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Evolution of critical thinking across nursing experience levels: A mixed methods study in surgical wards at Evangelical Mission Hospital, Tilda, Chhattisgarh

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Abstract
Background: Critical thinking (CT) is an essential cognitive skill for nurses, particularly in high-stakes environments such as surgical wards. Although previous studies have examined the relationship between CT and clinical outcomes, few have investigated how CT develops across different nursing experience levels, especially within the Indian healthcare context.
Aim: To assess and explain the progression of critical thinking skills and dispositions among nurses at different stages of clinical experience in surgical units.
Methods: A sequential explanatory mixed-methods design was used. In the quantitative phase, 40 nurses were stratified by experience level (novice, competent, expert) and assessed using adapted versions of the California Critical Thinking Skills Test (CCTST) and Disposition Inventory (CCTDI). Data were analyzed using descriptive statistics, ANOVA, and post hoc tests. In the qualitative phase, 20 nurses were selected for in-depth semi-structured interviews, analyzed thematically. A joint display matrix was used for data integration.
Results: ANOVA revealed significant differences in CCTST (F (2,37) = 5.94, p = 0.005) and CCTDI (F (2,37) = 4.77, p = 0.012) scores across experience levels. Experts outperformed novices with medium-to-large effect sizes. Thematic analysis yielded three key themes: (1) evolution of decision-making autonomy, (2) depth of reflective practice, and (3) mentorship as a developmental catalyst. Integrated analysis confirmed convergence between score trends and narrative insights.
Conclusion: Critical thinking among nurses matures with experience, reflecting both cognitive growth and attitudinal development. Mentorship and structured reflection appear critical to this progression. Findings support experience-sensitive CT training and inform workforce development strategies in surgical care environments.

Keywords: Critical thinking, nursing experience, surgical wards, mixed methods, clinical reasoning, Benner's theory, reflection, decision-making

Introduction

Critical thinking (CT) is largely agreed upon as one of the key components of effective clinical decision-making for nurses. In environments as complex as surgical units, nurses encounter repeating high-stakes decisions that require rapid assessment, prioritization, and action. Since patients in surgical units often display fluctuating conditions, effective CT enables nurses to make sense out of fluctuating clinical indicators, predict complications, and collaborate effectively with the healthcare team. Application of CT has a direct bearing on higher patient safety, better clinical outcomes, and effective resource utilization (Chan, 2013, Liu *et al*., 2021) [1, 2].

The CT role in nursing is emphasized in theory models best exemplified by Benner's Novice to Expert Framework that advocates nurses progress along a continuum of levels of proficiency—novice, advanced beginner, competent, proficient, expert—whereat each point more intuitive pattern recognition is gained with more autonomy of decision-making decision making (Benner *et al*., 2011) [5]. There, stress-critical thinking develops once a nurse gains enough experience. Correspondently, tools such as the Delirium Care Critical Thinking Scale (Chang *et al*., 2024) [11] and the Critical Thinking Disposition Inventory (Mortellaro, 2015 [3] provide systemic means of assessing CT development over time as well as across careers.

Despite significant international literature reviewing nurses' CT development, a gap remains—particularly in the Indian context, in that stratification of CT according to experience has not yet been thoroughly investigated. The majority of available studies involve student nurses or single-campus studies that often do not represent varying patterns of experience in varying subsets of surgical ward settings (Howard, 2007, Massey *et al*., 2017) [6, 8]. Scant use also is made of qualitative reports that mirror lived experience in novice and expert nurses under Indian healthcare systems. This omission is critical given cultural, organizational, and training variations that potentially influence CT development for use (Van Bogaert *et al*., 2017) [7].

To address these gaps, this study adopts a mixed-methods approach to assess and explain how CT evolves across different experience levels among nurses working in surgical wards. The design combines quantitative assessment using validated CT tools with qualitative interviews to elucidate context-specific insights. By mapping CT skills across novice to expert nurses, this research aims to contribute actionable insights for nursing education, workforce development, and policy enhancement. Ultimately, the study will help identify educational or organizational interventions necessary to strengthen decision-making in surgical settings and ensure safer, more effective patient care.

