, Model 2 only divided the reflective practice ability of hemodialysis specialty nurses into 2 categories, which could not reflect the gradient differences in the reflective practice ability of these nurses, inconsistent with the actual situation of the multi-level

distribution of nurses' abilities in clinical practice. When the number of categories was 4, the Entropy was 0.905, indicating that the fit of the latent profile decreased with the increase in the number of categories, and the classification of the 3-category model was more accurate than that of the 4-category model. When the number of models was 5, the AIC, BIC, and aBIC values were smaller and the Entropy value was higher, but the proportion of the smallest category was only 9.8%. Overly detailed category division made it difficult to focus on clinical intervention programs, which was inconsistent with the actual needs of group management of specialty nurses. In contrast, the probability distribution of Model 3 was more balanced with strong clinical interpretability, meeting the criteria of model suitability. Considering the goodness-of-fit indicators of each model comprehensively, Model 3 was selected as the fitting model in this study.

The characteristics of the 3 latent profile categories of reflective practice among hemodialysis specialty nurses are shown in **Fig. 1**. Based on the manifest characteristics of each item, the 3 profiles were named respectively. Category 1 included 65 nurses (19.5%), who had the lowest scores in all 5 dimensions, lacked insight into clinical problems in daily work, and had weak reflective practice ability, named “basic reflective type”. Category 2 included 161 nurses (49.1%), with scores at a medium level in all dimensions, possessing basic professional knowledge and professional initiative, and being able to meet routine clinical needs, named “advanced reflective type”. Category 3 included 108 nurses (31.4%), with the highest scores in all dimensions, and outstanding reflective awareness and practice ability, named “in-depth reflective type”.

Univariate analysis of different latent profiles of Reflective Practice

Univariate analysis results showed that there were statistically significant differences among the 3 categories in terms of hospital grade, experience of further study outside the hospital, frequency of regular reflective discussions on difficult cases in the department, frequency of reflective journaling, average daily number of dialysis patients responsible for, nurses' perceived professional benefits, knowledge sharing willingness, and task load index ($P < 0.05$), as shown in **Table 1**.

Multivariate Logistic Regression Analysis of Latent Profiles of Reflective Practice among Hemodialysis Specialty Nurses

Taking the 3 latent profile categories of reflective practice among hemodialysis specialty nurses as dependent variables, with the basic reflective type as the reference group, and the variables with statistical significance in the univariate analysis, including educational level (college = 1, bachelor's degree = 2, master's degree and above = 3), hospital grade (Grade 2B = 1, Grade 2A = 2, Grade 3B = 3, Grade 3A = 4), experience of further study outside the hospital (yes = 1, no = 2), regular organization of reflective discussions on difficult cases in the department (never = 1, occasionally = 2, sometimes = 3, often = 4, always = 5), frequency of reflective journaling (never = 1, occasionally = 2, sometimes = 3, often = 4, always = 5), and average daily number of dialysis patients responsible for (≤ 5 = 1, > 5 = 2), as independent variables, ordinal multivariate logistic regression analysis was performed. The likelihood ratio test $\chi^2=442.091$, $P < 0.001$, indicating a good model fit. The results of the multivariate logistic regression analysis are shown in **Table 3**.

Discussion

Current Status and Population Heterogeneity of Reflective Practice among Hemodialysis Specialty Nurses

The results of this study showed that the total score of reflective practice among hemodialysis specialty nurses was 142.76 ± 28.46, which was at a medium level, slightly higher than that of newly recruited general nurses [total score (128.97 ± 16.07)]. The reflective and decision-making abilities of specialty nurses depend not only on the accumulation of clinical experience but also on in-depth professional learning. The combined effect of these two factors enables them to more keenly perceive the deficiencies in their own decisions and behaviors when dealing with complex clinical problems. This study identified 3 categories of reflective practice ability among hemodialysis specialty nurses through latent profile analysis, confirming the existence of heterogeneity in the reflective practice ability of hemodialysis specialty nurses. Nurses of the “basic reflective type” had the lowest scores in reflective practice skills and for improvement, self-

confidence, average job satisfaction, reflective practice acumen and pressures from reflective practice. Nursing managers can provide platforms for nurses to develop their reflective practice abilities through continuing education or training, and create an environment that promotes reflective practice to help nurses reflect and improve various aspects of their reflective practice abilities. Nurses of the “advanced reflective type” had medium scores in other dimensions, among which the score of reflective practice ability and improvement willingness was the highest, but the score of pressure from reflective practice was the lowest, indicating that nurses in this category had a strong willingness to improve their reflective practice. With the continuous increase in the training intensity of specialty nurses, compared with clinical nurses, specialty nurses have more opportunities to update their knowledge and skills, which has cultivated their reflective practice abilities. Nurses of the “in-depth reflective type” had the highest overall score in reflective practice ability, suggesting that in the subsequent advanced training, managers should focus on training their ability to transform reflective observations into quantifiable and trackable professional development goals, thereby achieving the leap from being good at thinking to being proficient in improvement.

