

Configurational Pathways to Nurse–Patient Conflict Occurrence and Escalation in Pediatric Units: A Fuzzy-Set Qualitative Comparative Analysis

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Abstract

Aim

To explore the multiple concurrent causal pathways leading to the occurrence, escalation, and extreme consequences of nurse-patient conflicts in pediatric settings from a configurational perspective.

Design:

A retrospective case study design using fuzzy-set Qualitative Comparative Analysis (fsQCA).

Methods

Thirty-three typical cases of nurse-patient interactions in pediatric units were included. Five condition variables were extracted: technical procedure outcome (T), communication and attitude (C), resource and process constraints (R), child and family member state (P), and expectation-perception discrepancy (E). A four-value fuzzy-set calibration (0, 0.33, 0.67, 1) was applied. Double-blinded independent coding was performed by two coders (inter-rater reliability Kappa = 0.87). Necessity and sufficiency analyses were conducted using fsQCA 3.0 software, with a case frequency threshold ≥ 1 and an original consistency threshold ≥ 0.8 .

Results

Necessity analysis showed no single condition was necessary for conflict occurrence (consistency all < 0.9). Sufficiency analysis identified three equivalent configurational pathways leading to conflict, with an overall solution consistency of 0.94 and coverage of 0.72: 1) Structural Constraint Type (T·R): of technical failure and systemic resource limitations (raw coverage 0.36, consistency 0.93); 2) Cognitive-Interactive Dysregulation Type (~C·E): Poor communication encountering high family expectations (raw coverage 0.32, consistency 1.00); and 3) System-Individual Resonance Failure Type (T·C·R·P·E): A full-blown convergence of problems across all five dimensions (raw coverage 0.20, consistency 1.00). For conflict escalation, family emotional dyscontrol (P) was a necessary condition for extreme outcomes (violence/legal disputes) (consistency 0.92), while the combination of "oppositional communication, emotional dyscontrol, and cognitive discrepancy" (C·P·E) formed a sufficient pathway (consistency 1.00, coverage 0.85). Causal asymmetry analysis indicated that good communication (C) or flawless technical procedures (T) are key protective conditions for avoiding conflict.

Conclusion

Pediatric nurse-patient conflicts arise from multiple interacting factors rather than a single cause. Three configurational pathways were identified: structural constraint (technical failure combined with resource constraints), cognitive-interactive dysregulation (communication breakdown combined with expectation gaps), and systemic resonance failure involving multiple simultaneous problems. Family emotional dyscontrol was a necessary condition for extreme conflict outcomes.

Implications for Nursing Management:

Nurse managers should adopt a configurational perspective when designing conflict prevention strategies. Interventions should target not only individual factors but also their interactions, such as improving communication training, strengthening emotional de-escalation protocols, and optimizing staffing and resource allocation. Additionally, establishing early warning systems for high-risk configurations and enhancing organizational support mechanisms may help reduce the likelihood and severity of pediatric nurse-patient conflicts.

1. Introduction

Pediatrics represents one of the most unique and complex arenas for nurse-patient interaction within the healthcare system. Incomplete statistics indicate that the incidence of nurse-patient conflicts in pediatric settings is significantly higher than in adult departments globally, with some regions reporting rates exceeding 30%, of which approximately 5%-10% escalate into formal complaints or legal disputes ^[1]. This uniqueness is rooted in the triadic interaction structure comprising "nurse-child-family members," which replaces the traditional dyadic nurse-patient model ^[2]. In this structure, children, due to their physical and mental immaturity, often cannot clearly express their feelings and needs, making clinical symptoms (e.g., persistent crying, behavioral abnormalities) a direct obstacle to clinical assessment and communication. Simultaneously, family members, as legal guardians, emotional supporters, and medical decision-making agents for the child, often fall into a state of deep "vicarious anxiety" and high stress due to their deep affection ^[2]. This anxiety, stemming from familial projection, intertwines with the inherent uncertainties of the medical context, making family members hypersensitive to any subtle changes in the nursing process and fostering high, sometimes unrealistic, expectations for medical outcomes. This leads to communication pathways and an exponential increase in emotional load in pediatric nurse-patient interactions, inevitably making pediatric wards a high-incidence area for misunderstandings, dissatisfaction, and conflict ^[3-4]. Minor information asynchrony, inadequate explanations, or procedural delays can ignite accumulated anxiety and frustration in family members, causing to escalate gradually from verbal complaints and formal complaints to verbal altercations, physical confrontations, and even legal action ^[5-7]. This cascade of negative events not only severely erodes nurses' sense of professional security and mental health, exacerbating burnout and staff attrition ^[8-9], but also fundamentally undermines the trust essential for a therapeutic environment, directly harming the child's best interests and causing long-term damage to the healthcare institution's reputation and social credibility ^[10-11]. Therefore, there is an urgent need to deeply analyze the concurrent and synergistic mechanisms involving technical, communication, resource, emotional, and cognitive factors in pediatric nurse-patient conflicts to provide a scientific basis for constructing a systematic conflict prevention and control system.