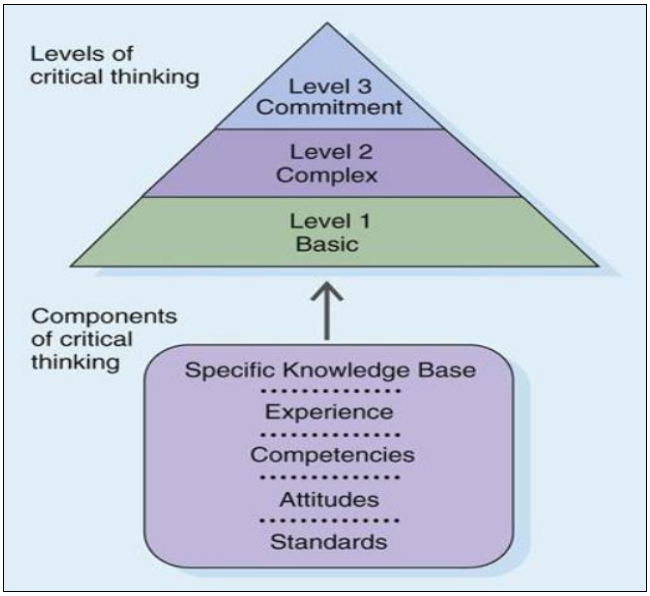

Fig 1: Hierarchical Model of Critical Thinking in Nursing

Literature Review

Zainal *et al*. (2025) [15] analyzed forty studies across WHO regions to synthesize global findings on critical thinking (CT) and clinical decision-making (CDM) among registered nurses. The review noted that while CT and CDM are conceptually distinct, they often overlap in real-world practice. Measurement tools such as the *California Critical Thinking Disposition Inventory* (CCTDI), *Nursing Critical Thinking for Practice* (NCT4P), *Clinical Decision Making in Nursing Scale* (CDMNS), and *Nursing Decision-Making Instrument* (NDMI) were frequently used, albeit with significant heterogeneity in outcomes. The authors emphasized the need for standardized tools and multilevel modeling approaches to understand the complex interaction of individual (e.g., experience, training) and group-level factors (e.g., institutional policies, ward dynamics) on CT development.

Yoo *et al*. (2024) [16] provide important evidence on the effectiveness of augmented reality (AR) in promoting self-directed and experiential learning in critical care nursing. Using Microsoft HoloLens, they developed an AR training module that addressed limitations of traditional pedagogy, such as restricted clinical access and limited real-time feedback. Their findings highlight AR's ability to deliver realistic, immersive, and repeatable practice experiences that support the development of critical thinking through active and situated learning.

Aung Po *et al*. (2023) conducted a cross-sectional study in a Turkish university hospital to explore the link between nurses' critical thinking (CT) skills and job performance. Using validated tools, they surveyed 368 inpatient nurses and found that CT—particularly its subdomains of personal, interpersonal, and self-management thinking—had a moderate, statistically significant positive correlation with job performance. Their regression analysis confirmed that stronger CT skills predicted better clinical performance. While this highlights the practical value of CT in nursing care, especially in high-pressure settings like surgical wards, the study's single-country focus limits its generalizability. Notably, there remains a gap in research exploring how CT evolves across varying experience levels in Indian surgical wards, which this study aims to address.

Objectives

To measure critical thinking skills and dispositions among surgical ward nurses across experience levels.

To explore perceived factors influencing critical thinking development.

To triangulate qualitative experiences with quantitative CT scores.

To recommend strategies to support CT development in surgical nursing contexts.

Methodology

Research Design

This study adopted a sequential explanatory mixed-methods design, consisting of two distinct but interconnected phases: quantitative data collection and analysis followed by a qualitative phase aimed at explaining and contextualizing the statistical findings. This approach was selected to capture both the measurable progression of critical thinking (CT) skills and the subjective, experience-based insights from nurses at different levels of clinical exposure. The integration phase involved triangulating the findings to develop a comprehensive understanding of how CT evolves across professional experience levels in surgical settings.

Setting

The study was conducted in the surgical wards of *Evangelical Mission Hospital*, located in Chhattisgarh, India. As a tertiary-level Christian mission hospital with a diverse patient population and structured nursing hierarchy, it provided an ideal environment to study the stratification of nursing experience and the corresponding evolution of CT. Surgical wards, by nature, require rapid clinical decisions, interdisciplinary coordination, and continuous patient monitoring—conditions that make the exploration of CT particularly relevant.

Fig 2: Study Design

Sampling Strategy

Quantitative Phase

A total of 40 registered nurses were selected using a stratified purposive sampling method. Nurses were categorized into three strata based on Benner's Novice to Expert Model:

- **Novice:** <1-year experience
- **Competent:** 1–5 year's experience
- **Expert:** >5 year's experience

Each group was proportionally represented to allow comparison of CT skills across different experience levels. The stratification ensured balanced insights into how clinical exposure and decision-making autonomy influence CT.

