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About the Journal

Child Health Nursing Research (CHNR) is the official peer-reviewed research journal of the Korean Academy of Child Health Nursing. CHNR is a multidisciplinary, double-blind peer-reviewed, open-access journal that publishes original research, theory, and review papers on health care and nursing from the beginning of life to young adulthood, including both children and their families. It is devoted to all fields of child health, including global and cultural issues, aimed at both domestic and international healthcare professionals. The journal is published quarterly (Jan 31, Apr 30, July 31, and Oct 31) in English. The journal welcomes submissions from healthcare professionals around the world, and encourages the submission of papers dealing with cultural issues and those studied by international research teams.

- Indexed in major databases: PubMed Central, PubMed, Scopus, CINAHL, DOAJ, Crossref Metadata, Google Scholar, ScienceCentral, KCI (Korea Citation Index), RISS, KoreaMed, and KoMCI.
- Its abbreviated title is Child Health Nurs Res.
- Open access: All articles published in the journal are freely available with an open access license for everyone to read and download from the CHNR website (http://www.e-chnr.org/) immediately and permanently after publication.

Aims and Scope

Child Health Nursing Research aims to promote the health, development, and well-being of children and their families in Korea and all over the world by providing research on evidence-based practices.
Its scope includes the most recent clinically and academically relevant topics in health care and nursing from the beginning of life to young adulthood, including both children and their families. The journal deals with articles that address research, theory, and practice in a wide range of child health nursing areas and relevant cultural issues. Its regional scope is mainly Korea, but it welcomes submissions from researchers and nurses worldwide.
The primary readers of this journal are healthcare professionals, administrators and scientists serving newborns, infants, children, adolescents, young adults, and their families, including nurses, midwives, physicians, developmental specialists, public health workers, scientists, educators, epidemiologists, and other health caregivers.
The ultimate goal of *Child Health Nursing Research* is to develop a body of knowledge on the health of newborns, infants, children, adolescents, young adults, and their families while improving the clinical field and community with evidence-based practices to promote the health of children and families all over the world.

Manuscripts should be submitted via the online Manuscript Central website (http://www.e-chnr.org). Other correspondences can be sent by an e-mail to the Editor, Dr. Yunsoo Kim, Department of Nursing, Catholic Kwandong University, Gangneung, Korea (Tel: +82-33-649-7614, Fax: +82-33-649-7620, e-mail: agneskim@cku.ac.kr).

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EDITORIAL

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CHNR

Becoming a skilled reviewer: elevating expertise in Child Health Nursing Research

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To become a competent reviewer for *Child Health Nursing Research* (CHNR), it is essential to thoroughly understand and adhere to the standards and procedures required by the journal. Reviewers should evaluate research in a fair andccurate manner and be able to contribute to the advancement of knowledge. Herein, we will cover the key points to consider in order to become a competent reviewer for CHNR.

1. Understanding the Scope and Aims of CHNR

As a review for CHNR, it is crucial to critically assess whether the study's target population aligns with the journal's scope and aim. This evaluation involves confirming that the research focuses on children and their families, covering an appropriate age range from newborns to young adults. The inclusion criteria must accurately reflect this demographic scope to ensure the study population is relevant to child health nursing. Reviewers are also tasked with determining whether the research addresses significant issues that impact child health and the factors influencing these outcomes. Specifically, the paper should explicitly discuss health issues pertinent to children and their families, highlighting the unique needs of these groups within the context of CHNR's mission.

Although CHNR primarily emphasizes research within the Korean cultural context, it is receiving an increasing number of submissions from international researchers. Therefore, reviewers must possess both the knowledge and cultural sensitivity required to assess studies from diverse cultural backgrounds effectively. A nuanced understanding of child health practices across various regions and cultures enables a more comprehensive and impartial review process. While maintaining CHNR's strong focus on Korean cultural contexts, reviewers should also be prepared to evaluate international submissions through a culturally informed yet objective lens. This approach ensures that research is assessed fairly, regardless of the cultural, racial, or socioeconomic background of the population studied.

Many articles submitted to CHNR focus on child health issues across a variety of racial, ethnic, and socioeconomic groups. Cheng et al. [1] highlight that health disparities linked to race, ethnicity, and socioeconomic status (SES) often continue into adulthood, and these disparities are more strongly associated with social determinants than biological factors. Thus, reviewers must ensure that studies examining these variables are robustly designed and precisely interpreted. This involves carefully examining how race, ethnicity, and SES are defined and measured in the research. Additionally, reviewers should evaluate whether the study's findings can be generalized to a broader context, especially for children from diverse social and cultural backgrounds. The research should address health disparities and offer insights into both the social and biological factors that contribute to these disparities.