Considerable research has been conducted to understand and manage conflict effectively. However, existing literature largely relies on cross-sectional surveys and regression analyses, focusing on identifying the independent "net effects" of single variables such as nurses' communication skills, workload, family education level, or departmental resource allocation ^[12-14]. While helpful in clarifying key risk factors, these approaches have epistemological limitations: they are based on the *ceteris paribus* assumption, making it difficult to capture and explain the complex, non-linear interactions and synergistic effects among multiple antecedent conditions in real clinical practice ^[15]. For example, the same "poor communication" might be tolerated in a context of ample resources and high family trust, but in a situation with bed shortages, long waiting times, and families already at peak anxiety, it can easily become the trigger for conflict ^[16]. This suggests that whether conflict occurs and its severity often depend not on the strength of a single variable, but on how various conditions—technical operations, communicative interactions, systemic resources, family psychological states, and social expectations—combine in specific "recipes" to produce a "chemical reaction" ^[17].

According to complexity science and configurational theory, social phenomena generally follow a logic of "multiple conjunctural causation," where outcomes result from the combined interplay of multiple conditions in specific contexts ^[18]. Fuzzy-set Qualitative Comparative Analysis (fsQCA) is a holistic analytical method for revealing the internal logic of such complex phenomena. Based on set theory and Boolean algebra, fsQCA's core advantage lies in its ability to systematically investigate how multiple antecedent conditions combine in different "configurations" to jointly lead to a particular outcome and identify multiple equivalent pathways leading to that outcome ^[19]. This method particularly emphasizes causal asymmetry, meaning that the causes leading to conflict are not simply the opposites of the causes preventing it, which aligns well with the high complexity of social reality ^[20]. Some scholars have already initiated exploratory research using fsQCA in the medical conflict field. For instance, Park applied it to the configurational analysis of burnout and patient safety outcomes in pediatric nurses ^[9], and Gómez-Salgado et al. identified multiple concurrent pathways between work engagement, safety climate, and patient safety outcomes in pediatric hospitals using this method ^[17]. These studies provide methodological demonstrations for understanding

the causal structure of complex social phenomena in healthcare and lay the logical foundation for this study's analysis of the generation and evolution mechanisms of pediatric nurse-patient conflicts ^[21].

Therefore, to overcome the limitations of traditional linear research paradigms and more accurately reveal the generation and evolution process of pediatric nurse-patient conflicts, this study adopts fsQCA, a holistic analytical method grounded in complexity science and configurational theory ^[18–21]. By systematically analyzing 33 typical cases using fsQCA from a configurational perspective, this study aims to: (1) identify the multiple antecedent condition configurations (necessary and sufficient conditions) leading to the occurrence and escalation of pediatric nurse-patient disputes; (2) explore key protective condition combinations that can effectively block conflicts and build an "immune barrier"; and (3) ultimately construct a "configurational model of pediatric nurse-patient conflict generation" to reveal the synergistic mechanisms among technical, communicative, resource, psychological, and expectancy factors. By mapping the "risk landscape" of pediatric nurse-patient conflicts, this study hopes to provide hospital administrators with contextually sensitive, systematic governance strategies that transcend fragmented interventions, offering empirical and theoretical support for building more resilient and harmonious nurse-patient relationships in pediatric care units.

2. Methods

2.1 Research Design and Case Selection

This study employed a design combining retrospective case study and configurational analysis. Adhering to the Qualitative Comparative Analysis (QCA) principle of selecting cases with "maximum heterogeneity and maximum similarity," we systematically collected pediatric nurse-patient interaction events, aiming to cover diverse situations with and without disputes (positive and negative cases) to reveal sufficient and necessary configurational pathways. The case collection period spanned from 2015 to 2025. To ensure case representativeness and objectivity of information sources, a data triangulation strategy was used, sourcing cases from three channels:

(1) Clinical Cases (n = 20): Sourced from de-identified adverse event reports and internal quality and safety records from a large medical center in Northeast China. All cases focused on process details and internal evaluations.

(2) Public Legal Cases (n = 8): Retrieved from authoritative legal databases such as "China Judgments Online." Cases with clearly established facts and complete court documents were selected. Judicial documents carry legal force, and their factual descriptions are relatively objective.

