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ORIGINAL RESEARCH

Development of a Training Content Index System for Pressure Injury Prevention Training Programs for Healthcare Assistants in Tertiary Hospitals

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Objective: This study aims to develop an index system for a pressure injury prevention training program specifically designed for healthcare assistants in tertiary hospitals, providing a theoretical basis for training initiatives. The "index system" developed in this study refers to a structured framework outlining the content and components of training programs, rather than a performance evaluation tool.

Methods: Based on a literature review and expert interviews, a customized expert consultation questionnaire titled "Pressure Injury Prevention Training System for healthcare assistants in Tertiary Hospitals" was created. The Delphi method was employed to conduct two rounds of consultations with 23 experts who met the selection criteria, resulting in the establishment of the final training program indicator system.

Results: The average positive coefficient from the two rounds of expert consultations was 100%, with an authority coefficient of 0.823, and a coefficient of variation of 0.2037. The degree of consensus among expert opinions was 0.380 (P = 0.000). The finalized training system comprises seven primary indexes and 40 secondary indexes. Key training elements include repositioning techniques, the use of pressure-relieving devices, and skin cleansing methods, which were rated with high consensus by experts.

Conclusion: The findings of this study demonstrate good representativeness and authority, serving as a valuable reference for developing pressure injury prevention training programs for healthcare assistants in tertiary hospitals. This index system serves as a structured framework outlining key knowledge, skills, and training delivery components, rather than a performance evaluation tool.

Keywords: Delphi method, healthcare assistants, pressure injuries, training

Introduction

In 2019, the National Health Commission and other departments issued the notice titled "Notice on Strengthening the Training and Standardized Management of healthcare assistants",[1] which clearly defined the concept of healthcare assistants. These individuals do not fall under the category of healthcare technicians; rather, they primarily engage in auxiliary care tasks. This definition distinguishes them from caregivers outside of healthcare institutions and hospitals, and it delineates their role from that of nurses. Healthcare assistants are required to perform patient care activities under the guidance of nurses, functioning as essential support personnel in healthcare settings. Given that pressure injury prevention measures are a common aspect of their daily responsibilities, educating healthcare assistants on the prevention of pressure injuries is of paramount importance.[2] In tertiary hospitals, which are typically highly specialized and serve critically ill patients, healthcare assistants play a crucial role in continuous bedside care. They are often the first to

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observe early signs of pressure injuries, yet their interventions are frequently unstandardized due to variable training quality.

Although national guidelines in China mandate training for healthcare assistants, there is currently no standardized curriculum or structured framework for pressure injury prevention training.[3] Currently, training programs in tertiary hospitals are often fragmented, lack standardized curricula, and fail to address the practical needs of healthcare assistants. In many cases, training materials are either outdated or too generalized to be clinically applicable, failing to address practical competencies required in high-risk inpatient settings. Internationally, organizations such as the National Pressure Injury Advisory Panel (NPIAP)[4] and European Pressure Ulcer Advisory Panel (EPUAP)[5] have published evidence-based guidelines emphasizing the importance of structured, role-specific training programs for pressure injury prevention. These documents underscore the need for skill-based training in repositioning, risk assessment, and use of pressure-relieving devices, which are currently underdeveloped in China's healthcare assistant training systems. Therefore, this study aimed to develop a structured index system that defines essential training components for pressure injury prevention among healthcare assistants in tertiary hospitals. The goal is to provide a standardized framework to guide the design, implementation, and evaluation of relevant training programs. In this study, the term "index system" refers to a structured framework of essential training components—including objectives, content, methods, and evaluation—that supports the development of a standardized curriculum for pressure injury prevention among healthcare assistants.

Materials and Methods

Formation of the Research Team

The research team comprised one master's thesis advisor, two international ostomy care specialists, and two graduate students. Their primary responsibilities included determining the research theme, selecting and contacting consulting experts, developing the expert consultation questionnaire, establishing the screening criteria for primary and secondary indicators, and analyzing and discussing the consultation results. The study was approved by the Ethics Committee of the First Affiliated Hospital of Jinan University. All experts provided written informed consent before participating in the Delphi process.

