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Intuition in Diabetic Foot Nursing: A Q Methodology Study

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Abstract

Background: Intuitive judgment is critical in diabetic foot nursing, as it aids rapid wound assessment and timely decision-making. The intuitive judgment of nurses improves early detection, facilitates individualized care, and enhances patient outcomes. Despite its importance, research specifically examining intuition in diabetic foot nursing is limited, and empirical studies on how nurses use it in practice are scarce. This gap underscores the need to clarify how intuition functions in diabetic foot care and how it can be integrated into practice. The following study aimed to examine intuitive judgment and decision-making processes in diabetic foot nurses.

Methods: Q methodology was chosen for its structured approach to exploring and classifying subjective viewpoints, making it particularly useful for understanding diverse patterns of intuitive judgment in nursing practice. Q sorting was conducted using a forced normal-distribution grid. Data analysis was performed using PQMethod 2.35, integrating interview transcripts, demographic data, and factor arrays.

Results: Four factors were identified: Patient-Centered Intuitive, Observation-Driven Experiential, Risk-Aware Adaptive, and Precision-Guided Analytical.

Conclusion: Identifying these intuitive types offers valuable insights into the cognitive processes underlying diabetic foot care decisions. The findings may inform simulation-based training and education programs, providing practical guidance for strengthening decision-making skills and making diabetic foot nursing more responsive and effective in real-world settings.

Keywords: Diabetic foot; Intuition; Decision making; Nursing; Q-Sort

Introduction

Diabetic foot is a major health problem. Its incidence is gradually increasing worldwide, with approximately 19% to 34% of patients who are diabetic reported to experience diabetic foot ulcers at least once in their lifetime [1]. As diabetic foot ulcers carry a significant risk of progressing to severe complications, timely and effective treatment greatly affect patients' quality of life and survival rates [2]. Without proper management, ulcers can lead to infection, necrosis, and even limb amputation, underscoring the importance of early detection and nursing interventions [2,3].

In management of diabetic feet, nurses perform various roles, including wound assessment, treatment planning, patient education, and psychological support, making significant contributions to the overall health status of patients and the wound healing process [3]. In complex wound care situations, where individual patient factors significantly vary, the nurse's clinical intuition plays a key role [3,4]. Clinical intuition refers to a nurse's ability to make immediate judgments about a patient's condition by drawing on tacit knowledge and accumulated experience, rather than relying solely on explicit analytical reasoning [3-5]. Such clinical intuition is essential for nurses, enabling them to quickly assess the patient's condition and make appropriate deci-

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sions based on experience and clinical knowledge, which are crucial for providing patient-tailored care in parallel with scientific data [5].

Benner emphasizes that clinical intuition is a vital skill developed through nurses' experience and learning [6]. It enables appropriate judgment and intervention in highly complex clinical situations. Intuition helps nurses detect critical information through subtle changes in patient status or indirect cues, serving as a key mechanism in clinical decision-making [7]. In diabetic foot care, intuition aids in the early recognition of wound deterioration and infection—an increasingly recognized role in recent studies focusing on high-risk and unpredictable clinical settings [3,8].

However, current research lacks systematic and targeted analysis of nurses' clinical intuition in the context of diabetic foot care. While the role of intuition in general nursing practice has been acknowledged, few studies have focused on how intuitive decision-making is specifically manifested and utilized by nurses in diabetic foot management.

Employing Q methodology, this study explored the subjective patterns and typologies of intuitive judgment among diabetic foot nurses. This approach enables systematic analysis of personal and complex phenomena such as intuition from the participant's perspective. By understanding how nurses apply intuitive judgment in this context, the study seeks to support the development of educational programs that enhance clinical decision-making and ultimately improve patient outcomes.

Methods

This descriptive study used Q methodology to explore the intuitive judgment and decision-making processes of diabetic foot nurses. Q methodology is useful for systematically exploring subjective perceptions by constructing statements based on various perceptions on a specific topic [9,10]. The methodology allows objective measurement of subjective aspects such as individual attitudes, beliefs, and values, and focuses on differences within individuals rather than differences between individuals [9]. Consequently, this study employed Q methodology to identify the types of intuitive judgment in diabetic foot nurses and to systematically examine the characteristics of each type (Fig. 1).

Q population composition and Q sample determination

In Q methodology, the Q population refers to the concourse of statements representing all possible opinions or perspectives about the topic under study [9]. In this study, the Q population consisted of statements related to the intuitive judgment of diabetic foot care nurses, developed through literature review and in-depth interviews [10]. The process involved two main steps: deriving interview questions through literature analysis and collecting statements through in-depth interviews.