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When evaluating submissions to CHNR, reviewers should focus on the scientific rigor of the study. This includes determining whether the selection of variables is appropriate and whether the interpretation of results accurately reflects the complexity of factors that influence child health. It is particularly important to assess the extent to which the study addresses significant disparities in child health. For multinational or cross-cultural studies, reviewers must consider how well the findings are contextualized to each country's unique social and economic conditions. This is crucial when interpreting results from diverse populations, as it is essential to strike a balance between biological and social determinants of health. Ultimately, the findings should be presented within a broader context that considers their potential applicability across different cultural and social environments.

By adhering to these guidelines, CHNR reviewers can ensure that the studies they evaluate are scientifically sound, culturally sensitive, and significantly contribute to the advancement of child health nursing research.

2. Objective Assessment: Elements of the Manuscript and Quality Evaluation

CHNR requires authors to adhere to reporting guidelines from the EQUATOR Network [2], a global initiative aimed at enhancing the transparency and accuracy of health research reporting. This adherence depends on the specific type of study design used. Such a policy ensures consistency and quality across publications. During the review process, reviewers are expected to identify the study design employed and assess the manuscript according to the relevant reporting guidelines. It is imperative that each paper is structured and its content tailored to suit its specific study design.

Reporting Guidelines for Specific Study Designs

- Observational cohort, case-control, and cross-sectional studies
Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)
Meta-analysis of Observational Studies in Epidemiology (MOOSE)
- Qualitative studies
Consolidated Criteria for Reporting Qualitative Research (COREQ)
Standards for Reporting Qualitative Research (SRQR)
- Quasi-experimental/non-randomized trials
Transparent Reporting of Evaluations with Non-randomized Designs (TREND)
- Randomized (and quasi-randomized) controlled trials
Consolidated Standards of Reporting Trials (CONSORT)
- Study of Diagnostic accuracy/assessment scale
Standards for the Reporting of Diagnostic Accuracy Studies (STARD)
- Systematic Review and meta-analysis
Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA)
Meta-analysis of Observational Studies in Epidemiology (MOOSE)
- Quality improvement studies
Standards for Quality Improvement Reporting Excellence (SQUIRE)

CHNR reviewers are tasked with assessing the originality and relevance of the topic and purpose from the introduction of the paper. They must also ensure that the supporting literature is both appropriate and current. Furthermore, reviewers are responsible for evaluating whether the theoretical framework and methodology employed in the study are scientifically sound and well-suited to the research objectives. The evaluation of the paper primarily focuses on its originality, appropriateness, relevance, and scholarly value. Reviewers provide feedback by identifying the study's strengths and suggesting areas for improvement. This feedback is crucial for enhancing the quality of the author's work. To support their evaluations, reviewers should reference the literature cited in the submitted paper and offer well-founded feedback on the research. It is important that the feedback be both constructive and detailed to facilitate improvements in the quality of the submitted manuscript.

Good General Comment

Ex: *"This manuscript addresses an important and timely topic in child health nursing, particularly in pediatric care in underserved populations. The research question is well-defined, and the study provides valuable insights into applying qualitative methods to explore family perspectives. The methodology is appropriate, and the findings are presented in a clear and structured manner. However, further elaboration on the theoretical framework and its application to the study findings would strengthen the overall contribution of the research. Expanding the discussion to include more recent literature would enhance the study's relevance."*

Why is it good?

This comment is constructive and provides a balanced evaluation. It highlights the paper's strengths and offers specific, actionable suggestions for improvement. It acknowledges the paper's contributions while suggesting areas for further development.

The reviewer's feedback is categorized into general and specific comments. Specific comments are further divided into significant and minor comments. It is advisable for the reviewer to begin with general comments, which serve as an overall evaluation of the paper, followed by specific comments that provide detailed evaluations.

Significant comments in the review should detail the primary content improvements needed in the paper, spanning from the introduction to the discussion and conclusion. These improvements should address both conceptual and methodological issues. The discussion and conclusion sections should particularly emphasize the necessity for further explanations, verifications, or extensions that could enhance the research's contribution. Minor comments are generally adequate. However, it is advisable for minor comments to focus on increasing the academic value of the paper by encouraging authors to improve aspects such as language and clarity.

Good Major Comment

Ex: *"The study presents a valuable exploration of the impact of health education on pediatric asthma management. However, the sampling strategy is a major concern in the methodology section. The paper mentions a 'convenience sample,' but a further explanation of how participants were selected and whether this sampling method may have introduced bias is necessary. Additionally, the rationale for the sample size is unclear – providing a power calculation or justification for the number of participants would strengthen the validity of the findings. Moreover, it would be beneficial to include a more detailed description of the intervention to enhance the reproducibility of the study. Addressing these issues will significantly improve the study's methodological rigor and credibility."*

Why is it good?