Analysis of Influencing Factors of Reflective Practice among Hemodialysis Specialty Nurses

Individual Characteristics

Educational Level: The study showed that nurses with a college education were more likely to be classified as the basic reflective type, consistent with the research results of Hu Rong et al. [20]. Specialty nurses with higher educational levels had stronger reflective practice abilities. The possible reason is that such nurses received courses on theories, paradigms, and analytical frameworks during their undergraduate, especially postgraduate studies, making their awareness of reflective practice stronger and their thinking clearer. Hospital Grade: The study showed that hemodialysis specialty nurses working in Grade 2A hospitals were more likely to be classified as the in-depth reflective type. This conclusion is inconsistent with some previous research results on the abilities of nursing staff in medical institutions of different grades, which is the result of the combined effect of multiple working scenarios and management models. From the perspective of medical resources, compared with Grade 3A hospitals, Grade 2A hospitals have relatively limited hardware resources such as medical equipment and specialized technical support, and the scale of the specialized medical and nursing team is smaller. When facing clinical problems such as complex dialysis complications and individual needs of special patients, hemodialysis specialty nurses find it difficult to quickly obtain collaborative support from a multidisciplinary team and need to independently complete disease assessment, program adjustment, and effect review. This working scenario forces nurses to take the initiative to carry out in-depth reflection to make up for the shortage of resources. From the perspective of nursing management models and training systems, although Grade 3A hospitals have a sound training system, they mostly adopt standardized and large-scale training models, and the practical behaviors of specialty nurses are easily restricted by process-based norms, with relatively limited space for independent reflection. In contrast, the nursing management of Grade 2A hospitals is more flexible, and their training focuses on the improvement of "problem-oriented" practical abilities, such as organizing 2–3 specialized difficult case review meetings and one-on-one preceptorship reflective guidance every month. Moreover, the department management emphasizes the independent decision-making responsibility of nurses, which further strengthens the reflective practice abilities of specialty nurses in Grade 2 hospitals, making them more likely to be classified into the in-depth reflective practice group. Experience of Further Study Outside the Hospital: The study showed that nurses with experience of further study outside the hospital were more likely to be classified as the advanced reflective type. On the one hand, further study and training help to comprehensively improve the professional knowledge and skills of hemodialysis specialty nurses, thereby enhancing their ability to solve problems. On the other hand, through the re-exploration of theories and practices, hemodialysis specialty nurses have strengthened their reflective awareness, thereby continuously optimizing clinical nursing effects. Average Daily Number of Dialysis Patients (≤ 5): The study showed that nurses with an average daily number of dialysis patients of ≤ 5 were more likely to be classified as the advanced reflective type and in-depth reflective type. An average daily number of dialysis patients of ≤ 5 means that nurses have more sufficient time to provide in-depth care to patients, creating

working conditions for nurses to think rather than just operate, which is the key to improving the connotative quality of nursing and patient safety[21].

Reflection and discussion on Difficult cases

The results of this study showed that departments that sometimes organize reflective discussions on difficult cases are more likely to have nurses classified as the advanced reflective type. Regular organization of reflective discussions on difficult cases in the department helps to comprehensively improve the reflective practice abilities and comprehensive literacy of hemodialysis specialty nurses. Multidisciplinary and multi-field discussions on difficult cases can exercise the thinking ability and language expression ability of specialty nurses, promoting their growth. Medical institutions can systematically carry out problem-oriented discussions on difficult cases to strengthen the clinical thinking and problem-solving abilities of specialty nurses, thereby improving their professional level.

Frequency of Reflective Journaling

Reflective journaling refers to a thinking teaching method in which nurses transform and reflect on the knowledge and experience they have learned in the form of journaling during clinical practice[22]. Through continuous recording and review, it can guide nurses to reflect on and summarize the advantages and disadvantages of their own attitudes, behaviors, and nursing measures, discover problems in a timely manner, analyze problems, and solve problems, promoting the improvement of their critical thinking and autonomous learning abilities. The results of this study showed that clinical nurses who never or sometimes keep reflective journals are more likely to be classified as the basic reflective type. Low frequency of reflective journaling may be due to insufficient sensitivity to clinical problems or weak recording awareness, which deprives them of the opportunity for in-depth thinking through written review, ultimately leading to difficulty in improving their reflective practice abilities. This suggests that managers should emphasize the importance of keeping reflective journals in clinical work, continuously improve and reflect, thereby improving the quality of clinical nursing[5].