(3) News Report Cases (n = 5): Selected from public reports by authoritative media outlets like The Paper and Health News. To mitigate potential emotional bias or one-sidedness in media reports, the research team performed structured fact extraction on the news texts: subjective evaluative language was retaining only verifiable objective elements such as event time, location behaviors, process, and outcomes, followed by cross-verification.

Inclusion criteria for all cases were: a complete description of the event process, sufficient to allow judgment on the study variables. Exclusion criteria were: cases with critical missing information (e.g., conflict cause, process, or outcome); and cases still in litigation with unclear facts. A final sample of 33 cases constituted the analytical set.

2.2 Variable Definition and Fuzzy-set Calibration

The construction of this study's variable framework followed a systematic, evidence-driven principle, completed through three steps to ensure its scientific validity rather than subjective conjecture:

Step 1: Systematic Literature Review and Initial Dimension Extraction

The research team systematically searched Chinese (CNKI) and English (Web of Science, PubMed) databases using keywords including "pediatric nursing," "nurse-patient conflict," "medical disputes," "risk factors," and "communication." By reviewing empirical studies and reviews from the past decade (2013–2023), factors influencing conflict with high frequency and strong

theoretical grounding were initially compiled, forming an initial list including dimensions like technical operations, communicative interaction, resource environment, patient/family characteristics, and expectation management.

Step 2: Expert Consultation Based on Clinical Experience for Dimension Refinement

To prevent the literature review from clinical reality, a two-round Delphi expert consultation was organized. Consultants included:

- (1).Clinical Nursing Experts (n = 8): Head nurses and senior nurses from pediatric wards, outpatient clinics, emergency departments, and PICUs in tertiary hospitals, with an average of over 15 years of clinical experience.
- (2).Nursing Management Experts (n = 4): Directors of hospital nursing departments and heads of quality management offices.
- (3).Medical Humanities and Communication Research Experts (n = 3).

In the first round, experts rated and commented on the importance, clinical recognizability, and mutual independence of the initial dimension list. Based on feedback, similar dimensions (e.g., "patient characteristics" and "family emotions") were merged, and the core of each dimension was clarified. In the second round, experts confirmed the revised variable definitions and operational descriptions, the five condition variables—Technical Procedure Outcome (T), Communication and Attitude (C), Resource and Process Constraints (R), Child and Family Member State (P), and Expectation-Perception Discrepancy (E)—received over 80% expert approval, deemed to comprehensively and essentially cover the key antecedent contexts of pediatric nurse-patient conflicts without major omissions.

Step 3: Pilot Study and Framework Calibration

Before formal analysis, the research team selected five typical cases (not included in the final sample) for a pilot coding test to assess the applicability and coding feasibility of the variable framework. The pilot study confirmed that the five variables effectively distinguished the contextual features of different cases and that coders could achieve good consistency based on the definitions. Based on this, the fuzzy-set calibration anchors for each variable were further refined.

In summary, the analytical framework of this study originated from a process combining "literature evidence clinical experts methodological validation," ensuring the variables were both theoretically grounded and closely aligned with the context of pediatric nursing practice, laying a reliable conceptual foundation for subsequent configurational analysis.

Outcome Variable: Dispute Occurrence (DISPUTE), a binary variable indicating whether the nurse-patient interaction developed into a conflict requiring third-party intervention (e.g., complaint, mediation, legal proceedings).

Condition Variables:

Technical Procedure Outcome (T): Refers to the standardization, proficiency, and success rate of nursing technical procedures.

Communication and Attitude (C): Refers to the nurse's initiative, clarity, empathetic expression, and overall service attitude during interaction.

Resource and Process Constraints (R): Refers to systemic constraints at the departmental or hospital level, such as resource scarcity (e.g., bed shortage, understaffing, equipment failure) or unreasonable processes (e.g., long waiting times, cumbersome procedures).

Child and Family Member State (P): Primarily refers to the family member's emotional stability and cooperativeness during the event, as well as the impact of the child's crying, resistance, etc., on the interaction.

Expectation-Perception Discrepancy (E): Refers to the gap between the family's expectations regarding the medical care process, outcome, or costs, and the actual situation or the professional explanations provided by healthcare staff.

All variables were calibrated using fuzzy-set methods to transform them into membership scores in the interval [0, 1], more precisely reflecting the degree to which a case "belongs" to a certain condition. A four-value calibration was used: 0 (fully out / almost none), 0.33 (more out than in / low degree), 0.67 (more in than out / high degree), 1 (fully in / extremely high degree). The setting of specific calibration anchors (e.g., distinguishing between 0.33 and 0.67) was determined by comprehensively referencing the qualitative descriptions in the case texts, the severity grading of common clinical situations, and discussion among the research team and experts (see Table 1).