Selection of Consulting Experts

The selection of experts is critical to the success of the Delphi method.[6] Adhering to the principles of authority and representativeness, clinical care experts and nursing management specialists with a strong understanding of pressure injuries were chosen. Typically, a panel of 4 to 16 experts can yield satisfactory results; however, if the number of items is substantial, 15 to 30 experts may be selected.[7,8] Inclusion criteria included: ① possession of an international wound and ostomy care certification; ② a minimum of five years of experience in wound and ostomy care; ③ a bachelor's degree or higher; ④ a mid-level professional title or above; ⑤ a strategic selection of experts from nursing education and geriatrics, in addition to those specializing in wound care; ⑥ willingness to participate in the study and support the completion of the questionnaire survey. The expert panel consisted of professionals from various geographical regions, including southern, central, and western China, with representation from both tertiary hospitals and academic institutions. This geographical and institutional diversity ensured broader applicability of the resulting index system. The research team included a thesis advisor with 15 years of clinical experience in geriatric and wound nursing, and two postgraduate students trained in qualitative health education and curriculum design. Two internationally certified stoma care nurses (with WOCN credentials) participated as senior advisors and contributed to the validation and refinement of content, ensuring alignment with clinical practice and international standards.

Research Methodology

A modified Delphi method was selected due to geographic dispersion of participants and the need to conduct asynchronous expert consultation remotely. This allowed for iterative feedback while maintaining anonymity and independence of expert opinion.

Development of the Expert Consultation Questionnaire

Experts rated the importance and relevance of each indicator on a 5-point Likert scale, where 1 = Not important at all, and 5 = Extremely important. The questionnaire was developed using keywords such as "healthcare assistant training",[9–12] "pressure ulcers", "pressure injuries",[13,14] "training of healthcare assistants, healthcare assistants, healthcare assistants", "training",[15,16] and "Delphi method".[17–19] A comprehensive review of both domestic and international literature on the current state of training for healthcare assistants, the conceptual standards required for constructing pressure injury training, relevant international nursing training requirements, and China's medical care worker training policies was conducted. Insights from expert interviews were also integrated, culminating in a complete consultation questionnaire that included an introduction, general information about the experts, criteria for assessing familiarity, and the survey content. A preliminary set of indicators was developed through a scoping literature review of pressure injury prevention training programs, nursing education guidelines, and healthcare assistant competency frameworks. In addition, semi-structured interviews were conducted with five wound care and geriatric nursing experts to identify practical training challenges and commonly neglected content. Insights from the literature and interviews were used to construct the first-round Delphi questionnaire, which included seven proposed primary dimensions and 42 draft secondary indicators. The 23 experts included 5 nursing educators, 8 senior clinical nurses, 6 geriatric care coordinators, and 4 wound and ostomy care specialists. This composition ensured representation from education, practice, and specialty areas relevant to training development.

Distribution and Collection of the Expert Consultation Questionnaire

The researchers distributed the consultation questionnaire via email, setting a consultation period of three weeks. Following the first round of expert consultation, the research team analyzed the feedback and established criteria for item deletion: (1) importance rating ≤ 4.00; (2) coefficient of variation > 0.30; (3) expert recommendations for deletion. Items suggested for addition or modification by experts were incorporated into the subsequent round of consultation. Experts were provided with a guide document explaining the Delphi process, rating criteria, and example responses. For open-ended responses, two researchers with qualitative training independently reviewed the feedback and performed thematic categorization. Suggested new items, deletions, or modifications were consolidated through group discussion and incorporated into the next round of the Delphi process.

In addition to applying quantitative thresholds for indicator retention—such as mean importance score ≥ 4.0 and coefficient of variation ≤ 0.30—the research team also considered qualitative feedback provided through open-ended responses. Experts' suggestions for additions, deletions, or modifications were carefully reviewed, discussed, and incorporated into the second-round questionnaire where appropriate. The expert questionnaire served as a tool not only for validation but also for structured content development. Rather than traditional consensus-building alone, experts were actively involved in refining, adding, and prioritizing content areas. Thus, the process functioned as both a modified Delphi and a curriculum development methodology.

Qualitative feedback was analyzed and directly used to add or reword training components. Therefore, the experts' role extended beyond rating to co-constructing the training content, justifying a shift from purely consensus-based Delphi to integrated content development. This study employed a modified Delphi method. This study conducted two rounds of expert consultation. In the first round, experts collected their ratings and open-ended feedback on the preliminary items, and adjusted some items (deleted, modified, and added) based on the rating criteria and suggested content. In the second round, the rating was re-conducted based on the revised items to determine the final indicator system. Feedback analysis and content redesign were carried out between the two rounds, which conformed to the basic procedures of the classic Delphi method.