Nurses' Perceived Professional Benefits

Perceived professional benefits refer to the cognitive experience of nurses' sense of pride, satisfaction, etc. brought by their occupation in the process of practicing, reflecting individuals' positive evaluation and attitude towards their occupation[21]. The results of the study showed that specialty nurses with higher perceived professional benefits were more likely to be classified as the in-depth reflective type. High perceived professional benefits are usually manifested as significant professional efficacy and work enthusiasm[23, 24]. Through in-depth reflection, the clinical ability and decision-making level of specialty nurses are improved. While bringing better outcomes to patients and realizing their own value, their perceived professional benefits are also significantly enhanced[25]. This positive feedback enables in-depth reflection to become their internal and continuous motivation for professional development.

Intention to Share Knowledge

Regression analysis results showed that nurses with strong ISK were more likely to be classified as the in-depth reflective type, consistent with the research results of Yang Xia et al.[26]. ISK refers to an individual's willingness to externalize and transfer their knowledge, which is a prerequisite for knowledge sharing behavior[27]. In the process of knowledge sharing and interaction, individuals can reconstruct their understanding of problems and conduct critical reflection on their own practices based on external perspectives, thereby driving effective decision-making and problem-solving[9]. Nurses with strong ISK help promote communication and exchange among the team, form more comprehensive clinical judgment abilities, and improve nursing quality. In practice, the improvement of knowledge sharing behavior can be promoted through active encouragement and support. Therefore, nursing managers can consider building a continuous learning and development system, such as regularly organizing specialized difficult case seminars and practical experience exchange meetings in the department to stimulate interactive learning and experience sharing among nurses, and promote the

efficient transmission and transformation of professional knowledge. At the same time, attention should also be paid to knowledge flow in informal communication environments, such as daily conversations in pantries and canteens. These relaxed and natural interactions also help promote the deepening of team reflective practice and the accumulation of practical experience.

NASA-TLX

Regression analysis results showed that specialty nurses with higher task loads were more likely to be classified as the basic reflective type, which is highly consistent with the research conclusions of scholars such as Montani[28]. This study pointed out that moderate task load can stimulate individual work potential and achieve the optimal work state; however, when the load exceeds the threshold, individuals are prone to stress overload, accompanied by work fatigue and negative emotions, which in turn affect in-depth professional behaviors such as active reflection. Therefore, nursing managers can consider reducing ineffective load by optimizing scheduling, refining division of labor, and improving the support system, and carry out efficient reflective training for nurses in high-load positions to help them improve their reflective abilities within a reasonable load range.

Limitations

This study has several limitations. Firstly, the use of convenience sampling may restrict the applicability of the findings. The relatively small sample size, consisting solely of hemodialysis specialist nurse, could hinder the ability to generalize the results to other populations. Secondly, cross-sectional studies are unable to ascertain the causal relationships between variables. Longitudinal studies would be beneficial to explore the trajectory of reflective practice over time and pinpoint the factors contributing to its occurrence, thus enabling the development of targeted intervention strategies. In addition, all data were obtained based on self-reported questionnaires, which may be subject to bias.

Implications for nursing and health policy

These findings indicate that improving reflective practice ability has a significant impact on improving nursing care quality. Reflective practice is a cognitive skill that involves consciously examining situations with an awareness of one's own beliefs and values. Through this process, nurses learn from experience and apply their insights to improve patient care outcomes. Therefore, nursing managers and decision-makers should develop sustainable strategies to promote and sustain reflective practice for nurses. Targeted support is crucial for nurses whose profiles indicate basic reflective practice. Given the multifaceted nature of this resource, it is recommended that subsequent studies involve large-sample surveys and randomized controlled trials to build a robust evidence base for intervention.

Conclusion

In conclusion, this study identified three potential categories of reflective practice in hemodialysis specialist nurse through PLA. We found three obvious profiles of reflective practice in hemodialysis specialist nurse, consisting of the “basic reflective type”, “advanced reflective type” and “in-depth reflective type”. Regression analysis showed that education level, hospital grade, experience of further study outside the hospital, average daily number of dialysis patients, reflection and discussion on difficult cases, frequency of reflective journaling, nurses' perceived professional benefits, ISK and NASA-TLX were the factors influencing nurses’ reflective practice. Nursing managers should actively understand the individual characteristics of clinical nurses, identify the group with basic reflective type, and provide effective intervention measures in time to improve their reflective practice.