This comment is specific, constructive, and detailed. It identifies an apparent methodological concern, explains why it is important, and provides actionable suggestions on how the author can address it. The comment maintains a professional tone and focuses on improving the research quality.

Writing feedback can be considered the essence of reviewing papers since high-quality feedback provides authors valuable insights that can strengthen their work. It also serves as a crucial communication channel between reviewers and authors, making it imperative to craft review comments with politeness. Constructive feedback not only facilitates peer mentoring but also promotes scholarly development and improves the quality of research in pediatric nursing. Additionally, it plays a vital role in fostering high-quality research. To support this, CHNR reviewers should consistently update their knowledge of emerging research trends and methodologies by engaging with the latest literature.

In other words, CHNR reviewers should check whether submissions align with the journal's aims and scope, ascertain whether manuscripts comply with reporting guidelines, and provide evidence-based feedback.

Dear CHNR reviewers, you play a crucial role in the academic advancement of child health nursing research and the journal's success. Fair and thorough reviews enhance the quality of research and provide credibility to the academic community. When reviewing each paper, please maintain fairness and honesty and approach the task with an open mind that is sensitive to and respectful of diverse cultural backgrounds. Your constructive feedback is invaluable to the authors and serves as a catalyst for the advancement of child health nursing. Please take pride in your significant role in advancing knowledge and continue to develop your skills while staying informed about new research trends.

ARTICLE INFORMATION

Authors' contribution

All the work was done by Yunsoo Kim.

Conflict of interest

Yunsoo Kim has been the editor-in-chief of *Child Health Nursing Research* since 2022. She was not involved in the review process of this editorial. No existing or potential conflict of interest relevant to this article was reported.

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Data availability

Please contact the corresponding author for data availability.

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REVIEW ARTICLE

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CHNR

The effect of peer tutoring on pediatric nursing education: a systematic review

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Purpose: This study aimed to systematically review studies on the effect of peer tutoring on pediatric nursing education for nursing students and identify its contents and characteristics. **Methods:** A comprehensive search was conducted from November to December 2023 across databases including PubMed, Embase, CENTRAL, CINAHL, ProQuest, and others. We included both published and unpublished literature in English or Korean. Three reviewers independently screened and selected eligible studies that involved undergraduate nursing students participating in peer tutoring programs focused on pediatric nursing education. We analyzed quantitative outcomes related to learning effects and learner responses. The quality of the studies was assessed using the revised Cochrane risk-of-bias tool for randomized trials and the risk of bias assessment tool for non-randomized studies. **Results:** Five studies were reviewed, encompassing randomized controlled trials, a non-randomized controlled trial, a cohort study, and a before-after study. These interventions were conducted in school settings or pediatric clinical environments and featured different forms of peer teaching: horizontal, near-peer, and reciprocal. The tutor-to-tutee ratios ranged from 1:3 to 1:36.5. The educational content covered nursing care for major neonatal diseases, communication skills, medication administration, and resuscitation techniques. Significant improvements in cognitive knowledge and communication skills were observed among nursing students. However, there was noticeable variability in the design and reporting of the studies. **Conclusion:** Peer tutoring programs can effectively enhance pediatric nursing education by improving nursing students' knowledge and skills. For future meta-analyses, more studies in this field reported according to reporting guidelines are needed.

Keywords: Child health; Pediatric nursing; Peer group; Students, nursing

INTRODUCTION

Nursing students must apply their theoretical knowledge of pediatric nursing in clinical settings to develop into competent nurses capable of independently caring for child patients [1]. Children have underdeveloped physical functions compared to adults, which significantly increases their risk of complications from infections and injuries. Therefore, children receiving care require precise and meticulous nursing [2].

Nursing students acquire clinical decision-making skills and integrate knowledge and skills through instruction from nursing faculties or clinical instructors. They also gain first-hand experience with job capabilities and interpersonal interactions. Consequently, the development of nursing students' practice competency is significantly shaped by nursing educators [3]. However, clinical instructors often face an overwhelming workload and feel limited in their ability to provide effective practicum instruction [4]. Nursing students

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may be reluctant to engage with nursing educators due to fears of receiving negative evaluations [5]. To improve students' capacity to apply theoretical nursing knowledge in practical settings, nurse educators have employed a variety of teaching strategies [6].

Peer tutoring has been effectively implemented for nursing students, where tutors assist tutees in adapting to efficient learning strategies [7,8]. It is characterized by individuals from similar social groups, who are not professional educators, helping each other learn while also enhancing their own understanding through the act of teaching [9]. This approach is distinct from peer mentoring, which involves a one-on-one relationship that provides encouragement and support from someone more experienced. Peer tutoring specifically requires participants to assume designated roles, focuses heavily on curriculum-based content, and follows clearly established procedures for interactions between tutors and tutees [10].