Statistical Analysis

Data were analyzed and processed using SPSS 29.0.1.0 and Excel 2021 statistical software. The authority and reliability of the Delphi method results were reflected through the expert positivity coefficient, authority coefficient, and the degree of consensus among expert opinions. Qualitative data were expressed as frequencies and percentages (%), while quantitative data conforming to a normal distribution were presented as mean ± standard deviation ($x \pm s$), with a significance level set at $\alpha = 0.05$.

To evaluate the level of consensus among experts for each indicator, the mean score and coefficient of variation (CV) were calculated. A mean score ≥ 4.0 and CV ≤ 0.25 were considered indicators of strong agreement. This approach is commonly used in Delphi studies involving ordinal Likert-scale data, especially when full inter-rater agreement metrics such as Kappa are not applicable.

To assess the degree of agreement among experts during the Delphi rounds, Kendall's coefficient of concordance (W) was calculated. This non-parametric statistic measures consensus among raters who rank a set of items. The value of W ranges from 0 (no agreement) to 1 (complete agreement). A statistically significant W indicates strong inter-expert agreement, supporting the reliability of the Delphi results. A significance level of $\alpha = 0.05$ was applied.

Results

Overview of Expert Consultation

According to the inclusion criteria established through the Delphi method, a total of 23 consulting experts were identified prior to the formal distribution of the expert consultation questionnaire. This group consisted of 22 experts affiliated with tertiary hospitals and 1 expert from a higher education institution. Among the 23 professionals, 20 specialized in clinical nursing and nursing management, all of whom are certified international ostomy care specialists. Additionally, one expert was a geriatric nursing specialist, while two others were engaged in nursing education and management.

In terms of professional qualifications, the panel included 0 individuals with senior titles, 1 with an associate senior title, and 19 at the intermediate level, including one professor. The educational backgrounds of the experts varied, with 20 holding bachelor's degrees, 2 possessing master's degrees, and 1 earning a doctoral degree. The age range of the experts was between 42 and 54 years, with an average age of 47.48 years. Their professional experience ranged from 16 to 31 years, and the 20 international ostomy care specialists had been involved in wound management for 7 to 20 years following their certification, averaging 14.26 years. All experts reported being "very familiar" or "familiar" with the research topic, as summarized in Table 1.

Table 1 Basic Information of Experts

	Number	Composition Ratio (%)
Gender		
Male	23	78.3
Female	6	21.7
Age		
40 years old and below	4	4.3
40–50 years old	13	56.5
50 years old and above	9	39.1
Years of Experience		
Less than 20 years	20	87
20–29 years of experience	2	8.7
30 years and above	1	4.3
Education Level		
Bachelor's degree	20	56.5
Master's degree	2	34.8

(*Continued*)

Table 1 (Continued).

	Number	Composition Ratio (%)
Doctoral degree	1	8.7
Degree		
Has degree	20	87
No degree	3	13
Position		
Dean	1	4.3
Director/Deputy Director of Nursing	1	4.3
Head Nurse/Charge Nurse	19	82.6
Clinical Nurse	2	8.7
Professional Title		
Senior Professional	0	0
Associate Senior Professional	1	4.3
Intermediate Professional	19	82.6
Research Field		
Nursing Management	4	17.4
Clinical Nursing	17	73.9
Nursing Education	1	4.3
Graduate Supervisor		
Yes	0	0
No	20	100
Work Unit		
Hospital	20	87
School	3	13
International Stoma Care Nurse Qualification		
Yes	19	82.6
No	4	17.4
Years in Specialized Nursing (years)		
None	0	0
Less than 10 years	20	87
10–20 years	3	13

Note: There are a total of 20 stoma care nurses.

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Expert Participation Rate (E)

In this study, both rounds of questionnaires were distributed and returned within a three-week timeframe, achieving a 100% effective response rate. This finding suggests that the experts were highly engaged in the research, demonstrating significant interest in the subject matter. In the first round, feedback was provided by 14 experts, while 7 experts contributed in the second round, resulting in suggestion rates of 60.9% and 30.4%, respectively.

Expert Authority Level

The authority level (Cr) is determined by the basis of the experts' evaluations (Ca) and their familiarity with the subject matter (Cs), calculated as Cr = (Ca + Cs) / 2. A Cr value of ≥ 0.8[20] indicates a high level of authority. In this study, the average authority levels from the two rounds of expert consultations were as follows: the average basis of judgment values were 0.945 and 0.963, respectively; the average familiarity values were 0.950 and 0.956, respectively. Consequently, the mean authority coefficients were 0.819 and 0.823. These results indicate a strong scientific foundation for the experts' judgments, reflecting a high level of authority and credibility in the findings. The high authority coefficient (Cr = 0.823) indicates that experts provided their ratings based on both substantial theoretical understanding and practical familiarity with pressure injury prevention. This strong background supports the reliability of the consensus reached and the validity of the final indicator system.

