Research Article

BIOMEDICAL Journal of Scientific & Technical Research

ISSN: 2574 -1241

DOI: 10.26717/BJSTR.2026.67.010488

AI-Generated Home Healthcare Nursing Simulation Scenarios: A Structural Analysis Based on Benner's and Wiedenbach's Theories

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ARTICLE INFO

Received: November 13, 2026

Published: November 24, 2026

Citation: Nobuko Sekinaga, Masayo Ayukawa, Hiromi Tamura and Yusuke Oda. AI-Generated Home Healthcare Nursing Simulation Scenarios: A Structural Analysis Based on Benner's and Wiedenbach's Theories. Biomed J Sci & Tech Res 67(3)-2026. BJSTR. MS.ID.010488.

ABSTRACT

Background and Objective: Clinical judgment based on patients' and families' living circumstances is essential in-home healthcare nursing, and simulation-based education plays an important role in developing this competency. Although generative artificial intelligence (AI) is increasingly used in nursing education, the structure of clinical practice represented in AI-generated simulation scenarios has not been fully examined. This study aimed to clarify the characteristics and structure of clinical practice in AI-generated home healthcare nursing simulation scenarios using Benner's phenomenological nursing theory and Wiedenbach's clinical nursing theory.s

Methods: A home healthcare nursing simulation scenario was generated using Gemini 1.5 Pro from patient information, a physician's home healthcare order, and a home care service plan. The scenario was divided into scenes and analyzed by theoretical triangulation based on Benner's and Wiedenbach's theories.

Results: The AI generated a seven-scene simulation scenario that represented the home healthcare nursing process, incorporating the living circumstances and psychosocial factors of the patient and family. Benner's theory revealed a process progressing from situational understanding through clinical perception to determining nursing interventions. Wiedenbach's theory demonstrated that nursing interventions developed by identifying patients' needs for help and deploying goal-directed care. Furthermore, post-visit reflections articulated the rationale for clinical judgments, making expert nurses' tacit knowledge visible in a learnable format.

Discussion and Conclusion: The AI-generated scenario consistently represented the structural process from situational understanding to nursing intervention. These findings suggest that AI-generated simulation scenarios can serve as effective educational resources for developing clinical judgment in home healthcare nursing.

Keywords: Generative AI; Home Care Nursing; Simulation Scenario

Abbreviations: AI: Artificial Intelligence; OSCE: Objective Structured Clinical Examinations; COPD: Chronic Obstructive Pulmonary Disease; HOT: Home Oxygen Therapy: COI: Conflicts of Interest

Background and Objective

In modern home healthcare nursing practice, nurses are required to exercise advanced clinical judgment based on the living backgrounds and circumstances of care recipients (patients) and their families. Individuals receiving care at home possess unique lifestyle habits, values, and life worlds that cannot be fully grasped solely through objective medical data. Consequently, nursing professionals must possess the competence to understand each individual's unique life world while delivering tailored support. Expert nurses synthesize not only observable physical conditions and medical information, but also subtle cues such as the speech, expressions, and living environments of patients and families, anticipating unexpressed needs and future changes. While such clinical wisdom (practical knowledge) is developed through accumulated experience, it often exists tacitly within individuals, presenting ongoing challenges for verbalization

and educational translation. In recent years, nursing education has increasingly adopted Objective Structured Clinical Examinations (OSCE) and simulation-based education to foster clinical judgment skills. However, creating simulation scenarios requires extensive educator experience and substantial time investment. Moreover, constructing dynamic scenarios that incorporate the complex living backgrounds and family dynamics characteristic of home healthcare nursing presents significant difficulties.

Against this backdrop, the potential application of Generative Artificial Intelligence (Generative AI) in simulation education is being actively explored. While Generative AI can produce diverse narratives and scene configurations based on given inputs, the extent to which it reflects contextual understanding and expert decision-making processes in clinical practice remains insufficiently investigated. Therefore, this study aimed to clarify the characteristics of nursing practice and the structure of clinical knowledge embedded in home healthcare nursing simulation scenarios generated by AI. To achieve a multi-faceted evaluation, two distinct nursing theories were employed: Patricia Benner's Phenomenological Nursing Theory, which explains expert nurses' situational judgment and clinical wisdom, and Ernestine Wiedenbach's Clinical Nursing Theory, which explicates the purposeful process of nursing assistance.