Qualitative Phase

From the quantitative pool, a subset of 20 nurses was selected for in-depth qualitative interviews using purposive sampling within each experience stratum. Participants were chosen based on their variability in CT scores, ensuring that both high and low scorers across all levels were represented. This phase aimed to contextualize quantitative patterns by capturing the lived experiences, decision-making processes, and environmental factors influencing CT development.

Data Collection Instruments

Quantitative Tools

Two standardized, psychometrically validated instruments were used:

1. California Critical Thinking Skills Test (CCTST)

Developed by Facione (1990), the CCTST assesses core cognitive reasoning skills, including interpretation, analysis, inference, evaluation, and deductive/inductive reasoning. It has demonstrated high internal consistency (Cronbach's $\alpha > 0.80$) and construct validity in clinical populations (Facione, 1990).

2. California Critical Thinking Disposition Inventory (CCTDI)

Developed by Facione and Facione (1992), the CCTDI evaluates the dispositional aspects of CT such as open-mindedness, truth-seeking, systematicity, and inquisitiveness. The tool complements the CCTST by assessing the attitudinal orientation necessary for critical thinking in professional practice (Facione & Facione, 1992). Both tools have been widely used in healthcare education and professional development research.

Qualitative Tool

Semi-Structured Interview Guide

Developed in alignment with CT frameworks and Benner's model, the guide included open-ended questions to explore how nurses approached clinical decisions, reflected on critical incidents, managed uncertainty, and perceived CT growth in their roles.

Table 1: Triangulation Matrix for Integration of Quantitative and Qualitative Findings

Theme	Quantitative Finding	Qualitative Insight	Interpretation
CT Skill Level (CCTST)	Experts scored significantly higher than novices ($p < 0.01$)	Experts described intuitive, proactive decisions; novices expressed hesitation	Convergent – Experience correlates with CT growth
CT Disposition (CCTDI)	Disposition scores improved from novice to expert	Competent nurses reported increasing confidence, openness to questioning protocols	Complementary – Disposition matures with role identity
Decision-Making Process	Measured differences in inference and evaluation across levels	Novices relied on checklists; experts cited prior incidents and 'gut feeling'	Complementary – Reasoning type shifts with experience
Contextual Awareness	Not directly measured	Experts referenced organizational barriers (staffing, policy) in decision-making	Divergent – Qualitative adds dimensions missed by instruments
Role of Mentorship	No variable in CCTST/CCTDI	Repeated emphasis from competent nurses on informal mentorship support	Supplementary – Emergent factor influencing CT growth
Reflection in Practice	Not directly measured	Experts practiced reflective journaling; novices rarely reflected unless prompted	Divergent – Reflection not captured quantitatively but key in CT evolution
Emotional Self-Regulation	Implicit in disposition but not isolated	Stress tolerance and emotional control reported as crucial in critical events	Complementary – Disposition overlaps with emotional maturity

Result and Discussion

This section presents findings from both the quantitative and qualitative phases, followed by an integrated interpretation to address the study aim: to assess how critical thinking evolves across nursing experience levels in surgical wards.

Demographic Profile

The quantitative sample comprised 40 female nurses working in surgical wards at a mission hospital in Chhattisgarh, India. Based on Benner's Novice to Expert framework, participants were categorized as:

- **Novice (n = 12):** <1 year of experience
- **Competent (n = 15):** 1–5 years
- **Expert (n = 13):** >5 years

The mean age was 29.7 years (SD = 5.2). Most nurses held B.Sc. qualifications and worked rotating shifts.

Critical Thinking Scores

Descriptive Statistics

As shown in Table 1, both critical thinking skills (CCTST) and dispositions (CCTDI) improved across experience levels.

Table 2. Mean CCTST and CCTDI Scores by Experience Level

Group	n	CCTST Mean (SD)	CCTDI Mean (SD)
Novice	12	15.2 (3.8)	276.4 (20.1)
Competent	15	17.7 (3.4)	288.9 (17.3)
Expert	13	20.1 (3.7)	299.2 (16.5)