First, interview questions were developed based on key themes derived from a review of relevant literature, particularly Chang's study on clinical nurses' intuition [11] and Benner's theoretical work [6]. From this review, five major categories were identified: (1) the form of intuitive knowledge; (2) the clinical role of intuition; (3) components that lead to intuitive insight; (4) the influence of intuition on the decision-making process; and (5) the reasoning process following intuition. These categories served as a framework for constructing semi-structured, in-depth interview questions to explore how dia-

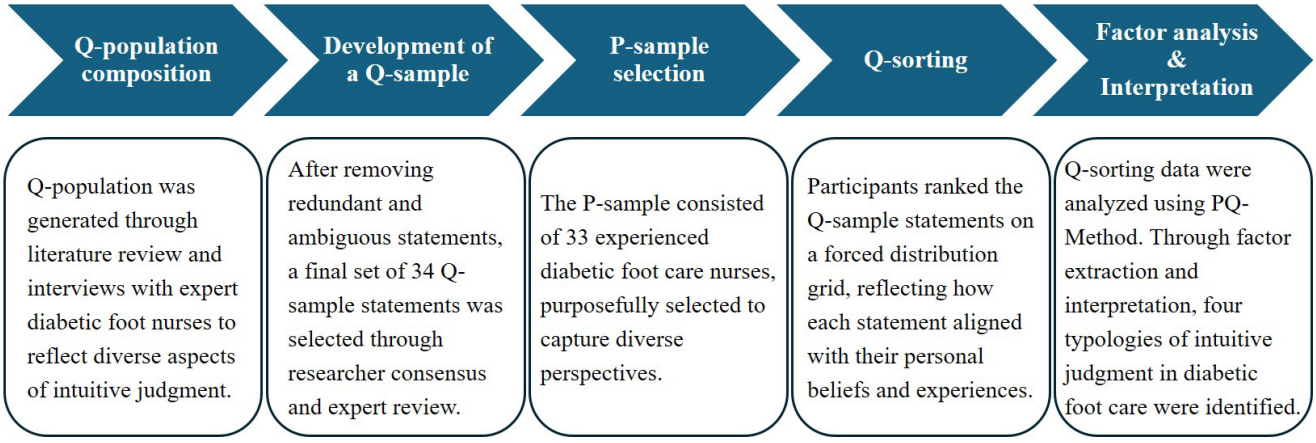

Fig. 1. Research process of this study.

betic foot nurses perceive and apply intuitive judgment in clinical contexts. For example, to explore the clinical role of intuition, participants were asked: "Can you describe a situation where intuition played an important role while caring for a patient with a diabetic foot?" To examine the reasoning process following intuition, they were asked: "What process do you go through before acting on an intuitive feeling?" These questions were designed to elicit detailed insights into intuitive decision-making, the role of intuition, and influencing factors.

Subsequently, based on the designed interview questions, in-depth interviews were conducted with wound care nurses who had at least 3 years of clinical experience and completed the Korean Wound Academy fellowship program. The interviews were conducted until the data saturation point, and ten nurses participated. The researcher conducted in-depth discussions on nurses' intuitive judgment process, the factors influencing intuitive judgment, and the role of intuition in clinical decision-making. A total of 137 statements were initially collected through in-depth interviews. Two researchers independently reviewed and coded these statements to identify redundancy, ambiguity, and lack of relevance to intuitive judgment in diabetic foot care. Statements that reflected the same underlying construction, for instance, those describing intuition as tacit awareness without objective evidence were consolidated into a single representative item. Additionally, vague statements or those unrelated to clinical intuition were excluded.

Through iterative discussions, the researchers reached consensus on a refined Q population of 75 statements that were thematically distinct and representative of the broader domain of intuitive judgment. The Q sample is a subset of the Q population, consisting of carefully selected statements that are representative of the broader concourse [9,10]. Following Q methodology guidelines recommending 30 to 50 statements for optimal cognitive sorting, 34 items were selected as the final Q sample (Table 1). The selection criteria emphasized clarity, conceptual originality, and absence of semantic overlap. To ensure content validity, thematic clarity, and enhance the reliability of the Q sample, this process was finalized through consensus among researchers, and reviewed by a panel with expertise in relevant clinical domains such as wound care and diabetic foot nursing. Expert feedback was incorporated to confirm the appropriateness and comprehensiveness of each statement, with the Content Validity Index for all items verified as exceeding 0.80, reinforcing methodological rigor. Each selected statement was intended to capture a unique aspect of intuitive judgment in diabetic foot nursing.

P sample selection

Sample P refers to the research participants who participated in Q sorting [10]. In this study, P samples were selected using purposive sampling, which is commonly employed in Q methodology to ensure accessibility to participants with relevant expertise and also to capture a diverse range of subjective perspectives. Given the specific focus of the study on nurses with diabetic foot wound care experience, this approach enabled the efficient recruitment of qualified participants within this specialized field. The selection criteria were as follows: (1) nurses with at least 1 year of experience as wound care nurses; (2) active members of the Diabetic Foot Society; and (3) nurses who voluntarily expressed their intention to participate in the research. Finally, 33 nurses were selected as the P sample and participated in Q sorting. Although purposive sampling may limit the generalizability of the findings, it is considered appropriate for Q studies that aim to explore subjectivity and typologies rather than statistical representativeness.