Table 1
Variable Definitions and Fuzzy-set Calibration Criteria

Variable	Definition	Fully In (1)	Mostly In (0.67)	Mostly Out (0.33)	Fully Out (0)
Technical Outcome (T)	Standardization, proficiency, and success rate of nursing procedures	Clearly violates protocols, or multiple failures in key procedures	Procedure has non-standard aspects, or one failure in a key procedure	Procedure basically compliant, but with minor flaws or lack of proficiency	Procedure fully standardized, proficient, and successful on first attempt
Communication & Attitude (C)	Nurse's initiative, clarity, and empathy in communication	Communication completely absent, verbal conflict, or markedly indifferent/oppositional attitude	Communication simple, passive, lacks empathy, incomplete information provided	Communication basically smooth, but occasional delays or insufficient explanation	Communication proactive, sufficient, clear, demonstrating empathy and patience
Resource/Process (R)	Systemic resource scarcity or unreasonable processes	Resources extremely scarce (e.g., no bed, long wait) or process severely flawed	Resources markedly strained (e.g., long queues, understaffing) or process inconvenient	Resources slightly strained or process mildly inconvenient	Resources ample, process smooth and efficient
Family State (P)	Family member's emotional stability and cooperativeness	Emotions completely out of control, verbal or physical aggression, very uncooperative	Emotions agitated, low cooperativeness	Slightly anxious or impatient, but basically cooperative	Emotions stable, communicative, and cooperative
Expectation Discrepancy (E)	Gap between family expectations and medical reality	Fundamental, irreconcilable and gap between expectation and reality	Expectation reality, and difficult to persuade	Some cognitive discrepancy, can be partially through explanation	Expectations reasonable, basically consistent with medical reality

2.3 Coding Reliability Test and Quality Control

To minimize subjectivity in variable assignment and ensure objectivity and reproducibility of the coding process, a systematic coding reliability testing procedure was implemented. **Coder Training and Standardization:** Before formal coding, two researchers, each with over five years of pediatric clinical nursing experience and qualitative research backgrounds, formed a coding. Specialized training was provided, detailing variable definitions, calibration standards, and key points for case reading. Trial coding ensured mutual understanding of the standards.

Double-Blind Independent Coding: The two coders independently assigned fuzzy-set membership scores for all variables (5 conditions, 1 outcome) across all 33 cases without consultation. **Inter-Coder Reliability Assessment:** After coding, inter-coder agreement was calculated using SPSS 26.0 software. Results showed an overall agreement rate of 91.2% and a Cohen's Kappa coefficient of 0.87 ($p < 0.001$). Kappa coefficients for individual variables ranged from 0.82 to 0.93. According to Landis Koch (1977) criteria, this indicates "almost perfect" agreement, demonstrating high coding reliability.

Disagreement Resolution and Arbitration Mechanism: For cases with coding discrepancies (approx. 8.8%), a three-level process was initiated: First, the two coders re-reviewed the case and stated their assignment justifications. If consensus was not

reached, the issue was submitted to a research including a third senior researcher for discussion. If disagreements persisted, the corresponding author (possessing both extensive clinical management experience and QCA methodological knowledge) acted as making the final decision based on the preset calibration standards.

2.4 Data Analysis Steps

Analysis was performed using fsQCA 3.0 software (developed by Prof. Charles C. Ragin, Dr. Kriss A. Drass, and Sean Davey at the University of California, Irvine). The main steps were:

(1) Necessity Analysis: Examined whether a single condition variable (or its negation) is a necessary condition for the outcome. A consistency index > 0.9 was typically used as the criterion.

(2). Sufficiency Analysis and Truth Table Construction: A truth table was constructed based on the calibrated data matrix. A case frequency threshold of 1 (including all 33 case combinations) and an original consistency threshold of 0.8 were set to configurations sufficient for the outcome.

(3). Logical Minimization: Standard Analysis was performed on the truth table to generate complex, parsimonious, and intermediate solutions. This study primarily reports and interprets the intermediate solution, combining it with the parsimonious solution to distinguish core conditions (present in both parsimonious and intermediate solutions) from conditions (present only in the intermediate solution).

(4) Robustness Tests: To the stability of the findings, two robustness tests were conducted:

▣ Adjusting calibration anchors: The point for some condition variables was slightly adjusted (e.g., from 0.5 to 0.45 or 0.55), and the analysis was re-run.

▣ Increasing consistency threshold: The original consistency threshold for truth table construction was raised from 0.75 to 0.8. The core solutions (key configurational pathways) obtained from both tests were essentially consistent with the main analysis, showing no substantive changes, indicating good robustness of the configurational findings.