Concentration of Expert Opinions

The concentration of expert opinions was assessed using the mean ± standard deviation ($x \pm s$) of the importance and relevance scores assigned to the consultation content, with each item rated on a scale of 1 to 5. In the two rounds of expert consultations, the importance scores for the primary indicators ranged from 4.35 to 5.0 and from 4.22 to 4.91, respectively, both of which met the item selection criteria. In the first round, the importance scores for 33 secondary indicators ranged from 3.26 to 5.0, while in the second round, the scores for 40 secondary indicators ranged from 3.3 to 4.96. These findings demonstrate a strong consensus among experts regarding the significance of the assessed indicators.

Among all training content indicators, "bedside teaching" was rated the highest, with a mean score of 4.87 and a maximum score ratio of 91.3%, reflecting experts' strong preference for practical, in-situ instruction methods. Experts noted that different formats yield varying outcomes, and this recommendation was accepted. Two new items were added to the requirements for teaching staff: "Nurses with relevant wound care qualifications" and "Strong communication and presentation skills". Two items regarding assessment and certification were revised to include "Setting an expiration date for healthcare assistant assessment certificates" and "Re-certification of healthcare assistant assessment certificates", with an emphasis on "Preventing pressure injuries" for greater specificity.

The Kendall's W coefficient calculated for the two rounds of expert consultation was 0.380 ($P<0.05$), indicating a moderate but statistically significant level of agreement among the 23 participating experts. This suggests that while experts came from diverse professional backgrounds, there was consistent convergence toward a shared evaluation of the importance and relevance of the proposed indicators. These metrics are essential in Delphi studies as they indicate convergence of opinion, ensuring that the selected indicators reflect a collective judgment rather than individual bias. Moreover, the predominance of experts with clinical wound care experience may have contributed to the prioritization of practical skills such as repositioning techniques and pressure-relief equipment usage.

While four secondary indicators presented a CV above the 0.25 threshold in the second round, they were retained due to strong qualitative endorsement from multiple experts. These indicators—typically related to theoretical knowledge such as "understanding pressure injury pathophysiology"—were viewed as essential for long-term competency building, despite divergent ratings. Their inclusion reflects a deliberate balance between short-term training feasibility and broader educational goals.

Results of the Second Round of Expert Consultation

Table 2 summarizes the modifications to selected secondary indicators across the two Delphi rounds, including items that were retained, excluded, or adjusted based on expert feedback. This overview enhances the transparency of how consensus was achieved and how qualitative input shaped the final index system.

Table 2 Modifications to Indicators Across Two Delphi Rounds

Primary Category	Secondary Indicator	Round 1	Round 2	Final Status	Justification
Training Content	Correct use of pressure-relieving devices	Retained	No change	Included	High mean score and low CV
Training Method	Simulation-based teaching	Removed	—	Excluded	Low mean score and expert consensus on exclusion
Training Method	Bedside teaching	Retained	Wording adjusted	Included	Top-rated item with strong endorsement
Training Objective	Understanding pressure injury pathophysiology	Retained	Retained	Included	High CV, but retained based on qualitative expert support for long-term value

In the second round of consultations, two experts indicated that knowledge regarding pressure injury prevention already encompassed techniques for repositioning, the use of pressure-relieving devices, the application of common dressings, and skin cleansing methods for evaluating the effectiveness of pressure-relieving devices. After discussion among the research team, this suggestion was accepted, leading to the removal of that item. Among the results, four secondary indicators exhibited a coefficient of variation greater than 0.25: (1) The historical development of the concept of pressure injuries (Vj=0.34), (2) High-risk areas for pressure injuries (Vj=0.58), (3) Theoretical training venue: wards (Vj=0.39), and (4) Re-certification of healthcare assistant pressure injury prevention certificates (Vj=0.28). The research team concluded that these four items were important and decided to retain them, acknowledging the varying interpretations of course content among experts. Ultimately, a comprehensive training framework for preventing pressure injuries among healthcare assistants in tertiary hospitals was established, encompassing 7 primary indicators (training objectives, target audience, content, training model, teaching staff, assessment and certification, and training base) and 40 secondary indicators, as detailed in Table 3. Table 3 presents the results of the second-round Delphi consultation, including the mean importance score, maximum score ratio (Kj), and coefficient of variation (CV) for each secondary indicator. The