Q sorting

Q sorting is a process by which P samples classify Q samples (34 statements) in a forced quasi-normal distribution method [10]. The researcher provided P samples with each statement printed on cards 8×3 cm in size. The P samples read each statement and classified them on a 9-point scale from "strongly agree (+4)" to "strongly disagree (–4)" (Fig. 2). During the classification process, participants first divided the statements into three groups–agree, neutral, and disagree–and then placed the statements in each group to fit the forced distribution form. The goal of this exercise was to highlight which statements stood out as most important or meaningful to participants, based on their strongest intuitive agreement or disagreement. After the classification was completed, the researcher collected additional demographic information and interview data to support interpretation of the Q-sorting results. These data were not used in the factor extraction process itself but served as supplementary material to enhance understanding of each identified factor.

Data analysis

The data collected through Q-sorting were analyzed using the PQMethod 2.35 program [10]. Data analysis was conducted using the following steps: after calculating the correlation between the P samples, a principal component factor analysis was performed [10,12]. The number of factors was determined based on eigenvalue ≥1.0, and through Varimax rotation, 4 Q

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Table 1. Factor arrays for the Q statements

Q statement	Factor arrays			
	I	II	III	IV
1. I can intuitively detect signs of infection by observing subtle color changes in the skin around the wound or by noticing a specific odor from the foot, and use these cues to predict the potential worsening of the condition.	0	2**	–1	4**
2. I can intuitively assess a patient's self-care ability by evaluating their hygiene and other signs, such as the smell of cigarette smoke, and use this information to predict the course of treatment.	0	–1**	1	1
3. I believe that in diabetic foot care, it is essential to assess the patient as a whole—including their lifestyle habits—and that long-term clinical experience plays a crucial role in intuitive judgment.	2	1	1	2
4. I find that my intuitive sense plays a greater role than clinical knowledge when evaluating the condition of diabetic foot patients.	–3	–2	–3	–3
5. Even though I've educated patients multiple times, some still apply dressings in their own way, while others, even if clumsily, follow the basic principles as taught. Just by looking at the state of the dressing rather than the wound itself, I can assess the potential for improvement.	0	–3**	0	0
6. I intuitively judge that the longer the duration of diabetes or the presence of chronic complications such as undergoing dialysis, the more difficult it is for wounds to heal.	1	1	0	0
7. I believe that when a patient undergoes a kidney transplant due to chronic diabetic complications and is on immunosuppressants, the outcome of their foot wound may differ from what would be expected based solely on the wound's appearance.	0	–1	2	–2
8. I believe that when a patient experiences severe anxiety about diabetic foot treatment, I can intuitively predict how that anxiety will affect their recovery.	–2*	–1*	–4	–4
9. I believe that the intuition of a diabetic foot wound nurse plays a crucial role in the early detection of changes in diabetic foot wounds by sensing subtle changes around the wound.	1**	4	3	–2**
10. I believe that the intuition of a diabetic foot wound nurse plays a crucial role in detecting changes in a patient's overall condition—including signs such as swelling, fever, and alterations in the feet—and in enabling swift, appropriate action when the situation worsens.	1*	2	2	3
11. I believe that a wound nurse's intuitive judgment plays a vital role in detecting patient anxiety and responding appropriately, thereby strengthening the trust relationship with the patient.	–1	1	–1	0
12. I believe that diabetic foot is greatly influenced by a patient's overall condition and experiences significant daily changes, making it crucial to rely on intuition to predict treatment responses and guide the direction of care.	–2	–3	0	0
13. I believe that while intuition can be valuable, diabetic foot care should rely more on objective data, such as vascular examination results and tests for inflammatory responses related to infection.	2*	1*	–4**	3**
14. I intuitively judge that when a patient is accompanied by a guardian, their support positively influences the wound healing process.	0	–1	0	–2
15. I feel that the longer I treat a patient, the more accurate my intuitive judgment becomes regarding changes in their condition.	–1	–2	–1	–1
16. I feel that the more clinical experience I have, the better my intuition develops, as repeated exposure to diverse situations gradually enables faster and more accurate judgments.	2	3**	1	1
17. I believe that intuition naturally develops through clinical experience, and that actively learning about diseases further strengthens intuitive judgment by integrating real clinical scenarios.	4	3	4	3
18. I think that positive interactions between nurses and patients—such as when a patient seeks out a particular nurse for dressing changes or faithfully follows treatment guidelines—further enhance intuitive judgment.	–2	–4	–2	–1
19. I believe that making intuitive judgments requires closely observing not only the wound but also the patient's overall condition, including factors like whether they are eating well and any changes in their daily routine.	2	0**	3	2
20. I believe that because diabetic foot care is influenced by various factors beyond just the dressing technique, nurses with limited clinical experience may struggle to develop intuitive judgment as easily.	–1	0	–2**	1
21. I believe that aspects of my personality, such as my communication skills and meticulous nature, influence patient care.	1	–3**	0	1
22. I think that in urgent situations like infections, intuitive judgment takes precedence over scientific reasoning, playing a decisive role in quickly recognizing signs of diabetic foot deterioration.	–3**	0	3**	–1

(*Continued to the next page*)