It has been suggested that simply preparing to be a peer tutor can enhance cognitive processing in the tutor by increasing their focus and motivation to complete tasks, as well as requiring them to revisit their previous knowledge and skills [9]. Nursing student tutors found that engaging in peer tutoring not only boosted their learning capacity but also motivated them to pursue further learning [11]. Tutors created a supportive and non-threatening learning environment where tutees were able to effectively absorb knowledge [8]. Therefore, peer tutoring has been shown to help tutees overcome their academic challenges [12].

Despite the reported benefits of peer tutoring, several shortcomings have been identified, including tutor inefficiency and tutee dependency [5,12]. Additionally, peer tutoring has not been effective in reducing anxiety or enhancing self-efficacy among students [13]. Furthermore, the majority of peer tutoring studies have focused on qualitative research [7,8,12,14]. Therefore, the effects of peer tutoring in nursing education need to be comprehensively evaluated.

This study systematically reviewed research on the impact of peer tutoring in pediatric nursing education and explored the topics and content delivered through this method.

METHODS

Ethical statements: This study is a literature review of previously published studies and was therefore exempt from Institutional Review Board approval.

This study was conducted to answer the research question, "What is the impact of using peer tutoring in pediatric nursing education for nursing students?" The research was carried out in accordance with the research protocol registered in PROSPERO (No. CRD42023399026) and reported following the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 [15].

1. Eligibility Criteria

To clearly establish the eligibility criteria, five key articles related to the research question were analyzed. The specific eligibility criteria are presented in Table 1 and are as follows: 1) The tutees were undergraduate nursing students, and the tutors were peers or near-peers, including undergraduate or graduate nursing students; 2) the intervention involved peer mentoring with clearly defined roles for both tutor and tutee, and included education on the knowledge and skills required for pediatric nursing; 3) outcome measures included quantitative results regarding the learner's learning effects in cognitive, psychomotor, and affective domains, or individual responses to the education; 4) the study designs encompassed quantitative methodologies that presented quantitative outcomes of the intervention, regardless of the presence of a control group; 5) additionally, studies must be published in English or Korean.

2. Search Strategy

For an extensive search, the COre, Standard, Ideal search (COSI) model [16] was followed in selecting the sources. The Core search accessed databases such as PubMed, Cochrane Central Register of Controlled Trials (CENTRAL), Embase, KMbase, and the Korean Studies Information Service System (KISS). The Standard search included the Cumulative Index to Nursing Allied Health Literature (CINAHL) and Research Information Sharing Service (RISS) databases. For the Ideal search, unpublished literature was sourced from the ProQuest and RISS databases, and reference lists from the selected studies were thoroughly reviewed. The studies retrieved were managed using EndNote 21 (Clarivate), where duplicate records were identified and removed. This phase of the project spanned from November 26, 2023, to December 30, 2023. The search strategy incorporated MeSH terms, Emtree terms, and relevant natural language expressions. The main keywords were selected according to the population, inter-

Table 1. Eligibility Criteria

Categories	Inclusion criteria	Exclusion criteria
Population	•Tutees: undergraduate nursing students •Tutors: nursing undergraduates or graduate students	•Tutees: not undergraduate nursing students •Tutors: undergraduate or graduate students in non-nursing healthcare fields, healthcare professionals
Intervention	Interventions that satisfy the following two criteria: •An intervention utilizing peer or near-peer education where the roles of tutor and tutee are clearly distinguished •Includes theoretical or practical training that covers the knowledge and skills necessary for child nursing	•Interventions where the roles of tutor and tutee are not distinguished and learning occurs (e.g., interprofessional education, team-based learning) •Interventions that do not include child nursing in the educational content
Comparator	•Education provided by faculty and professionals (healthcare providers), e-learning, self-directed learning, or no treatment •Includes single-group studies without a comparison group	-
Outcomes	Includes any of the following quantitative outcomes: •Three levels of learning effects, including the cognitive, affective, and psychomotor domains •Individual responses to education, such as comfort, anxiety, and satisfaction	•Qualitative data such as learners' perceptions and meanings related to their educational experiences
Study design	•Randomized controlled trials •Quasi-experimental study •Cohort study •Before-after study •Mixed methods study	•Methodological study •Descriptive study •Qualitative study •Reviews •Conference abstracts •Editorials
Others	•Studies published in Korean or English •No restrictions on the year of publication	•Studies written in languages other than English or Korean

vention, comparison, and outcome (PICO) elements and were as follows: "students, nursing," "peer group," and a range of terms related to pediatric nursing such as "pediatric nursing," "pediatrics," "neonatal nursing," "newborn nursing," "maternal-child nursing," "maternal child health care," "child health," "family nursing," and "family centered care."