Table 3 Results of the Second Round of Expert Consultation

	Importance Mean (Mj)	Maximum Score Ratio (%) (Kj)	Coefficient of Variation (Vj)
I-1 Training Objectives			
I-1-1 Understanding the Related Factors of Pressure Injuries	4.52	56.52	0.1312
I-1-2 Mastering Position Change Techniques for Preventing Pressure Injuries ★	4.86	86.95	0.0708
I-1-3 Mastering the Use of Pressure Relief Devices ★	4.91	91.3	0.0586
I-1-4 Mastering the Use of Common Dressings for Preventing Pressure Injuries	4.87	43.48	0.0706
I-1-5 Mastering Skin Cleansing Methods★※	4.08	95.65	0.2326
I-1-6 Mastering the Assessment of the Effectiveness of Pressure Relief Devices	4.96	65.22	0.042
I-2 Training Audience			
I-2-1 Understanding the Educational Background of Healthcare Workers	4.13	39.13	0.2103
I-2-2 Understanding the Work Attitude and Experience of Healthcare Workers	4.69	73.91	0.1191
I-2-3 Understanding the Communication Skills of Healthcare Workers	4.21	39.13	0.1747

(*Continued*)

Table 3 (Continued).

	Importance Mean (Mj)	Maximum Score Ratio (%) (Kj)	Coefficient of Variation (Vj)
I-2-4 Understanding the Health Status of Healthcare Workers	4.26	47.82	0.1901
I-3 Training Content			
I-3-1 historical Development of Pressure Injury Concepts Δ	3.3	21.74	0.3469
I-3-2 Mechanisms of Pressure Injury Development	4.09	39.13	0.2073
I-3-3 Staging of Pressure Injuries Δ	3.78	21.74	0.2249
I-3-4 high-Risk Groups for Pressure Injuries ★	4.74	82.61	0.1306
I-3-5 high-Risk Areas for Pressure Injuries ★	4.91	91.3	0.5867
I-3-6 high-Risk Factors for Pressure Injuries	4.74	73.91	0.0947
I-3-7 Characteristics of Pressure Relief Devices (eg, air mattresses, water pads, wedge cushions)	4.65	73.91	0.1391
I-3-8 Key Points and Precautions for Position Change ★	4.91	91.3	0.0586
I-3-9 Cleansing Methods for Perineal and Perianal Skin in Incontinent Patients ★	4.9	91.3	0.06
I-3-10 Methods for Using Pressure Relief Devices (eg, air mattresses, water pads, wedge cushions) ★※	4.78	86.96	0.1254
I-3-11 Methods for Using Common Dressings for Preventing Pressure Injuries (eg, Skin Protectant, Stoma Skin Powder, 3M Liquid Dressing)	4.26	43.48	0.1901
I-3-12 Observing Dressing Fixation and Contamination Status	4.6	65.22	0.1267
I-4 Training Model			
I-4-1 Venue for Theoretical Training: Skills Center	4.13	34.78	0.1832
I-4-2 Venue for Theoretical Training: Demonstration Room Δ	4	26.08	0.1846
I-4-3 Venue for Theoretical Training: Ward	4.65	73.91	0.3975
I-4-4 Method of Theoretical Training: Classroom Teaching	4.26	39.13	0.1616
I-4-5 Method of Theoretical Training: Flipped Classroom	4.09	34.78	0.1938
I-4-6 Method of Theoretical Training: WeChat Group Δ	3.74	13.04	0.201
I-4-7 Form of Skills Training: Workshop	4.48	65.22	0.2114
I-4-8 Form of Skills Training: Bedside Teaching ★	4.87	91.3	0.0939
I-4-9 Need to Specify the Hours of Theoretical Training	4.17	39.13	0.2
I-4-10 Need to Specify the Hours of Skills Training	4.22	43.48	0.2015
I-5 Teaching Faculty			
I-5-1 Degree Requirement: Bachelor's Degree or Higher Δ	3.78	13.04	0.1946
I-5-2 Title Requirement: Intermediate Level or Higher Δ	3.78	17.39	0.2103
I-5-3 Obtaining Wound Care Training Certification or 5+ Years of Relevant Work Experience	4.52	65.22	0.1615

(*Continued*)

Table 3 (Continued).