Table 1. Continued

Q statement	Factor arrays			
	I	II	III	IV
23. I believe that intuition is a valuable tool in diabetic foot care for immediately assessing changes in a patient's condition when making crucial decisions, such as amputations or vascular procedures.	–4**	0	–1	–1
24. I believe that even if infection-related test results (e.g., C-reactive protein) appear acceptable, diabetic foot care may involve special situations like silent infections, and when scientific data conflicts with intuition, intuition plays a more critical role in immediate evaluation and response.	–3**	–1	1	0
25. I believe that intuition helps reduce a nurse's stress when rapid decisions need to be made in diabetic foot care.	–4	–2	–3	–3
26. I think that in diabetic foot care, given the many influencing factors such as vascular status, blood sugar control, and infection, relying solely on intuitive judgment can sometimes lead to misguided decisions.	3	2	–2**	1*
27. I believe that if I intuitively judge that a diabetic foot wound is unlikely to heal with dressing alone, opting for early amputation might be the better decision for overall recovery.	–1**	–4	–3	0**
28. I think that by directly observing a diabetic foot, I can intuitively deduce potential issues, and nurses must quickly detect even minor changes in the foot.	1	3**	2	–2**
29. I believe that in diabetic foot care, intuitive judgment should be validated alongside clinical data, such as test results, and serve a complementary role.	4	4	4	4
30. I think that intuition in diabetic foot care, developed through diverse clinical experiences, aids in rapid reasoning and immediate decision-making by integrating the complex condition of the diabetic foot.	0	1	2	2
31. I believe that intuitive reasoning takes effect immediately when encountering diabetic foot patients, and its importance grows when infection is a concern.	–1*	2*	–1*	2*
32. I think that diabetic foot treatment is prolonged and repetitive, and when there is a lack of confidence and anxiety about how the wound will progress during treatment, it may worsen.	–2	0*	–2	–3
33. I intuitively assess a patient's literacy and ability to accept education, allowing me to set appropriate nursing goals and provide tailored education and dressing.	3**	0	1	–1
34. I believe that a nurse's stress or fatigue can influence intuitive judgment, so caution is essential in those situations.	3**	–2**	0**	–4**

*P<0.01, **P<0.05.

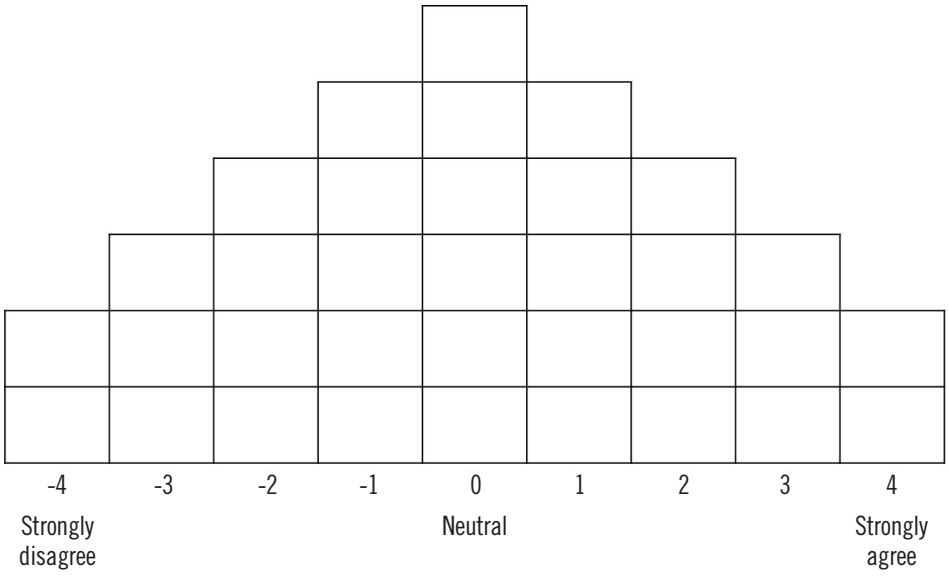

Fig. 2. The Q-sorting distribution chart.

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factors were finally derived. Each derived factor was interpreted through a comprehensive analysis of the statements with which participants strongly agreed or strongly disagreed, characteristics of the P samples, and interview data [3]. Following factor extraction, two researchers independently proposed preliminary labels based on distinguishing statements and interview data. Final factor names were established through consensus reached in group discussions and were subsequently reviewed by five wound care specialists, all of whom endorsed the suitability of the labels.

Ethical considerations

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki and approved by the Yonsei University Health System, Severance Hospital Institutional Review Board (No. 4-2024-0758). The research participants were fully informed about the purpose and process of the research. It was specified that participation in the study was voluntary, and anonymity was guaranteed. Participants were informed that the research data would not be used for purposes other than research and that personal information would be kept strictly confidential. The participants completed a written consent form before participating in the study and were provided with an incentive for their contribution. All data was securely stored and will be retained for 3 years, after which it will be permanently destroyed in accordance with institutional guidelines.