3. Study Selection and Data Extraction

All authors participated in the literature selection process, which involved an initial review of titles and abstracts to identify potential studies. This was followed by a full-text review to determine their final eligibility based on the established criteria. Data extraction was conducted using a predefined data coding form. One author (BRL), performed the extraction, while another (HA), reviewed the extracted data. The data coding form captured general information about the study, characteristics of tutors and tutees, sample size, education topic, learning contents, tutoring method, preparatory tutor training, outcome measures, and key conclusions. Any disagreements that arose during the literature selection and data extraction processes were resolved through discussion until a consensus was reached among the researchers.

4. Quality Evaluation

The quality assessment tools used were the revised Cochrane risk-of-bias tool for randomized trials (RoB-2) [17] and the risk of bias assessment tool for non-randomized studies (RoBANS) [18]. Two researchers (HA, BRL) independently conducted the quality assessment. The inter-rater reliability for the quality assessment, measured by Cohen's kappa, was 1, indicating "almost perfect" reliability [19].

5. Measures of Intervention Effect and Reporting Biases

Due to the diversity of outcomes reported in the analyzed studies, no single outcome was consistently reported by three or more studies; consequently, the effect size was not pooled [20]. Therefore, the mean difference (MD) and 95% confidence interval (CI) for the experimental and control groups were calculated and presented for each individual study.

Because the number of selected studies (N=5) was small, a funnel plot could not be used to assess reporting bias [21].

RESULTS

1. Study Selection

The process of selecting studies was presented using a PRISMA flow chart (Figure 1). Initially, a systematic literature search was conducted across various databases, resulting in the identification of 1,605 studies after duplicates were removed. Following a review of the titles and abstracts, nine articles were chosen for a full-text review. During this phase, four articles were excluded, leaving five studies for further analysis. Additionally, the gray literature was explored, yielding 1,591 entries. Duplicates from previously searched literature, totaling 77, were also removed. Including references cited in the selected studies (n=149), a total of 1,663 titles and abstracts underwent review. At the title and abstract screening stage, 1,653 were excluded, leaving 10 for full-text review. However, none of these 10 met the selection criteria. Consequently, a final total of five studies were selected for analysis [22-26].