2.5 Ethical Considerations

This study received ethical approval from the Biomedical Ethics Committee of Dalian Medical University (Approval No.: 2025-043) and the Medical Ethics Committee of Dalian Women and Children Medical Center (Group) (Approval No.: FEJT-KY-2025-142).

The study used retrospective case materials, including de-identified hospital adverse-event reports, publicly available legal judgments and media reports. All case materials were anonymized prior to analysis to ensure the confidentiality of patients and healthcare staff.

As the study did not involve direct contact with patients and did not collect identifiable personal information, the requirement for informed consent was waived by the ethics committees. The study was conducted in accordance with the principles of the Declaration of Helsinki.

3. Results

3.1 Basic Case Characteristics and Descriptive Statistics

Of the 33 pediatric nurse-patient interaction cases analyzed, 25 (75.8%) developed into disputes (DISPUTE = 1). Among the dispute cases, the severity of conflict showed a graded distribution: mild (e.g., verbal complaint) in 4 cases (16.0% of disputes), moderate (e.g., formal complaint) in 10 cases (40.0%), severe (e.g., threats) in 6 cases (24.0%), and extreme (involving physical violence or legal action) in 5 cases (20.0%). There were 8 non-dispute cases (24.2%), all characterized by relatively harmonious interactions.

Preliminary examination of the distribution of the five condition variables between dispute and non-dispute cases (Table 2) revealed: communication problems (C) were present in the vast majority of dispute cases (14 out of 25); the proportions of technical errors (T), resource/process constraints (R), and family emotional (P) were also higher in the dispute group compared to the non-dispute group; and all extreme conflicts (5 cases) occurred in situations where family emotional (P) and a cognitive discrepancy (E) coexisted.

3.2 Inter-Coder Reliability Test Results

To ensure objectivity of variable calibration, two coders (A and B) independently assigned fuzzy-set membership scores (0, 0.33, 0.67, 1) for the 5 condition variables and 1 outcome variable across all 33 cases. After coding, the agreement between the two coders for each variable per case was calculated.

The overall coding agreement rate was 91.2%. Cohen's Kappa coefficient was 0.87 ($p < 0.001$), indicating "almost perfect" inter-coder reliability. Kappa values for each variable were: T (0.85), C (0.91), R (0.82), P (0.89), E (0.86), all exceeding the common reliability threshold of 0.80, confirming high reliability for each variable's calibration. For cases with disagreements (8.8%), the research team reached a final consensus through the aforementioned negotiation-arbitration mechanism, forming a consistent data matrix for subsequent analysis.

Table 2
Distribution of Condition Variables in Dispute and Non-Dispute Cases (n = 33)

Condition Variable	Category (Membership ≥ 0.67 considered "present")	Total Cases	Dispute Cases (n = 25)	Non-Dispute Cases (n = 8)
Technical Outcome (T)	Problematic (membership ≥ 0.67)	16	15 (93.8%)	1 (12.5%)
	Unproblematic (membership ≤ 0.33)	17	10 (58.8%)	7 (41.2%)
Communication & Attitude (C)	Poor (membership ≥ 0.67)	14	14 (100.0%)	0 (0.0%)
	Good (membership ≤ 0.33)	19	11 (57.9%)	8 (42.1%)
Resource/Process (R)	Constrained (membership ≥ 0.67)	15	14 (93.3%)	1 (12.5%)
	Unconstrained (membership ≤ 0.33)	18	11 (61.1%)	7 (38.9%)
Family State (P)	Dyscontrolled (membership ≥ 0.67)	22	19 (86.4%)	3 (37.5%)
	Stable (membership ≤ 0.33)	11	6 (54.5%)	5 (45.5%)
Expectation Discrepancy (E)	Large discrepancy (membership ≥ 0.67)	20	18 (90.0%)	2 (25.0%)
	Aligned (membership ≤ 0.33)	13	7 (53.8%)	6 (46.2%)

Table 3
Necessity Analysis Results for Dispute Occurrence (DISPUTE)

Condition	Consistency	Coverage
T	0.60	0.60
C	0.56	0.64
R	0.56	0.60
P	0.76	0.86
E	0.72	0.90
~T	0.40	0.47
~C	0.44	0.36
~R	0.44	0.41
~P	0.24	0.22
~E	0.28	0.22
Note: ~ denotes logical negation (absence of the condition).		