Results

This study applied the Q methodology to analyze data to explore the intuitive judgment and decision-making processes of diabetic foot nurses. As a result of factor analysis, four Q factors were derived, and each factor was classified as an independent type, reflecting the characteristics of the intuitive judgment and decision-making process of diabetic foot nurses. Four Q-factors were extracted with eigenvalues of 11.32 for Q-factor I, 3.06 for Q-factor II, 2.21 for Q-factor III, and 2.05 for Q-factor IV, all exceeding the threshold of 1.0, indicating meaningful factors [10]. Factor loadings revealed that each participant was clearly associated with a single factor, without any cross-loadings, confirming that the four factors represent distinct and independent types. Q-factor I (n=14) included the most significant number of nurses, reflecting the dominant mode of intuitive judgment in diabetic foot care. At the same time, Q-factors II (n=8), III (n=6), and IV (n=5) comprised smaller groups that represented alternative patterns, such as experience-based, risk-aware adaptive, and analytic–integrative intuition (Table 2). The explanatory power of each Q-factor was 21% for Q-factor I, 13% for Q-factor II, 11% for Q-factor III, and 11% for Q-factor IV. The cumulative explanatory power was 56%, which is considered acceptable in Q methodology [10], as typical cumulative variances range between 40% and 60%. The distinguishing statements that best differentiate

Table 2. Characteristics for the P sample

Characteristics		Factor I (n=14)	Factor II (n=8)	Factor III (n=6)	Factor IV (n=5)
Age (yr)		40.07±9.54	34.50±9.77	36.00±7.13	42.60±8.32
Sex	Male	2 (14.3)	3 (37.5)	1 (16.7)	1 (20.0)
	Female	12 (85.7)	5 (62.5)	5 (83.3)	4 (80.0)
Education level (yr)	BSN	8 (57.1)	7 (87.5)	4 (66.7)	3 (60.0)
	MSN	5 (35.7)	0	1 (16.7)	2 (40.0)
	Doctorate	1 (7.1)	1 (12.5)	1 (16.7)	0
Practice setting	Tertiary/university	7 (50.0)	4 (50.0)	1 (16.7)	5 (100.0)
	General/secondary	6 (42.9)	3 (37.5)	2 (33.3)	0
	Long-term care	1 (7.1)	1 (12.5)	3 (50.0)	0
RN experience (yr)		16.90±10.06	8.21±7.49	10.58±5.16	17.18±5.44
WCN experience (yr)		8.52±8.12	1.58 (1.00–2.23)	6.31±5.64	10.50±2.14
Wound care certification	Yes	8 (57.1)	1 (12.5)	5 (83.3)	4 (80.0)
	No	6 (42.9)	7 (87.5)	1 (16.7)	1 (20.0)

Values are presented as mean±SD, number (%), or median (IQR).
BSN, bachelor of science in nursing; MSN, master of science in nursing; RN, registered nurse; WCN, wound care nurse; SD, standard deviation; IQR, interquartile range.

Table 3. Distinguishing Q statements for Factor I (P<0.01)

No.	Q statement	Q-SV	Z-score
Factor I			
33	I intuitively assess a patient's literacy and ability to accept education, allowing me to set appropriate nursing goals and provide tailored education and dressing.	3	1.18
34	I believe that a nurse's stress or fatigue can influence intuitive judgment, so caution is essential in those situations.	3	1.10
9	I believe that the intuition of a diabetic foot wound nurse plays a crucial role in the early detection of changes in diabetic foot wounds by sensing subtle changes around the wound.	1	0.40
27	I believe that if I intuitively judge that a diabetic foot wound is unlikely to heal with dressing alone, opting for early amputation might be the better decision for overall recovery.	–1	–0.53
24	I believe that even if infection-related test results (e.g., C-reactive protein) appear acceptable, diabetic foot care may involve special situations like silent infections, and when scientific data conflicts with intuition, intuition plays a more critical role in immediate evaluation and response.	–3	–1.32
22	I think that in urgent situations like infections, intuitive judgment takes precedence over scientific reasoning, playing a decisive role in quickly recognizing signs of diabetic foot deterioration.	–3	–1.72
23	I believe that intuition is a valuable tool in diabetic foot care for immediately assessing changes in a patient's condition when making crucial decisions, such as amputations or vascular procedures.	–4	–2.04
Factor II			
16	I feel that the more clinical experience I have, the better my intuition develops, as repeated exposure to diverse situations gradually enables faster and more accurate judgments.	3	1.55
28	I think that by directly observing a diabetic foot, I can intuitively deduce potential issues, and nurses must quickly detect even minor changes in the foot.	3	1.44
1	I can intuitively detect signs of infection by observing subtle color changes in the skin around the wound or by noticing a specific odor from the foot, and use these cues to predict the potential worsening of the condition.	2	0.96
19	I believe that making intuitive judgments requires closely observing not only the wound but also the patient's overall condition, including factors like whether they are eating well and any changes in their daily routine.	0	–0.10
2	I can intuitively assess a patient's self-care ability by evaluating their hygiene and other signs, such as the smell of cigarette smoke, and use this information to predict the course of treatment.	–1	–0.53
34	I believe that a nurse's stress or fatigue can influence intuitive judgment, so caution is essential in those situations.	–2	–0.57
21	I believe that aspects of my personality, such as my communication skills and meticulous nature, influence patient care.	–3	–1.32
5	Even though I've educated patients multiple times, some still apply dressings in their own way, while others, even if clumsily, follow the basic principles as taught. Just by looking at the state of the dressing rather than the wound itself, I can assess the potential for improvement.	–3	–1.38
Factor III			
22	I think that in urgent situations like infections, intuitive judgment takes precedence over scientific reasoning, playing a decisive role in quickly recognizing signs of diabetic foot deterioration.	3	1.15
34	I believe that a nurse's stress or fatigue can influence intuitive judgment, so caution is essential in those situations.	0	0.24
26	I think that in diabetic foot care, given the many influencing factors such as vascular status, blood sugar control, and infection, relying solely on intuitive judgment can sometimes lead to misguided decisions.	–2	–0.84
20	I believe that because diabetic foot care is influenced by various factors beyond just the dressing technique, nurses with limited clinical experience may struggle to develop intuitive judgment as easily.	–2	–0.98
13	I believe that while intuition can be valuable, diabetic foot care should rely more on objective data, such as vascular examination results and tests for inflammatory responses related to infection.	–4	–1.70
Factor IV			
1	I can intuitively detect signs of infection by observing subtle color changes in the skin around the wound or by noticing a specific odor from the foot, and use these cues to predict the potential worsening of the condition.	4	1.81
13	I believe that while intuition can be valuable, diabetic foot care should rely more on objective data, such as vascular examination results and tests for inflammatory responses related to infection.	3	1.48
27	I believe that if I intuitively judge that a diabetic foot wound is unlikely to heal with dressing alone, opting for early amputation might be the better decision for overall recovery.	0	0.22
9	I believe that the intuition of a diabetic foot wound nurse plays a crucial role in the early detection of changes in diabetic foot wounds by sensing subtle changes around the wound.	–2	–0.67
28	I think that by directly observing a diabetic foot, I can intuitively deduce potential issues, and nurses must quickly detect even minor changes in the foot.	–2	–0.70
34	I believe that a nurse's stress or fatigue can influence intuitive judgment, so caution is essential in those situations.	–4	–1.92