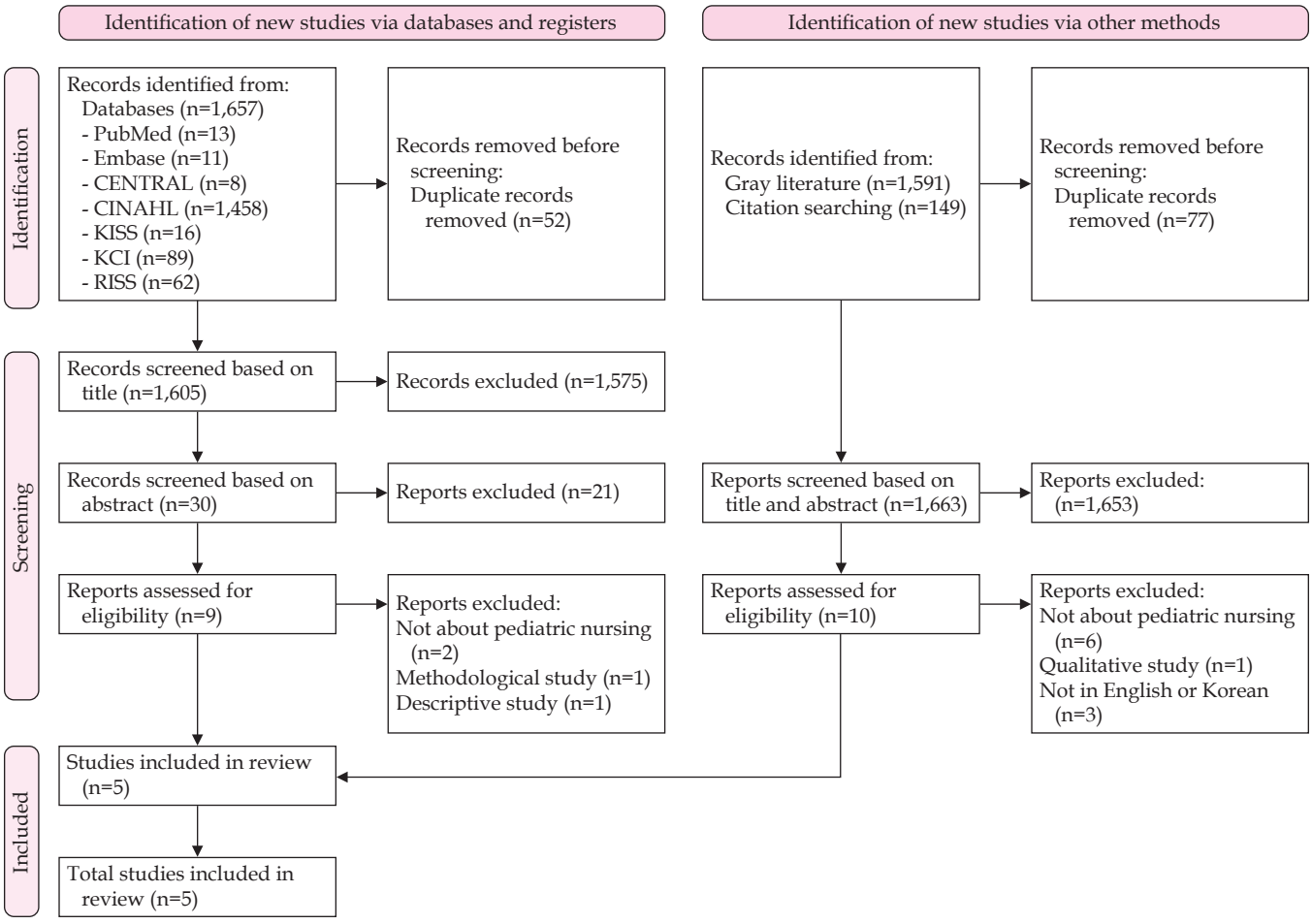

Figure 1. Flow diagram of the screening process. CENTRAL, Cochrane Central Register of Controlled Trials; CINAHL, Cumulative Index to Nursing Allied Health Literature; KISS, Korean Studies Information Service System; KCI, Korea Citation Index; RISS, Research Information Sharing Service.

2. Characteristics of the Included Studies

The characteristics of the selected studies are presented in Table 2. The studies were published from 2010 to 2023 and were conducted in the United States, United Kingdom, Iran, India, and Turkey, with one study from each country. Three studies were conducted in school settings [22,25,26], while two studies were carried out in pediatric clinical settings [23,24]. The two studies conducted in clinical settings were randomized controlled trials (RCTs) [23,24], while the remaining studies included a non-randomized controlled trial (NRCT) [22], a cohort study [25], and a one-group before-after study [26].

The number of participants (tutees) ranged from 24 to 143. Two studies targeted third-year students [22,24], one study focused on fourth-year students [23], and another study included second-year students [26]. One study targeted nursing students at risk of failing major courses, regardless of

Table 2. Characteristics of the Included Studies and Summary of Findings

Authors (year), Country	Study design/ Setting	Tutees		Tutors		Comparison	Outcomes (tool)-MD (95% CI)
		Level	Number	Level	Number		
Bhele et al. (2015) [22]; India	NRCT/College of nursing	Third-year students	Exp. 37 Cont. 48	Undergraduate students	NR	FT, Conventional lecture	Knowledge (tool developed by researchers) ↑*-MD 20.02 (95% CI 17.54 to 22.50)
Cheraghi et al. (2021) [23]; Iran	RCT/Pediatric clinical setting	Fourth-year students	Exp. 51 Cont. 52	Post-graduate students in pediatric nursing	2	FT, Usual pediatric practicum education with a nursing educator	Communication skills with children (nurse-hospitalized child communication skills) ↑*-MD 10.72 (95% CI 8.87 to 12.57) Communication skills with parents (nurse-parent communication skills) ↑*-MD 8.99 (95% CI 7.51 to 10.47)
Öztürk Şahin et al. (2023) [24]; Turkiye	RCT/Pediatric clinical setting	Third-year students	Exp. 73 Cont. 70	Graduate students in the department of pediatric nursing	2	ET, Mentoring provided by the nurse	Self-efficacy in pediatric medication administration (MASSCNS)-MD 1.72 (95% CI -2.05 to 5.49) Clinical comfort and worry (PNSCCWT) -Comfort: MD 0.16 (95% CI -0.95 to 1.27) -Worry: MD 0.19 (95% CI -1.18 to 1.56)
Robinson and Niemer (2010) [25]; USA	Cohort study (using posttest scores only)/ School of nursing	Undergraduate students (risk for nonsuccess in major)	Exp. 97 Cont. NR	Undergraduate students	NR	Did not apply PMTP	Exam performance ↑*-Unable to calculate[a]
Valler-Jones (2014) [26]; UK	One-group before-after study/School of nursing	Second-year students	Exp. 24 Cont. none	Second-year students	24	None	Confidence and competence in caring for a critically ill child (tool developed by researchers) ↑*-Unable to calculate [a),b)] Satisfaction (NR)-Unable to calculate [a),b)]