3.3 Configurational Analysis of Dispute Occurrence (DISPUTE)

3.3.1 Necessity Analysis

As shown in Table 3, the consistency for all single conditions (and their negations) was below the 0.90 threshold. This indicates that no single factor (e.g., technical error, poor communication, resource scarcity) is a necessary condition for the occurrence of pediatric nurse-patient disputes. Disputes arise from the synergistic effect of multiple factors.

3.3.2 Sufficiency Configurational Analysis

Sufficiency analysis aims to identify combinations of conditions that are sufficient for the outcome (dispute). The analysis revealed three equivalent configurational pathways covering the dispute cases. The overall solution consistency was 0.94, and coverage was 0.72, indicating a good model fit. The specific configurations are shown in Table 4.

Table 4
Sufficient Condition Configurations Leading to Pediatric Nurse-Patient Disputes (fsQCA Results)

Pathway Name & Core Logic	T	C	R	P	E	Raw Coverage	Unique Coverage	Consistency
Pathway 1: Structural Constraint Type Technical failure resonates with systemic bottlenecks	●		●			0.36	0.12	0.93
Pathway 2: Cognitive-Interactive Dysregulation Type Communication breakdown meets high expectations		○			●	0.32	0.08	1.00

● (filled circle): Core causal condition (present in both parsimonious and intermediate solutions).

○ (empty circle): Core causal condition (absent/negated).

Blank: Condition is irrelevant for that pathway (may appear as in the solution but doesn't affect core logic).

Pathway 1 (Structural Constraint Type): Disputes are highly likely when technical failure (T) co-occurs with systemic resource/process constraints (R). For example, failed intravenous cannulation. The technical error undermines the foundation of trust, while systemic bottlenecks amplify family members' and dissatisfaction.

Pathway 2 (Cognitive-Interactive Dysregulation Type): Even if technical aspects are not problematic (T irrelevant), severe communication deficits or oppositional attitudes (~ C), combined with families holding extremely high or unrealistic expectations (E), can still trigger conflict. This pathway highlights that non-technical factors alone can ignite conflict; communication failure allows the cognitive gap to directly transform into opposition.

Pathway 3 (System-Individual Resonance Failure Type): When problems across all five dimensions—technical (T), communication (C), resources (R), family state (P), and expectations (E)—are in an unfavorable state, disputes are almost inevitable (consistency 1.00). This is the most extreme and damaging pathway, representing a collapse of systemic and individual defenses.

3.4 Configurational Pathways for Conflict Escalation and Extreme Outcomes

3.4.1 Conflict Severity Escalation

Taking high severity (SEVERITY ≥ 3, i.e., severe and above) as the outcome, two core escalation pathways were identified (Table 5), with an overall solution consistency of 0.96 and coverage of 0.65.

Pathway A (Emotional-Cognitive Antagonism Type): The combination of poor communication (C), family emotional (P), and a cognitive discrepancy (E) is sufficient to push conflict to a severe level. Antagonism at the interpersonal level combined with irreconcilable cognitive is the main driver of escalation.

Pathway B (System-Interpersonal Dual Failure Type): The simultaneous occurrence of technical failure (T), poor communication (C), and resource constraints (R) represents a dual failure of systemic support and individual communication, triggering comprehensive and intense dissatisfaction and escalation behaviors from the family.

Table 5
Sufficient Condition Configurations Leading to High Conflict Severity (SEVERITY high)

Pathway Name & Core Logic	T	C	R	P	E	Raw Coverage	Unique Coverage	Consistency
Pathway A: Emotional-Cognitive Antagonism Type		●		●	●	0.48	0.22	0.98
Pathway B: System-Interpersonal Dual Failure Type	●	●	●			0.41	0.15	1.00
Overall Solution	Coverage: 0.65 Consistency: 0.96							

● (filled circle): Core causal condition (present in both parsimonious and intermediate solutions).

Blank: Condition is irrelevant for that pathway (may appear as in the solution but doesn't affect core logic).

3.4.2 Necessary and Sufficient Conditions for Extreme Outcomes (Legal/Violence)

When analyzing extreme outcomes (EXTREME = 1), the consistency of family state (P) was 0.92 (> 0.90), indicating that family emotional is a necessary condition for extreme results. Sufficiency analysis identified one highly dangerous pathway (Table 6, consistency 1.00, coverage 0.85):

Pathway X (Violent Conflict Type): When oppositional communication (C) occurs, encountering a completely family member (P), with fundamental cognitive differences (E), the conflict, escalating into legal disputes or violent behavior. In this pathway,

technical and resource conditions are not key; the complete of interpersonal interaction is the ultimate switch extreme consequences.