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each factor are summarized in Table 3. These statements provide insight into the unique perspectives underlying each type and were used to guide the interpretation of factors in the following sections.

Q-factor I: Patient-Centered Intuitive type

Q-factor I included 14 participants who emphasized tailored nursing based on the individual characteristics and needs of patients. This type focuses on setting nursing goals and providing appropriate nursing interventions based on the patient's literacy, ability to accept education, and individual feedback on the patient's condition. Strongly agreed-upon Q statements are Q33 (+3) and Q34 (+3), and strongly disagreed-upon Q statements are Q22 (–3), Q23 (–4), and Q24 (–3) (Table 1).

This type views patients as individual beings and recognizes that not all patients require the same nursing approach. Although the wound condition itself may be common, a tailored approach is considered essential, as the physical, psychological, and social factors involved differ from patient to patient. This type prioritizes the patient's needs and comfort and tries to provide nursing that puts the patient at ease. They particularly focused more on the discomfort felt by the patient and individual situations over standardized guidelines or recommendations. Participants in this group generally had considerable clinical experience and a higher proportion had completed advanced academic programs, which may have contributed to their ability to integrate patient-centered perspectives with structured reasoning.

Participant P18, who showed the highest Q-factor weight, stated the following: "Patient improvement is not solely dependent on the wound itself; it is influenced by factors such as overall physical condition, economic status, and lifestyle habits. In cases where patients strictly follow dressing instructions and receive ongoing treatment education, their cognitive ability and adherence significantly enhance the chances of wound improvement."

Q-factor II: Observation-Driven Experiential type

Q-factor II included eight participants who believed that intuitive judgment develops through repeated clinical experience and observation. They emphasized the ability to quickly detect small changes in wound conditions and to infer problems. Strongly agreed-upon Q statements are Q16 (+3) and Q28 (+3), and strongly disagreed-upon Q statements are Q5 (–3) and Q21 (–3) (Table 1).

This type emphasizes that intuitive judgments are formed through experience and observation. They closely observed the condition of the patient's foot and emphasized their ability to quickly detect subtle changes in the wound. This reflects the belief that intuitive judgment gradually develops through repeated experience and observation and emphasis on the ability to find important clues from small changes around the wound. This group tended to include younger nurses with relatively shorter clinical experience, reflecting a stage of intuition-building primarily through direct patient observation rather than extensive prior exposure.

Participant P2, who showed the highest Q-factor weight, stated the following: "I believe that you can't really develop intuition just from books since sometimes wounds don't improve even with proper treatment. By getting hands-on clinical experience, finding the right treatment for each patient, and observing the results, nurse's intuition grows, and work efficiency improves."

Q-factor III: Risk-Aware Adaptive type

Q-factor III included six participants who emphasized rapid and adaptive responses through intuitive judgment in emergencies. They can intuitively detect the deterioration of a patient's condition in urgent situations and respond immediately. The strongly agreed-upon Q statements were Q22 (+3), and the strongly disagreed-upon Q statements were Q13 (–4) (Table 1).