[a)]Due to insufficient reporting; [b)]One group study; CI, confidence interval; Cont., control group, ET, expert teaching; Exp., experimental or exposure group; FT, faculty teaching; MASSCNS, Medication Administration Self-efficacy Scale in Children for Nursing Students; MD, mean difference; NR, not reported; NRCT, non-randomized controlled trial; PMTP, peer mentor tutor program; PNSCCWT, Pediatric Nursing Students Clinical Comfort and Worry Tool; RCT, randomized controlled trial; UK, United Kingdom; USA, United States of America. Reporting statistical significance: ↑* Increase and a statistically significant result.

year [25].

Two studies utilized control groups that received lectures or instructions from faculty [22,23], one study compared the effects with a mentoring group led by nurses (healthcare professionals) [24], and one study used a control group that received no treatment [25]. There was also one study with a single group and no control group [26].

3. Characteristics of Peer Tutoring

The characteristics of the interventions are presented in Table 3. Two studies structured their interventions around theoretical models. One implemented a cooperative group approach, drawing on cooperative learning theory [25], while the other employed peer tutoring within simulation education, guided by situational learning theory [26].

Regarding educational topics, two studies focused on the cognitive domain, addressing subjects such as pediatric nursing theoretical courses [25] and nursing care for major neonatal diseases [22]. Three studies examined the educational effects in the psychomotor and affective domains, concentrating on communication skills with hospitalized children and their parents [23], medication administration skills for pediatric patients [24], and neonatal and pediatric resuscitation [26].

Two studies provided horizontal peer teaching (HPT), where both tutees and tutors were undergraduates [22,25]. Two studies employed near-peer teaching (NPT) with graduate students as tutors [23,24]. The remaining study used reciprocal peer teaching (RPT), allowing participants to alternate between tutor and tutee roles [26]. Except for one study (insufficient reporting) [22], all were group programs, with tutor-to-tutee ratios ranging from 1:3 to 1:36.5. In the study by Valler-Jones [26], the tutor group supported tutees' learning, resulting in a ratio of 4:8. The duration of tutoring varied from one day to one semester, employing methods such as feedback and comments (n=3), role-modeling (n=2), explanation (n=1), support and assistance (n=1), and debriefing (n=1).

In four studies, tutors were recruited through voluntary applications, while in one study, tutors were assigned by the faculty [22]. Three of these studies established specific criteria for selecting tutors, all of whom were chosen based on their high academic or test performance [22,23,25]. Each study also provided comprehensive training for the tutors. This training included role-play activities [23], education on the concepts, purposes, and roles of mentoring [24,25], and development of simulation scenarios and skill training [26]. The duration of tutor training was approximately 120 minutes [23,24].

Three studies reported that faculty monitored the peer tutoring process. Faculty observed the tutoring in two studies [23,26], and the study by Valler-Jones [26] provided a final debriefing after the observation. Robinson and Niemer [25] maintained continuous communication with tutors throughout the semester, reviewed documents summarizing the tutoring activities, and supplied the most current learning materials through an online learning platform.

4. Outcomes of the Peer Tutoring

We identified learning effects and individual responses as the primary outcomes of peer tutoring. These outcomes, together with the tools and statistical measures employed for assessment, are presented in Table 2.

Learning effects were measured in all studies. Among the three domains of learning effects, the cognitive domain included measurements of knowledge, school exam scores, and grade point average (GPA) [22,25]. In the study by Bhele et al. [22], knowledge was measured on the 12th day after the intervention, and the MD improved to 20.02 (95% CI 17.54 to 22.50). Robinson and Niemer [25] reported significantly higher exam scores in the tutoring group; however, due to insufficient reporting of statistics, the MD could not be calculated. The effects in the affective and psychomotor domains included improvements in communication skills, self-efficacy in pediatric medication administration, and confidence and competence in caring for critically ill children [23,24,26]. Peer tutoring positively affected communication skills with hospitalized children (MD=10.72, 95% CI 8.87 to 12.57) and their parents (MD=8.99, 95% CI 7.51 to 10.47) [23]. Although positive effects on confidence and competence in caring for critically ill children were reported, the MD could not be calculated due to insufficient statistical reporting, and these results were measured in a single group [26]. In the study by Öztürk Şahin et al. [24], no significant difference in MD was found in self-efficacy in pediatric medication administration when compared to the nurse-mentoring group.