Theoretical Framework

To analyze the multi-dimensional structure of nursing practice represented in AI-generated scenarios, this study adopted two complementary nursing theories as analytical frameworks:

Patricia Benner's Phenomenological Nursing Theory

Benner demonstrated that expert nurses perform clinical judgment not by merely applying rules or procedures, but through "knowledge embedded in the situation," holistically grasping the context surrounding patients and families. Concepts such as the progression from novice to expert, clinical perception, and the "shift in primacy" (where a nurse's focus shifts dynamically in response to situational changes) provide essential lenses for analyzing expert clinical perception and reasoning. In this study, Benner's theory was used to analyze how the AI-generated scenario represents the nurse's situational understanding and thought processes.

Ernestine Wiedenbach's Clinical Nursing Theory

Wiedenbach conceptualizes nursing practice as a goal-directed helping process, delineating how nurses perceive a patient's "need for help" and translate it into purposeful intervention. Key concepts including "confirmative action (validation)," "prescription," and the "art of nursing" provide a framework to examine how clinical judgments unfold into concrete nursing actions. By combining these two theories, this study structurally analyzed both "the process of situational understanding and clinical judgment" (Benner) and "the implementation of judgment-based nursing interventions" (Wiedenbach).

Research Methods

Target Data and Simulated Case Profile

The target dataset comprised a home visit nursing simulation scenario generated by Google's Gemini 1.5 Pro (version as of June 2026). Modeling a standard 15-minute home visit exercise used in undergraduate nursing education, the AI was provided with objective patient data across three standard document types:

Patient Profile: Health status, physical/mental functions, living conditions, social resources, environmental factors.

Physician's Home Healthcare Order: Medical management specifications and clinical observation requirements.

Home Care Service Plan (Form 1): Overall care policy and interprofessional collaboration goals.

To evaluate how the AI interprets clinical contexts independently, predefined nursing plans and assessments were intentionally omitted from the input prompt. Multiple generation iterations were conducted with adjusted input parameters until a scenario meeting all research criteria was selected.

Specific Case Parameters

Patient (Mrs. A): Female in her 80s, gentle and quiet demeanor. Sequelae of cerebral infarction resulting in left-sided hemiplegia, alongside Chronic Obstructive Pulmonary Disease (COPD).

Family Profile & Care Environment: Primary caregiver is her husband (in his 80s), who is conscientious and earnest but "somewhat fatigued due to overexertion." The eldest son's wife, who lives with them, is cooperative and routinely concerned about the primary caregiver's burden (reflecting an elderly-caring-for-elderly dynamic supported by co-residing family).

Scenario Generation Criteria

Timeframe: Approximately 15 minutes covering vital sign measurement, condition observation, health guidance, and daily living support.

Characters: Visiting nurse, nursing student, Patient Mrs. A, primary caregiver (husband), co-residing family member (daughter-in-law).

Required Clinical Observations: Blood pressure monitoring, medication management check, bowel movement status check, Home Oxygen Therapy (HOT) management, and fall prevention environmental assessment.

Student Learning Process: The nursing student observes and participates under nurse supervision, culminating in a post-visit reflection to learn clinical reasoning.

Interpersonal Nursing Skills: Respecting the life world and self-esteem of the patient and family, incorporating family-conscious communication and appropriate verbal expressions.

Analytical Procedure (Matrix Analysis Based on Two Theories)

The generated scenario was divided into distinct sequential scenes based on nursing intentions and care progression. Matrix analysis was conducted by cross-referencing concepts from Benner (embeddedness in the situation, clinical perception, novice-level practice, shift in primacy, knowledge embedded in practice) and Wiedenbach (sensing/identifying need for help, confirmative action, prescription, art of nursing).

Rigor, Reliability, and Validity

Content validity regarding pathophysiology, care appropriateness, and interpersonal technique was evaluated by multiple nursing scholars. Theoretical triangulation using two complementary theories ensured balanced, non-unilateral interpretation.

Ethical Considerations & Conflicts of Interest

This study analyzed AI-generated textual simulation data without human subjects. All inputs were fictional cases without identifiable personal data, using privacy-protected AI settings. No conflicts of interest (COI) exist.