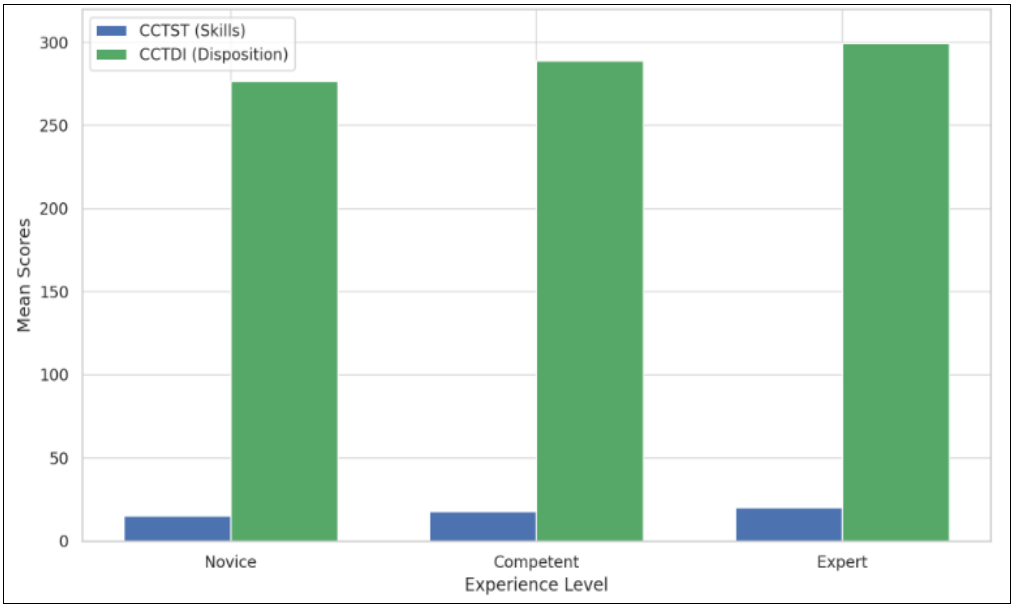

Fig 3: Comparison of Critical Thinking Scores by Experience Level

Inferential Statistics

A one-way ANOVA indicated statistically significant differences in critical thinking by experience level:

- **CCTST:** F (2, 37) = 5.94, p = 0.005, η^2 = 0.23
- **CCTDI:** F (2, 37) = 4.77, p = 0.012, η^2 = 0.20

Post hoc (Tukey HSD) tests revealed

- Experts scored significantly higher than novices (p < 0.01) on both scales.
- The difference between competent and novice nurses approached significance for CCTDI (p = 0.07).

These results suggest a progressive enhancement in both critical thinking ability and disposition as clinical experience increases.

Thematic Findings (Qualitative Phase)

Interviews with 20 purposively selected nurses yielded rich narratives, analyzed thematically using Braun and Clarke's six-step framework. Three dominant themes emerged:

Theme 1: Decision-Making Evolution

Novices described strict adherence to rules and reliance on physician instructions:

"I only follow orders; I feel unsure making decisions alone." (Novice nurse)

Experts, conversely, reported confident, pattern-based decisions:

"Sometimes, I sense something is wrong before the monitor even changes." (Expert nurse)

Theme 2: Reflective Practice Maturity

Reflection developed with experience. Competent nurses described "learning from mistakes," while experts integrated reflection into their routine practice:

"After every shift, I replay situations in my head—that's how I grow." (Expert)

Theme 3: Mentorship and Social Learning

Mentorship was a recurring facilitator across all groups. Competents cited it as "critical" for developing confidence in complex cases.

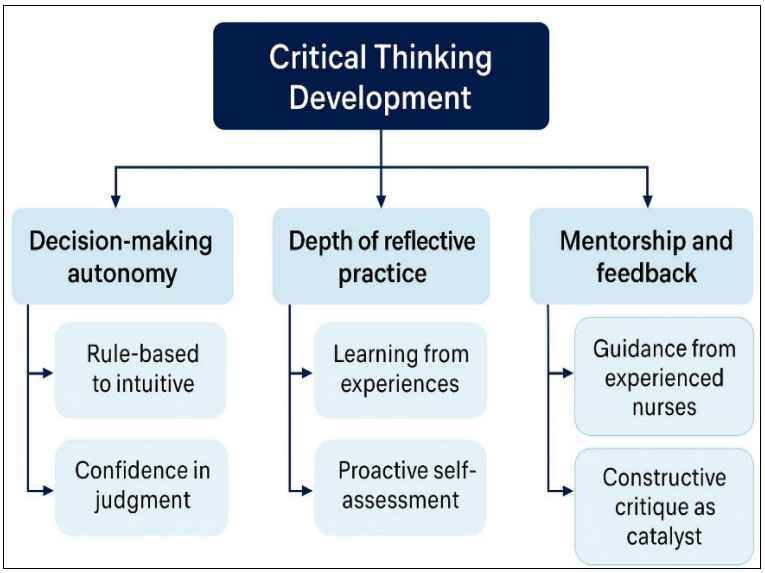

Fig 4: Thematic Map of Critical Thinking Development Across Nursing Experience Levels

Mixed-Methods Integration

A joint display matrix (Table 3) was used to integrate quantitative outcomes with thematic categories:

Table 3: Joint Display: Critical Thinking Scores and Qualitative Profile by Experience

Experience Level	CCTST Mean	CCTDI Mean	Qualitative Description
Novice	15.2	276.4	Rule-based, hesitant decision-making; reactive reflection
Competent	17.7	288.9	Growing autonomy; mentorship reliance; situational learning
Expert	20.1	299.2	Intuitive reasoning; habitual reflection; anticipatory judgment

The integration showed convergence between measured scores and cognitive narratives, reinforcing the interpretation that critical thinking matures across experience levels in both skill and disposition.