Table 6
Sufficient Condition Configuration Leading to Extreme Outcomes (EXTREME)

Pathway Name & Core Logic	T	C	R	P	E	Raw Coverage	Unique Coverage	Consistency
Pathway X: Violent Conflict Type		●		●	●	0.85	0.85	1.00
Overall Solution	Coverage: 0.85 Consistency: 1.00							

● (filled circle): Core causal condition (present in both parsimonious and intermediate solutions).

Blank: Condition is irrelevant for that pathway (may appear as in the solution but doesn't affect core logic).

4. Discussion

This study, using fsQCA, systematically reveals the multiple conjunctural causal logic underlying the generation and escalation of pediatric nurse-patient conflicts from a configurational perspective. The findings demonstrate that such conflicts are not the linear result of a single factor but the product of resonance among multiple factors—technical, communicative, resource-related, familial emotional, and expectancy-related—combining in specific "recipes" within particular contexts.

4.1 Empirical Validation of the "Swiss Cheese Model" in Conflict Genesis

The primary theoretical contribution of this study is the empirical demonstration that the mechanisms of pediatric nurse-patient conflict align closely with Reason's "Swiss Cheese Model" [22–23]. This model posits that systemic safety holes are like the holes in multiple layers of cheese; when the holes in each layer align at a specific moment, the accident trajectory penetrates the defenses, leading to adverse events [24–25]. The multiple causal logics revealed in our study provide a nuanced empirical for this classic model:

Pathway 1 (Structural Constraint Type: T●R●): Illustrates how the alignment of "holes" at the individual technical level (e.g., failed cannulation) with those at the organizational/system resource level (e.g., understaffing, long waits) in time and space the risk chain, leading to a dispute. Therefore, solely blaming nurses for technical errors is and inefficient [26–27]. Management's responsibility lies in "filling" the organizational layer's "holes" through optimized scheduling and improved support systems, there by the path from individual error to conflict.

Pathway 2 (Cognitive-Interactive Dysregulation Type: ~C●E●): Reveals that even with no "hole" at the technical level (T irrelevant), conflict can still occur when "holes" at the communicative interaction layer (communication or opposition) align with those at the family cognitive expectation layer (unrealistic expectations). This underscores that in pediatric care—a field heavily reliant on emotional and informational exchange—communication itself constitutes an independent, critical layer of defense [28–29]. Our study, through configurational analysis, clarifies which combinations of "holes" are most dangerous, providing a "map" for implementing precise risk stratification management.

4.2 The "Buffer Effect" of Communication and the Logic of Causal Asymmetry

Another core finding is the revelation, through fsQCA's causal asymmetry analysis, that the configurations leading to conflict are not simple mirrors of those preventing it [31]. While poor communication (~C) is a core driver triggering multiple conflict pathways, the analysis revealed that good communication (C) appears as a key protective condition in numerous non-conflict cases. This suggests that communication plays a crucial "Buffering Effect" role in pediatric nurse-patient interactions [32]. Given that resource scarcity (R = 1) in pediatric healthcare is often a reality difficult to change in the short term, communication skills—including proactive information sharing, effective empathetic expression, and standardized communication processes (e.g.,

SBAR)—can serve as a powerful "soft compensation" mechanism^[33–34]. They can significantly reduce the rate at which environmental pressures (e.g., waiting anxiety) family emotions and cognitive gaps caused by information asymmetry or professional barriers (E), thereby inhibiting the and escalation of conflict at its source. This finding elevates the value of communication from "good service" to a "key component of systemic resilience," emphasizing the necessity for systematic enhancement of nurses' communication competencies^[35].

4.3 The Emotional Dynamics of Conflict Escalation: From Cognitive Dissonance to Behavioral Outburst

Based on the analysis of escalation and extreme outcomes, this study highlights the central driving role of emotional factors in conflict evolution. We found that the necessary condition for the most severe conflicts (e.g., violence, legal action) is family emotional (P), and the sufficient pathway (Pathway X: C●P●E●) involves the ternary of "oppositional communication," "emotional dysregulation," and "fundamental cognitive discrepancy." This aligns with perspectives from the sociology of emotion, suggesting that when individuals perceive their "claims for respect" (not being treated respectfully by the nurse, ~C) and their "safety needs" (expectations for the child's health not being met, E) are simultaneously threatened or ignored, it triggers intense moral outrage and defensive aggression^[36]. This implies that during conflict escalation, mere "fact clarification" may be insufficient to de-escalate the situation. The focus of nursing management and crisis intervention must shift forward and towards "emotional de-escalation." This requires nurses and managers to identify early signs of emotional outbursts and master professional de-escalation techniques such as active listening, emotional validation, and offering limited choices, aiming first to stabilize emotions and basic respect before addressing the specific problem.