	Importance Mean (Mj)	Maximum Score Ratio (%) (Kj)	Coefficient of Variation (Vj)
I-5-4 Strong Communication and Expression Skills Required	4.7	78.26	0.135
I-6 Assessment and Certification			
I-6-1 Theoretical Assessment of Healthcare Workers	4	26.09	0.1994
I-6-2 Skills Assessment of Healthcare Workers ★	4.82	86.96	0.1018
I-6-3 Certificate of Completion for Healthcare Workers on Preventing Pressure Injuries	4.09	39.13	0.22
I-6-4 Re-certification of Certificate for Preventing Pressure Injuries	4	43.48	0.282
I-7 Training Base	4.22	39.13	0.1919

Notes: Indicators marked with ★ have a maximum score ratio ≥ 80%; indicators marked with Δ have a maximum score ratio ≤ 30%; Indicators newly added or modified based on qualitative feedback from the first round are marked with ※.

hierarchical structure of the training framework is reflected by grouping secondary indicators under their respective primary categories (I-1 to I-7).

Indicator Adjustment Between Delphi Rounds

After the first round of expert consultation, adjustments were made to the indicator system based on both quantitative criteria and qualitative feedback. A total of five indicators were flagged for revision. Among them, three were removed due to low importance scores (mean ≤ 4.0) and high coefficient of variation (CV > 0.30). These included "Historical development of pressure injury concepts" (mean = 3.30, CV = 0.3469), "Theoretical training venue: demonstration room" (mean = 4.00, CV = 0.1846), and "Title requirement: intermediate level or higher" (mean = 3.78, CV = 0.2103).

In response to open-ended expert suggestions, two new indicators were added. One related to the qualification of instructors, stating that "nurses with relevant wound care qualifications" should be included in the teaching faculty. The other emphasized the need for "strong communication and presentation skills" as a desirable attribute for instructors.

Additionally, four items were rephrased to improve clarity and clinical applicability. For example, the general item "skin cleaning" was revised to "cleansing techniques for perineal and perianal areas in incontinent patients", to better reflect actual care tasks and the needs of the target population.

These adjustments were intended to ensure that the final index system not only met statistical standards for consensus but also reflected expert insights derived from frontline clinical experience, enhancing its practical value and relevance to training program development. The final training framework was iteratively developed based on two rounds of expert consultation. Items with low consensus were removed or reworded, while new indicators were introduced based on open-ended feedback. This structured integration of expert input into content development formed the basis of the proposed index system.

Discussion

Necessity of Establishing Pressure Injury Prevention Training for Healthcare Assistants in Tertiary Hospitals

The terminology for healthcare assistants varies across countries; for example, they are referred to as "nursing assistants" in the United States[21,22] and "care workers" in Japan.[23,24] Despite these differences, the scope of their responsibilities and patient care functions remains largely similar.

Countries such as Germany, Japan, and Australia have established early development of the nursing assistant profession, with well-defined training models and standards that ensure systematic education and quality assurance.[25]

In 2023, the National Health Commission of China issued an action plan to enhance nursing services (2023–2025), advocating for healthcare institutions to employ appropriately qualified healthcare assistants based on scientific and demand-driven criteria within hospital wards.[26] This initiative aims to create a system for nursing assistants akin to those in developed nations, addressing the challenges associated with self-hired caregivers and informal patient care. In 2019, China released a notification on strengthening the training and management of healthcare assistants,[27] mandating that these professionals undergo specialized training and obtain certification. Continuous enhancement of the professional skills and overall competencies of healthcare assistants is imperative.

However, several challenges persist in the training landscape: (1) There is a lack of effective supervision and evaluation mechanisms, hindering the improvement of training quality. Studies have indicated a low certification rate among healthcare assistants, with many operating without proper credentials. Policy recommendations suggest the implementation of mandatory certification for healthcare assistants and the regulation of work hours and patient care loads to safeguard their rights. Nonetheless, current national standards do not impose a compulsory certification requirement.[28] (2) The training content often fails to align with the actual needs of nursing services, lacking systematic, targeted training programs and educational materials, resulting in suboptimal training outcomes.[29] (3) The demographic composition of healthcare assistants frequently includes older unemployed individuals and migrant workers from rural areas, who may possess limited experience and lower educational qualifications.