Results

The AI generated a structured simulation scenario comprising 7 distinct sequential scenes. The nurse's behaviors, reasoning processes, and patient/family responses across these 7 scenes were systematically mapped using the two-theory matrix (detailed in Tables 1 & 2 below).

Table 1: Generative AI-Extracted 7 Scene Structures of Home Healthcare Nursing Simulation.

Scene	Scene Title	Specific Care Content & Scenario Development
Scene 1	Observation of Family Relationships and Perception of Psychological State Upon Entering the Home	Upon entering the patient's home, greetings are exchanged with Mrs. A and her family. While maintaining respect for their living space (hospitality manners), an initial assessment is conducted to perceive unexpressed psychological exhaustion and family dynamics, observing the demeanor and facial expressions of the primary caregiver (husband)—who is "somewhat fatigued" due to caregiving burden—and listening to the conversation with the eldest son's wife, who is cooperative but increasingly anxious.
Scene 2	Vital Signs Measurement and Safety Management of Home Oxygen Therapy (HOT)	Vital signs are measured primarily to confirm Mrs. A's health condition. Simultaneously, following attending physician orders, Home Oxygen Therapy (HOT) parameters—including oxygen flow rate, equipment operating status, presence of tube kinks, and skin breakdown—are thoroughly verified. Instructions are provided to the nursing student to visually check equipment according to prescribed protocols.
Scene 3	Identification of Latent Needs Through Checking Medication Adherence	Remaining medications and administration status are checked with the husband and daughter-in-law. Moving beyond routine check-box verification, the nurse listens within the conversational context to uncover the earnest husband's "anxiety bottled up from trying too hard" and unvoiced daily living challenges (latent needs).
Scene 4	Inquiry into Bowel Movement Status and Guidance on Avoiding Straining Risks in Patients with COPD	Bowel movement status is verified per physician orders. Considering the pathophysiological characteristics of Chronic Obstructive Pulmonary Disease (COPD), the nurse conducts an assessment anticipating dyspnea, acute blood pressure elevation, and recurrent stroke risks caused by straining during defecation. Specific care guidance is provided to the family for safe and comfortable bowel management.
Scene 5	Observation of Care Environment for Hemiplegia and Environmental Adjustment for Fall Prevention	Reflecting Mrs. A's reduced ADL due to left hemiplegia, the care room and living pathways are carefully observed. Discreet environmental adjustments are made—confirming and repositioning floor obstacles and power cords that pose fall hazards—without offending the family's lifestyle habits or self-esteem.
Scene 6	Conclusion of the Visit and Empowerment of the Caregiving Family	Summarizing the day's visit care, observation findings based on physician orders are communicated to instill reassurance. The nurse acknowledges and appreciates the hardworking husband's dedicated care while positively validating the daughter-in-law's support, conducting interactions that enhance the entire family's vitality (empowerment) toward continued home care before departing.
Scene 7	Post-Visit Reflection (Debriefing) and Verbalization of Tacit Knowledge	A post-visit reflection conducted between the nurse and nursing student away from the patient's home. In response to objective facts visually observed by the student, the expert nurse verbalizes and transmits the underlying clinical reasoning (tacit knowledge)—explaining "why specific communication choices were made at critical moments" and "what subtle family cues were detected."

Table 2: Elucidation of Nurse Behaviors and Thought Processes Based on Two Nursing Theories.