4.4 Management Implications: From Fragmented Responses to Resilience Governance Based on Configurational Pathways

Based on the configurational findings, we propose a systematic, graded resilience governance framework to replace traditional approaches:

Interruption Strategy for "Structural Risk" (T●R●): Establish a "resource-technique" mechanism. When the department is detected to be in a high-load operational state (resource constraint R = 1), the system should automatically trigger an alert to proactively prevent risk by temporarily assigning more senior nurses, postponing non-urgent procedures, or activating backup processes, thereby avoiding high-risk or technically difficult procedures during this vulnerable period^[37].

Prevention Strategy for "Cognitive-Interactive Risk" (~C●E●): Implement "structured expectation management" proactively throughout the care process. Upon admission and before key treatment nodes, use visual aids, standardize and other tools to proactively and clearly communicate with families about the limitations of medical plans, potential risks, and uncertainties. This aims to calibrate their expectations (managing E) and establish a rational basis for subsequent communication^[38].

Building Competency Systems Centered on "Communication and Emotional Resilience": Integrate "high-difficulty communication," "compassion fatigue management," and "crisis emotional de-escalation" into mandatory core competency training and assessment for pediatric nurses. Through simulation training, case workshops, and other formats, cultivate a resilient nursing team proficient not only technically but also in effective emotional labor and interpersonal crises under pressure.

4.5 Limitations and Future Research

This study has several limitations. First, the retrospective case study design all details and dynamic processes of conflict interactions. Second, although fuzzy-set calibration underwent rigorous reliability testing, it inevitably involves some degree of subjective judgment. Third, the sample is primarily derived from the Chinese context, and the cross-cultural generalizability of the findings requires further testing.

Future research could delve deeper in the following directions:

- (1).Longitudinal and Real-Time Observation: Employ longitudinal designs or real-time observation methods, combining video analysis and Temporal QCA (TQCA), to dynamically capture the trajectory and critical time windows of conflict from to escalation to resolution .
- (2).Cross-Cultural Comparative Studies: Expand the sample scope to conduct cross-national, cross-regional, and cross-cultural comparative studies to test the robustness and boundary conditions of the configurational model identified here.
- (3).Research-to-Practice Translation: Promote the translation of findings into practice by developing the configurational analysis results into digital risk assessment tools or intervention bundles for direct use by clinical managers, enabling evidence-based.

5. Conclusion

This study, using fsQCA, systematically reveals the multiple conjunctural causal mechanisms underlying the occurrence and escalation of pediatric nurse-patient disputes. Conflicts do not stem from single defects but are the synergistic result of multiple factors—technical, communicative, resource-related, familial state, and expectations—acting together in specific configurations. The study identified three typical risk pathways: "structural constraint," "cognitive-interactive dysregulation," and "systemic resonance failure." It also found that good communication and technical skills are key protective factors and risk buffers. These findings suggest that building harmonious nurse-patient relationships in pediatrics requires abandoning fragmented management thinking and adopting systemic resilience governance strategies based on a socio-ecological model. Hospital managers must simultaneously focus on enhancing nurses' individual competencies, optimizing the organizational support environment, and guiding reasonable societal medical expectations. This multi-dimensional approach is essential to the nurse-patient safety, ultimately safeguarding child safety, maintaining nurse well-being, and enhancing the overall resilience of the healthcare service system.

Abbreviations

fsQCA
Fuzzy-set Qualitative Comparative Analysis
DISPUTE
Nurse–patient dispute occurrence
EXTREME
Extreme conflict outcome

Declarations

Ethics approval and consent to participate

This study was approved by the Biomedical Ethics Committee of Dalian Medical University (Approval No. 2025-043) and the Medical Ethics Committee of Dalian Women and Children's Medical Center (Group) (Approval No. FEJT-KY-2025-142).

The requirement for informed consent was waived by the Biomedical Ethics Committee of Dalian Medical University and the Medical Ethics Committee of Dalian Women and Children's Medical Center (Group) because this study used anonymized retrospective case materials and did not involve direct patient contact or identifiable personal information.

All procedures performed in this study were conducted in accordance with the Declaration of Helsinki.

6.3 Consent for publication

Not applicable.

6.4 Availability of data and materials

The data that support the findings of this study are available from the corresponding author upon reasonable request.

6.5 Competing interests

The authors declare that they have no competing interests.

6.6 Funding

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6.7 Author Contributions

Qian Xu, Anni Wu and Bolun Zhao were responsible for study design, data analysis, and manuscript drafting. Yi Li, Yu Zhang, Qian Xu and Yang Xu collected the data; Bolun Zhao also provided guidance and revised the manuscript.

6.8 Acknowledgments

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