Tertiary hospitals in China often manage patients with complex chronic conditions, high acuity levels, and prolonged hospital stays. Despite the presence of wound care specialists, the sheer volume of patients and the limited nurse-to-patient ratio make healthcare assistants critical to early detection and routine prevention of pressure injuries. These conditions make the need for structured training in such settings particularly urgent. In the tertiary hospital where the author is employed, there is a rising prevalence of chronic disease patients, with healthcare assistants primarily responsible for their care. As daily caregivers, they play a vital role in the skin care of high-risk patients, assisting nurses with repositioning and utilizing pressure-relieving devices to prevent pressure injuries. Research has confirmed that the use of pressure-relieving devices and regular repositioning are essential nursing interventions for preventing pressure ulcers.[30] Therefore, it is crucial to develop a comprehensive training curriculum focused on pressure injury prevention to enhance the competencies of healthcare assistants in this domain and standardize their caregiving practices.[31]

Content Analysis of the Index System for Pressure Injury Prevention Training for Healthcare Assistants

The indicator system formulated in this study for pressure injury prevention training encompasses seven primary indicators: training objectives, target audience, training content, training modality, teaching faculty, assessment and certification, and training base. Analysis revealed that ten secondary indicators achieved a score of ≥80%, signifying their central importance within the training framework. Specifically, eight secondary indicators related to training content scored above 80%, including: mastering repositioning techniques to prevent pressure injuries, correct usage of pressure-relieving devices, understanding skin cleansing methods, identifying high-risk populations and areas for pressure injuries, grasping key points and precautions for repositioning, and employing cleansing techniques for the perineal area and anal region in incontinent patients, as well as understanding the use of various pressure-relieving devices (eg, air mattresses, water mattresses, wedge cushions). These topics should be prioritized in training programs to ensure healthcare assistants can effectively prevent pressure injuries.

Regarding training modalities, bedside teaching is identified as a critical approach and should be a primary method of instruction. In terms of assessment and certification, practical skills assessments for healthcare assistants should be emphasized to evaluate their operational competencies effectively. Conversely, six secondary indicators received a score of ≤30%, indicating lower significance within the training system. In terms of training content, the historical development and staging of pressure injuries may be regarded as non-essential, requiring only a basic understanding by healthcare assistants. Additionally, training methods involving demonstration rooms and WeChat groups should not serve as primary

instructional strategies. The educational qualifications and professional titles of teaching faculty should also not be the primary selection criteria.

The calculated Kendall's W value of 0.380, with a significance level of $P < 0.001$, reflects a statistically significant level of agreement among the expert panel. While the W value does not reach the threshold of strong consensus (typically >0.7), it demonstrates acceptable convergence for a panel composed of individuals from diverse backgrounds, including wound care specialists, geriatric care experts, and nursing educators. This degree of agreement supports the scientific robustness of the indicator system developed. Moreover, the moderate consensus reinforces the value of using multiple Delphi rounds and integrating qualitative feedback to reach a balanced and inclusive training framework. While most indicators demonstrated strong consensus among experts, a few items exhibited relatively high coefficients of variation (CV > 0.30), particularly those related to theoretical or advanced knowledge. For example, indicators such as "understanding the pathophysiological mechanisms of pressure injuries" and "mastery of updated clinical guidelines" received more divergent ratings. Expert feedback significantly shaped the training framework. For example, based on open-ended comments in the first round, two new indicators were added, and four others were reworded for clarity. Low-rated items were either removed or retained with downgraded importance based on justifications provided by expert consensus. The high-priority item "bedside teaching" emerged through unanimous agreement across both rounds.

In conclusion, this study establishes a clear indicator system for training healthcare assistants in preventing pressure injuries. During the implementation of this training program, emphasis should be placed on high-scoring indicators to ensure the practicality and effectiveness of the training content. Conversely, lower-scoring indicators can be adjusted within the training framework to achieve optimal resource allocation and maximize training effectiveness. Despite the statistical dispersion, these items were retained based on qualitative input from senior experts, who emphasized their value in enhancing long-term competencies and fostering a deeper understanding of care rationale among assistants. Their inclusion reflects a strategic balance between addressing immediate training needs—centered on practical, task-based skills—and laying the groundwork for future tiered or progressive training programs. These indicators may serve as advanced modules or optional content in a differentiated curriculum framework.

Future Prospects for Pressure Injury Prevention Training for Healthcare Assistants in Tertiary Hospitals

In the United States, certified nursing assistant (CNA) training includes mandatory modules on repositioning, skin assessment, and hands-on practicums with pass/fail competency evaluations.[21,25] Germany incorporates scenario-based simulation and structured instructor supervision, while Japan emphasizes progressive training with standardized manuals. In contrast, China currently lacks such standardized programs, especially for unlicensed nursing assistants in tertiary hospitals. This gap in systematic training is a key driver for the development of the index system proposed in this study.