Declarations

Human ethics and consent to participate declarations: not applicable

AUTHOR CONTRIBUTIONS

Study design: XYY, QQD, XLB. Data collection: SMZ, YJX, YZW. Data analysis: QQD, JW. Study supervision: JW.Manuscript writing: XYY, QQD. Critical revisions for important intellectual content:XYY, JW, QQD.

FUNDING

There is no additional financial support.

DATA AVAILABILITY STATEMENT

The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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Tables

Table 1 Results of a univariate analysis of latent profiles of reflective practice in hemodialysis specialty nurses (N = 334).

Variables	Classification	Total (n=334)	C1(n=65)	C2(n=161)	C3(n=108)	x^2/F	P
Education level						12.387[a]	0.015
	Junior college	61(18.3)	15(23.1)	36(22.4)	10(9.3)		
	Undergraduate	257 (76.9)	47(72.3)	121(75.2)	89(82.4)		
	Master's degree or above	16(4.8)	3(4.6)	4(2.5)	9(8.3)		
Hospital grade						15.593[a]	0.016
	Grade 2A	12(3.6)	4(6.2)	3(1.9)	5(4.6)		
	Grade 2B	58(17.4)	8(12.3)	22(13.7)	28(25.9)		
	Grade 3A	81(24.3)	15(23.1)	36(22.4)	30(27.8)		
	Grade 3B	183 (54.8)	38(58.5)	100(62.1)	45(41.7)		
Experience of further study outside the hospital						7.501[a]	0.024
	Yes	149 (44.6)	21(32.3)	83(51.6)	45(41.7)		
	No	185 (55.4)	44(67.7)	78(48.4)	63(58.3)		
Reflection and discussion on Difficult cases						31.717[a]	0.001
	Never	25(7.5)	15(7.7)	8(0.6)	2(0.9)		
	Occasionally	65(19.5)	11(16.9)	40(24.8)	14(13.0)		
	Sometimes	105 (31.7)	17(26.2)	61(38.5)	27(25.0)		
	Often	116 (39.2)	18(43.1)	46(31.1)	52(49.1)		
	Always	23(7.5)	4(6.2)	6(5.0)	13(12.0)		
Frequency of Reflective Journaling						30.712[a]	0.001
	Never	28(8.4)	11(16.9)	13(8.1)	4(3.7)		
	Occasionally	125 (37.4)	20(30.8)	77(47.8)	28(25.9)		
	Sometimes	80(24.0)	19(29.2)	32(19.9)	29(26.9)		
	Often	82(24.6)	13(20.0)	33(20.5)	36(33.3)		
	Always	19(5.7)	2(3.1)	6(3.7)	11(10.2)		

Continued Table 1 Results of a univariate analysis of latent profiles of reflective practice in hemodialysis specialty nurses (N = 334).

Variables	Classification	Total（n=334）	C1(n=65)	C2(n=161)	C3(n=108)	x^2/F	*P*
Average daily dialysis patients in charge						9.520[a]	0.009
	≤5	104（31.1）	12（18.5）	62（38.5）	30（27.8）		
	＞5	230（68.9）	53（81.5）	99（61.5）	78（72.2）		
Nurses' Perceived Professional Benefits		133.69±16.97	124.11±19.11	128.49±11.77	147.19±13.81	75.320[b]	0.001
Knowledge Sharing Willingness Scale		20.67±3.20	18.91±3.69	19.97±2.46	22.79±2.76	47.700[b]	0.001
NASA-TLX		50.96±11.11	56.91±10.00	52.13±10.52	45.62±10.32	26.102[b]	0.001

Note：The only difference was statistically significant projects not listed. C1: basic reflective type; C2: advanced reflective type; C3:in-depth reflective type.

Table 2 Latent class fit indices.（n=334）

Model	AIC	BIC	aBIC	Entropy	*P*		Class probability(%)
					LMRT	BLRT	
1	10515.705	10553.817	10522.096	-	-	-	1.000
2	9838.923	9899.901	9849.148	0.941	＜0.001	＜0.001	0.213/0.787
3	9390.383	9474.228	9404.442	0.925	＜0.001	＜0.001	0.195/0.491/0.314
4	9274.751	9381.463	9292.645	0.905	＜0.001	＜0.001	0.194/0.399/0.106/0.301
5	7505.950	7612.662	7523.844	0.929	＜0.001	＜0.001	0.102/0.098/0.396/0.105/0.300

AIC: Akaike Information Criterion: BIC: Bayesian Information Criterion: ABIC: sample-size Adjusted Bayesian Information Criterion: LMR: Lo-Mendell-Rubin Adjusted Likelihood Ratio Test: BLRP: Bootstrapped Likelihood Ratio Test.