This type emphasizes that intuitive judgment plays an important role in rapid response in emergency situations. In situations where there is insufficient time to refer to scientific data, intuition acts as a key tool for preventing patient deterioration. This underscores the critical role of intuition in emergency decision-making. Many participants in this group worked in semi-tertiary hospitals, long-term care hospitals, or care facilities, where variability in resources and frequent acute deterioration events required flexible and rapid decision-making skills.

Participant P19, who showed the highest Q-factor weight, stated the following: "Sometimes lab tests or imaging results are obscured by conditions like a weak immune system or poor blood flow. In clinical practice, I've often seen seasoned nurses predict wound deterioration before official results are in, thanks to their deep experience and keen assessment skills."

Q-factor IV: Precision-Guided Analytical type

Q-factor IV included five participants who made intuitive judgments by combining precise observations and scientific data. They evaluated the wound condition based on objective

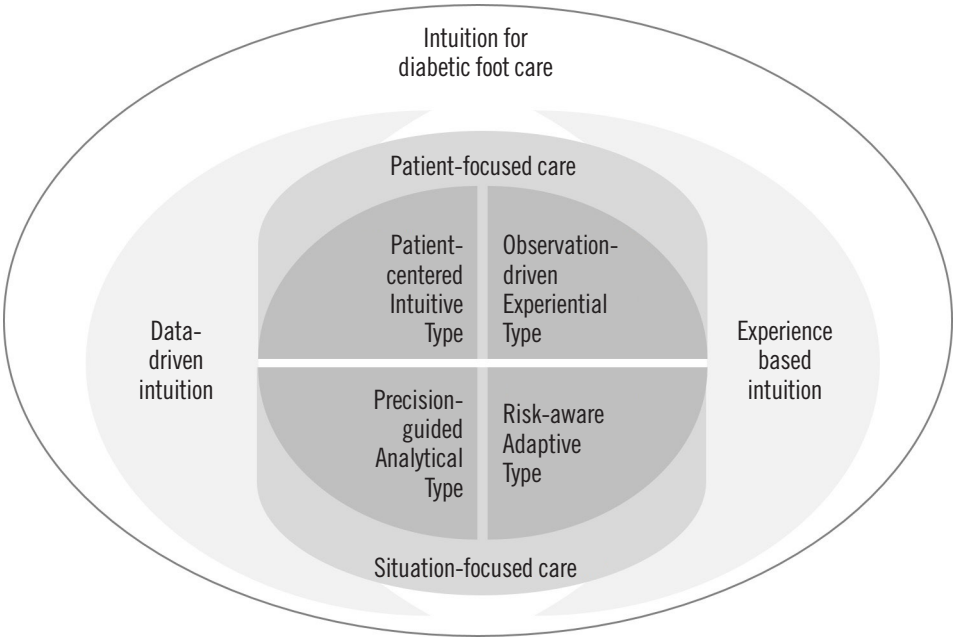

Fig. 3. Framework of intuitive judgment in diabetic foot nursing by wound care nurses.

data and performed nursing interventions that combined this with their intuition. The strongly agreed-upon Q statements were Q1 (+4) and Q13 (+3), and the strongly disagreed-upon Q statement was Q34 (–4) (Table 1).

This type focuses on balancing objective data and intuition. They refine nursing interventions through subtle changes around the wound and data-based evaluation and believe that objective data contributes to improving the accuracy of intuitive judgment. This group consisted of highly experienced nurses, many of whom were employed in large tertiary hospitals, enabling them to integrate high-level analytical skills with precision-guided intuition in complex clinical settings.

Participant P8, who showed the highest Q-factor weight, said, "I believe that intuition is enhanced when solid knowledge is paired with clinical experience. When theory and practice come together, it leads to more precise judgments, and relying solely on experience can be risky."

Discussion

This study classified the intuitive judgment and decision-making processes of diabetic foot nurses into four types using the Q methodology, and confirmed that nurses' intuition operates on two axes: patient-focused care versus situation-focused care, and experience-driven intuition versus data-driven intuition (Fig. 3). These results have important implications for a comprehensive understanding of the specific and complex needs in diabetic foot care.

Patient-focused care respects the individual needs and conditions of patients and focuses on improving their quality of life through individualized care [13]. Factors I and II, which are based on patient-centeredness, closely monitor patients' current conditions and needs, and deliver tailored care that reflects this approach [14]. This is consistent with previous studies reporting that patient-centered care is an important factor in building trust between patients and medical staff and improving the patient's quality of life [15]. On the other hand, situation-focused care emphasizes quick and precise judgment in situations that require urgent or complex decision-making [16]. Q-factors III and IV focus on quickly detecting signs of deterioration in acute situations and establishing optimal treatment plans using scientific data and precise analyses. This situation-focused approach is essential for effectively responding to emergencies such as infection, necrosis, or vascular complications in diabetic foot care [17].