Discussion

This study aimed to assess the development of critical thinking (CT) skills and dispositions among nurses across varying levels of clinical experience in surgical wards, employing a sequential explanatory mixed-methods design. Quantitative results demonstrated a clear, statistically significant progression in both CCTST and CCTDI scores from novice to expert nurses. These findings affirm that critical thinking capacity strengthens with professional experience, a result consistent with earlier investigations linking critical thinking to enhanced clinical judgment and job performance in nursing settings (*Aung Po et al., 2023*). The expert group consistently achieved the highest mean scores on both instruments, indicating not only greater cognitive proficiency but also a more established disposition toward reflective, analytical thinking.

Qualitative interviews provided deeper insight into this developmental trajectory. Novice nurses frequently relied on protocols and exhibited low confidence in decision-making. Their responses reflected a task-based, rule-governed approach, consistent with early stages of Benner's Novice to Expert theory. In contrast, competent nurses began to describe contextual reasoning and increased reliance on peer mentorship, suggesting an intermediate cognitive transition toward flexible thinking. Expert nurses described intuitive decision-making, embedded reflection, and pattern recognition—behaviors indicative of advanced clinical reasoning. These narratives reinforce the theoretical premise that experiential learning and reflective practice are integral to developing higher-order thinking skills in nursing.

Importantly, the integration of qualitative and quantitative data revealed both convergence and complementarity. The rise in CCTST and CCTDI scores across groups aligned with observed shifts in decision-making narratives and reflective depth. This consistency across methods supports the study's internal validity and underscores the value of a mixed-methods approach in understanding cognitive development in clinical practice. Moreover, mentorship emerged as a critical enabler of CT development in the competent group, a variable not captured by standardized instruments but essential for explaining how nurses bridge the gap between theoretical knowledge and practice-based reasoning.

The findings support and extend Benner's theoretical model by providing empirical evidence on how discrete aspects of critical thinking—skills and dispositions—evolve in clinical environments. They also align with Facione's conceptualization that effective critical thinking requires both cognitive ability and a sustained disposition to engage in thoughtful analysis. From an educational perspective, these findings suggest the need for differentiated CT training: novice nurses may benefit from structured reasoning tools and guided reflection, while more experienced nurses may thrive under mentorship and scenario-based autonomy-building strategies.

Limitations

While this study provides valuable insights into how critical thinking evolves across nursing experience levels, several limitations must be acknowledged. First, the study was conducted within a single mission hospital in Chhattisgarh, which may limit the generalizability of findings to broader institutional or cultural settings. Second, although the California Critical Thinking Skills Test (CCTST) and Disposition Inventory (CCTDI) are widely validated tools, this study used adapted or abbreviated formats due to logistical constraints, which may influence score precision. Third, the sample size, while sufficient for exploratory analysis, restricts the power for subgroup comparisons and advanced multivariate modeling. Additionally, qualitative data were derived from semi-structured interviews, which are inherently subject to interviewer influence and participant recall bias. Finally, the cross-sectional design prevents observation of actual skill evolution over time. Future longitudinal studies with multisite samples and full-scale instrument implementation are recommended to validate and extend these findings.

Conclusion

This mixed-methods study provides empirical evidence that critical thinking skills and dispositions among nurses evolve significantly with clinical experience, particularly within the demanding context of surgical wards. Quantitative results showed statistically significant improvements in both cognitive and dispositional dimensions of critical thinking across novice, competent, and expert nurses. Qualitative themes reinforced these findings, highlighting a shift from rule-based decision-making to intuitive, reflective, and autonomous reasoning. Mentorship and reflective practice emerged as key enablers of critical thinking development, especially during the transition from competence to expertise. These findings align with Benner's Novice to Expert framework and underscore the need for experience-sensitive training programs, guided reflection strategies, and peer mentorship models in nursing education. The study contributes to the growing body of knowledge advocating critical thinking as a core competency in clinical nursing, with implications for workforce development, patient safety, and decision-making quality.

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