In developed countries such as the United States, certified nursing assistants (CNAs) receive training through standardized programs that are regulated at the federal and state levels. These programs typically include 75 hours of instruction, encompassing both classroom learning and supervised clinical practice, and must meet minimum federal requirements outlined in the Omnibus Budget Reconciliation Act (OBRA) of 1987.[32] Key competencies emphasized include hygiene maintenance, patient positioning, skin care, and basic reporting protocols—all of which are aligned with the high-priority indicators identified in this study, such as "bedside teaching", "repositioning techniques", and "skills assessment". In contrast, China currently lacks a unified national curriculum or credentialing framework for healthcare assistants. Training varies significantly across institutions, and most assistants operate without formal certification. The structured index system developed in this study offers a preliminary model for standardizing training content across tertiary hospitals, bridging the gap between fragmented practice and formalized instruction. These programs emphasize competency-based learning and practical evaluation, which align with the high-priority indicators identified in our index system. Incorporating such comparative perspectives supports the cross-context relevance of the framework developed in this study. Beyond statistical validation, the indicators presented in Table 3 offer actionable insights into educational priorities. Items such as bedside teaching, repositioning techniques, and the use of pressure-relieving devices consistently

received high importance ratings, suggesting they should form the core of pressure injury prevention training modules for healthcare assistants.

The proposed curriculum aims to provide healthcare assistants with education on pressure injury prevention, with the goal of enhancing their theoretical knowledge and practical skills in this critical area. By cultivating a greater awareness of the importance of pressure injury prevention, healthcare assistants will be better prepared to apply relevant theories and skills in clinical practice. This approach aims to improve their self-efficacy and adherence to pressure injury prevention protocols, subsequently reducing the incidence of pressure injuries among hospitalized patients and enhancing overall clinical outcomes.[33] Furthermore, the implementation of this training program, coupled with an evaluation of its clinical effectiveness, will provide valuable insights into the efficacy of the proposed pressure injury prevention curriculum, serving as a reference for training healthcare assistants in medical institutions. This structured index system aims to standardize what should be taught, to whom, and how, rather than to evaluate outcomes or rank performance.

One limitation of this study lies in the composition of the expert panel, which was predominantly composed of wound and stoma care specialists (20 of 23). This may have led to an overemphasis on clinical and procedural content. Only two nursing educators and one geriatric specialist were included, and frontline healthcare assistants—the ultimate trainees—were not represented. Future studies should include end users to enhance practical applicability and responsiveness to trainee needs. Future studies are warranted to pilot test this training framework in tertiary hospital settings to evaluate its effectiveness in real-world practice. Key outcomes could include improvements in healthcare assistants' knowledge, confidence, and skill application, as well as reductions in the incidence of pressure injuries among hospitalized patients. Longitudinal studies can further assess the sustainability and long-term impact of the training program. By implementing this indicator system, tertiary hospitals in China could establish consistent training modules, define required skill competencies, and initiate formal certification pathways, ultimately improving the quality of pressure injury prevention care delivery.

Conclusion

This study developed a structured training content framework for pressure injury prevention, specifically designed for healthcare assistants in Chinese tertiary hospitals. Although referred to as an "index system" throughout the manuscript, the final product should be understood as a modular training curriculum rather than a quantitative evaluation tool. The detailed syllabus (Appendix 1) outlines seven competency-based modules, integrating theoretical instruction, practical skill demonstration, and standardized assessments to operationalize this framework.

Through a two-round Delphi consultation involving 23 experts from wound care, nursing education, and geriatric care, the framework was iteratively refined. Expert feedback led to the addition, removal, or rewording of several indicators. Components such as bedside teaching and hands-on skill instruction emerged as the highest-priority elements, while theoretical items exhibited greater variability in consensus.

The term "healthcare assistants" in this study refers to non-licensed support staff working under the supervision of registered nurses in tertiary hospital settings. The training framework aims to enhance their competence in early detection and routine prevention of pressure injuries, contributing to improved care quality and more standardized prevention practices.

While this framework holds potential for application, it has not yet been pilot-tested. Future studies should implement the framework in real hospital environments to evaluate its feasibility, training effectiveness, and impact on clinical outcomes such as pressure injury incidence. Longitudinal evaluation is recommended to assess knowledge retention and inform broader policy integration.

Data Sharing Statement

All data generated or analysed during this study are included in this article. Further enquiries can be directed to the corresponding author.

Ethics Approval and Consent to Participate

The study was conducted in accordance with the Declaration of Helsinki (as was revised in 2013). The study was approved by Ethics Committee of the First Affiliated Hospital of Jinan University. Written informed consent was obtained from all participants.

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Disclosure

The authors declare that they have no competing interests in this work.

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