Nurses' intuition also plays an important role in the second axis of experience- and data-driven intuition [5,7,11]. Experience-driven intuition develops through repeated clinical experience and careful observation, enhancing the ability to detect changes in patient conditions and small clues and to respond quickly in emergencies [5,7]. For example, Q-factors II and III intuitively grasp subtle changes in patients and the possibility

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of deterioration based on past experiences, enabling appropriate responses. This intuition contributes to the prevention of wound deterioration and reinforces patient-centered approaches [18]. Data-driven intuition focuses on the planning and implementation of systematic and precise care using scientific and objective data [8,17,19]. Q-factors I and IV combine data analysis and intuitive judgment to comprehensively evaluate wound and systemic conditions and establish long-term management strategies. For instance, using objective data such as blood test results, infection indicators like C-reactive protein, white blood cell count, and Doppler vascular examinations allows for a systematic analysis of the patient's condition and preparation of optimal nursing plans. This study suggests that the four types of intuition identified are not fixed traits but may appear fluid and context-dependent. A nurse may demonstrate elements of both factor I and IV depending on the specific clinical situation. This fluidity implies that intuitive decision-making is shaped dynamically by situational demands, personal experience, and contextual cues.

The development and expression of intuitive judgment may also be shaped by organizational or institutional culture, such as hierarchical norms, inter-professional dynamics, and time constraints [20]. Recognizing these influences is essential in creating environments supportive of clinical reasoning and intuition. Moreover, these findings imply that intuitive judgment can be cultivated through educational interventions. Structured programs that integrate case-based learning, simulation-based scenarios, and reflective practice may foster the ability to integrate data-driven insights with experiential knowledge. Encouraging critical reflection and peer discussion in these settings can also enhance awareness and refinement of intuitive processes. The dual axis model proposed in this study may serve as a conceptual framework for future education and research. Aligning this model with established decision-making theories, such as Benner's novice to expert model or clinical reasoning taxonomies, could further formalize its application [6]. Consistent with Benner's novice-to-expert model, the progression from novice to expert involves a shift from reliance on explicit rules toward the seamless integration of tacit knowledge and situational awareness in clinical reasoning [6].

Interestingly, although all participants had substantial nursing experience, factors I and IV, both characterized by data-driven intuition, comprised nurses with relatively longer overall and wound care experience compared to factors II and III. This pattern suggests that greater clinical experience does not necessarily reinforce reliance on experience-based intuition alone. Rather, at advanced stages of expertise, as described in Benner's model, nurses may increasingly integrate empirical data with their accumulated experiential knowledge to enhance decision-making precision [5,6]. Organizational contexts that facilitate access to diagnostic tools and stress evidence-based practice may further promote this shift toward data-driven approaches among highly experienced nurses [7].

The types of intuition identified in this study can be understood as manifestations of such expertise, where tacit knowledge accumulated through repeated exposure to complex cases enables rapid yet accurate judgment. From a clinical reasoning perspective, these intuitive processes represent the synthesis of pattern recognition, hypothesis generation, and decision refinement in real time [5,7]. By framing intuition within these established theoretical perspectives, this study moves beyond a purely descriptive account and positions intuitive judgment as a core element of expert nursing practice in diabetic foot care.

Given that this study was conducted in South Korea, it is also important to consider the influence of cultural factors such as hierarchical relationships, group orientation, and communication styles [20]. These cultural norms may shape the way intuition is expressed and valued in nursing practice, potentially differing from various cultural settings [7,20]. Future cross-cultural comparative studies could help deepen this understanding.

Diabetic foot care is not simply limited to wound management but requires a comprehensive understanding of the patient's overall condition and wound status and simultaneously achieves two goals, namely acute response and chronic management [2]. This study emphasizes that nurses' intuitive judgment is an important tool in this integrated approach. Patient-focused care respects the current needs and conditions of patients and contributes to improving their quality of life through individualized care [13,14]. Meanwhile, situation-focused care quickly responds to emergencies and maximizes the precision and efficiency of treatment through a data-driven approach [8,19]. In particular, experience-driven and data-driven intuition complement each other, enabling nurses to gain a comprehensive understanding of a patient's condition and achieve optimal treatment outcomes, even in complex situations [7,18].

While this study's findings may have limited generalizability due to the purposive sampling of nurses from a specific region, we sought to mitigate this by selecting participants with relevant expertise based on clearly defined criteria. However, given the cultural homogeneity of Korean nurses in the sample, it

is possible that the typologies identified reflect region-specific patterns of clinical judgment, limiting applicability to other healthcare contexts. Additionally, individual participants' interpretations of intuition may have varied depending on their clinical training, professional values, or personal experiences, potentially influencing how they engaged in Q-sorting, and introducing interpretive bias in factor interpretation. Future research should explore how such conceptual differences in understanding intuition may affect the outcomes in similar studies. Furthermore, although the interpretations of each factor were grounded in participants' Q-sort patterns and supplemented by post-sort interviews, no additional follow-up validation such as member checking or peer debriefing was conducted. This may limit the interpretive trustworthiness of the factor types. Incorporating such methods in future research could enhance the credibility of Q methodology findings.

In conclusion, this study identified four types of intuitive judgments in diabetic foot care nurses through Q methodology, confirming that they operate complementarily on the axes of patient-centeredness versus situation-centeredness and experience-based versus data-based approaches. The results provide direction for strengthening intuitive judgment in nursing practice and education, potentially contributing to nurses' expertise and the quality of life of patients with diabetic foot.

Conflict of interest

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