Scene	Nurse's Thinking & Clinical Judgment	Benner's Theoretical Concept	Wiedenbach's Theoretical Concept	Patient & Family Psychological Transformation (Student Transformation)	Psychological Transformation of the Patient and Family
Scene 1 Entry & Greetings+A4:A10	Intuiting unexpressed psychological fatigue from the family's posture, expressions, and subtle demeanor.	Embeddedness in the situationClinical perception	Sensing the need for help	Family tension eases, gaining reassurance that "it is safe to show our situation as it truly is."	Tension eases, and they gain a sense of reassurance that "it is safe to show our current situation just as it is."
Scene 2 Vital Signs & HOT Safety	Confirming objective data based on physician orders while demonstrating standard procedures to the nursing student.	Novice-level practice*(Demonstration to student)*	Confirmative action (*Validation*)	Patient/family acquire a "sense of safety" through reliable medical skills; student's self-esteem is fulfilled through structured participation.	Acquisition of a "sense of safety" through reliable medical techniques, and fulfillment of self-esteem through the student's active participation.
Scene 3 Medication Adherence Check	Shifting concern from remaining pill counts (rules) to the husband's isolation and anxiety, pinpointing latent care needs.	Shift in primacy	Identifying the need for help	Relief from isolation as the husband feels "someone finally recognized the hardship no one else noticed."	Alleviation of loneliness and isolation through the realization that "someone finally understood the hardships of mine that no one else had noticed."
Scene 4 Bowel Status Check	Integrating COPD pathophysiology (straining risks) with Mrs. A's daily living habits to construct a preventive intervention.	Knowledge embedded in practice	Prescription	Family correctly understands constipation risks (shared crisis) and gains confidence in concrete coping strategies.	Accurately understanding the hazards of constipation (sharing a sense of crisis) and gaining confidence in concrete coping strategies.
Scene 5 Environmental Adjustment	Discreetly rectifying fall hazards without criticizing or offending the family's lifestyle or self-esteem.	Embeddedness in the situation	Art of nursing	Reassurance that their living space is not judged, fostering self-efficacy ("*We can live safely like this*").	A sense of security that their living space is not being judged or rejected, and a sense of self-efficacy that "with this, we can live safely."
Scene 6 Conclusion of Visit	Shifting focus toward overall family sustainability, appreciating the husband's effort and validating the daughter-in-law's role.	Shift in primacy	Art of nursing (*Empowerment*)	The husband lays down his heavy burden, the daughter-in-law deepens confidence in her supportive role, and overall family caregiving vitality increases.	The husband feels the heavy burden lifted from his shoulders, the daughter-in-law deepens confidence in her caregiving role, and the recuperative and caregiving vitality of the entire family is enhanced.
Scene 7 Post-Visit Reflection (Debriefing)	Verbalizing intuitive clinical judgments (tacit knowledge) and transmitting them in contrast with the student's perspective (explicit knowledge).	Verbalization of knowledge embedded in practice (Contrast with novice)	(Sublimation into an educational approach)	Verbalizing one's intuitive clinical judgments (tacit knowledge) and transmitting them in contrast with the student's perspective (explicit knowledge).	Student's Transformation: Gaining insight into the profound depth of nursing practice, recognizing the existence of tacit knowledge, and experiencing heightened motivation for learning.

Discussion

Prompt Design Using Objective Data and Scenario Characteristics

Excluding explicit nursing assessments and care plans from the AI input forced the model to interpret raw objective context. As a result, the AI did not merely output mechanical instructions; it successfully generated realistic scenes capturing psychosocial nuances and implicit family caregiving burdens.

Theoretical Triangulation Validating Educational Value

The dual-theory framework confirmed that the AI scenario seamlessly linked contextual assessment to purposeful action, demonstrating that Generative AI can package expert nursing wisdom into accessible learning materials.

Verbalizing Tacit Knowledge in Educational Debriefings

In Scene 7 (post-visit reflection), the expert nurse explicitly explained the underlying rationale for intuitive decisions (making tacit

knowledge explicit). This provides nursing students with valuable opportunities to analyze clinical reasoning behind communication choices.

Educational Potential of Generative AI in Nursing

Generative AI significantly reduces the time and experience required to construct context-rich simulation scenarios, offering versatile support for nursing educators.

Challenges and Risk Management (Hallucinations)

Because AI output may contain pathophysiological or safety errors (hallucinations), expert clinical verification by qualified nursing faculty remains an indispensable prerequisite before classroom adoption.

Limitations in Reproducing Physicality and Non-Verbal Cues

As text-based output, AI scenarios cannot fully replicate real-world physical experiences, non-verbal cues (tactile feedback, subtle breathing changes), or somatic perception. Thus, AI scenarios should serve as complementary analytical tools alongside hands-on clinical training [1-13].

Conclusion

This study demonstrated that Generative AI can create structured, realistic home healthcare nursing simulation scenarios that reflect situational judgment and goal-directed care. Using Benner's and Wiedenbach's theories, the internal logic of clinical judgment embedded in AI output was successfully elucidated. Future research should evaluate the empirical learning outcomes of AI-generated simulation scenarios in actual clinical nursing education.

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ISSN: 2574-1241

DOI: 10.26717/BJSTR.2026.67.010488

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