Table 3 Logistic regression of different reflective practice profiles (N = 334).

Variables	Classification	*β*	*SE*	*Wald* c^2	*P*	*OR*	95%*CI*
Basic reflective type							
Constant		-1.433	2.170	0.436	0.509		
Experience of further study outside the hospital(Yes)	No	1.083	0.377	8.264	0.004	2.955	1.412~6.184
Reflection and discussion on Difficult cases(sometimes)	Always	2.411	1.085	4.938	0.026	11.150	1.329~93.526
Frequency of Reflective Journaling(Never)	Always	-3.479	1.401	6.164	0.013	0.031	0.002~0.481
Frequency of Reflective Journaling(sometimes)	Always	-3.021	1.350	5.005	0.025	0.049	0.003~0.688
Average daily dialysis patients in charge（≤5）	（5	1.141	0.430	7.036	0.008	3.129	1.347~7.269
NASA-TLX scores		-0.064	0.019	11.632	0.001	0.938	0.904~0.973
In-depth reflective type							
Constant		-13.671	3.221	18.011	0.001		
Education level（Junior college ）	Master's degree or above	-3.018	1.270	6.646	0.017	0.049	0.004~0.589
Hospital grade(Grade 2A)	Grade 3A	1.446	0.655	4.874	0.027	4.246	1.176~15.326
Average daily dialysis patients in charge（≤5）	（5	1.121	0.540	4.313	0.038	3.067	1.065~8.834
Frequency of Reflective Journaling（Never）	Always	-5.259	1.771	8.821	0.003	0.005	0.001~0.167
Nurses' Perceived Professional Benefits Scale scores		0.093	0.018	25.247	0.001	1.097	1.058~1.137
ISK scores		0.275	0.086	10.122	0.001	1.316	1.111~1.559
NASA-TLX scores		-0.107	0.024	20.291	0.001	0.898	0.857~0.941

Note:Take the basic reflective type as a reference. NASA-TLX: NASA Task Load Index，ISK Intention to Share Knowledge.

Figures

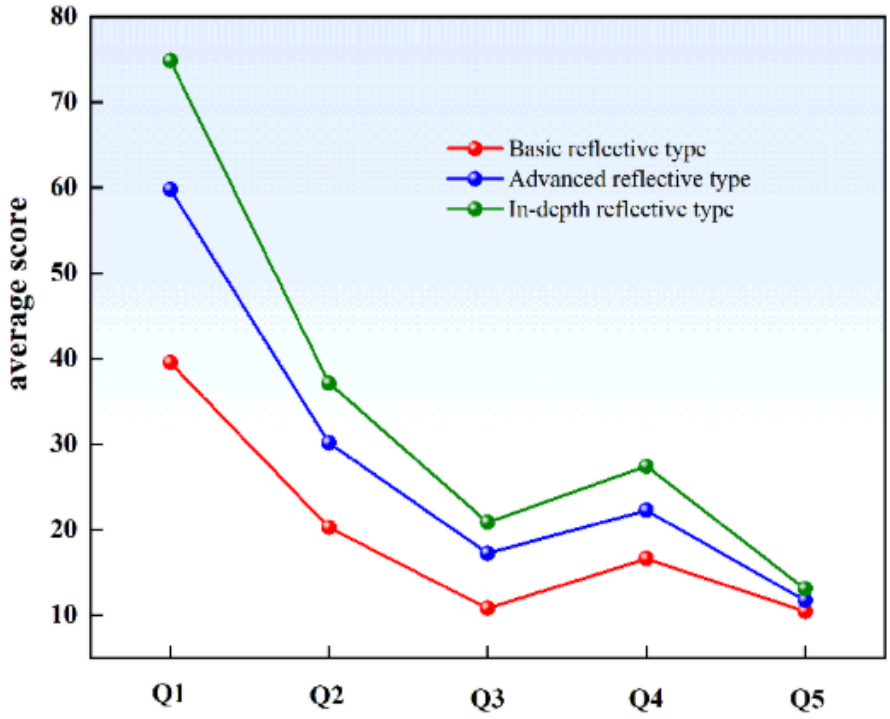


Figure 1

Mean value characteristics for the three-profile solution.