Learners' responses were measured in two studies [24,26]. In the study by Öztürk Şahin et al. [24], clinical comfort and worry showed no significant differences in MD between the groups when compared to the nurse-mentoring group. In the study by Valler-Jones [26], educational satisfaction was mea-

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Table 3. Characteristics of Peer Tutoring

Authors (year)	Model or theory	Educational topics	Tutoring		Frequency (duration)	Tutor		Faculty monitoring
			Type (GP ratio)	Method		Recruitment/ Criteria	Training (frequency)	
Bhele et al. (2015) [22]	-	Management of neonatal disorders (neonatal hypothermia, neonatal seizure, neonatal sepsis, neonatal jaundice)	HPT (NR)	NR	Every day for 4 days	Assignment/A score of over 80%	Yes (NR)	NR
Cheraghi et al. (2021) [23]	-	Communication skills with hospitalized children and their parents	NPT (1:6–7)	Role-modeling, explanation, comments	NR	Voluntary/Top scores in the written quiz	Yes Role-play training using five scenarios covering major childhood health problems (three sessions, 45 min/session)	Yes Supervised performances and peer coaching
Öztürk Şahin et al. (2023) [24]	-	Medication administration in pediatric age groups	NPT (1:36.5)	Role-modeling, support, assistance, feedback	8 hours for a day	Voluntary/ None	Yes Training sessions: concept of mentoring, roles of mentors, stages of mentoring, effective mentoring skills, interpersonal relationships, communication skills and conflict resolution (1 session, 2 hours)	NR
Robinson and Niemer (2010) [25]	Cooperative learning	Seven subjects including pediatric nursing Study strategies and test-taking skills Anxiety, stress reduction, and time management	HPT (1:3–5)	NR	2 hours/week for one semester (attendance of 75% or more required)	Voluntary/ Grades of A or B, faculty's recommendation, and selection through an interview	Yes Confidentiality agreement signature Training sessions: PMTP objectives and components, mentoring relationship, available campus resources, and materials for mentoring (handouts, case studies, practice questions, etc.) (NR)	Yes Review of the summary document on group meetings, tracking mentee's academic performance, and providing mentoring to tutors (active communication using an online learning platform)
Valler-Jones (2014) [26]	Situated learning	Resuscitation of a neonate or child, including airway management and drug administration	RPT (4:8)	Debriefing, feedback	NR	Voluntary/ None	Yes Participants form teams of four and take turns performing the role of the tutor group Team-based work: develop a simulation scenario for resuscitation, conduct practice for skill training, and create a flow chart for the simulation process (NR)	Yes Provide a briefing after observing the simulations and debriefings

GP, group program; HPT, horizontal peer teaching; NPT, near-peer teaching; NR, not reported; PAL, peer-assisted learning; PMTP, peer mentor tutor program; RPT, reciprocal peer teaching.

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sured using a single-group design with only a post-test, making it impossible to determine the effect.

5. Risk of Bias Assessment

In the two RCTs [23,24], concerns about bias arose due to the omission of details regarding the allocation sequence and the concealment of the group assignment order. Additionally, the study by Cheraghi et al. [23] failed to mention evaluator blinding and lacked a detailed description of the specific methods and fidelity of the interventions provided, leading to a high risk of bias (Figure 2).

In the remaining three studies, a high risk of bias was present due to challenges in excluding the natural progression of learning effects without a control group and the omission of adjustments for differences in confounding variables [22,25,26]. Additionally, the risk of bias was compounded by several study-specific issues: imprecise statistical reporting [25,26], the absence of blinding [26], the use of self-reported outcomes [26], and the high dropout rates of participants [25] (Figure 2).

DISCUSSION

This study carried out a systematic review to assess the impact of peer tutoring on pediatric nursing education among nursing students. Despite extensive searches across various databases, only five studies met the inclusion criteria. The five studies analyzed were conducted in the United States, the United Kingdom, Iran, India, and Turkey, underscoring a significant global research gap in the application of peer tutoring in pediatric nursing education. According to previous systematic reviews, peer tutoring for nursing students has predominantly been utilized in the United States, and most studies have reported qualitative outcomes and focused on fundamental nursing skills or resuscitation training for adults [27-29]. In South Korea, nursing students primarily engage in learning focused on adult patients and face difficulties in studying pediatric nursing due to the limited opportunities for pediatric clinical practice resulting from the declining birth rate and the reduced number of hospitalized children [30,31]. This has resulted in challenges ranging from understanding the characteristics of pediatric patients to appropriately applying nursing skills learned for adults to pediatric patients [31]. Therefore, it is necessary to develop instructional strategies that specifically address the educational content in pediatric nursing that nursing students find challenging to learn or practice directly, and intensive peer education can be particularly useful in this context. However, this review revealed a scarcity of quantitative studies measuring the effects of peer tutoring in pediatric nursing education. Consequently, it is vital to actively pursue research on the implementation and effectiveness of peer tutoring within nursing education in pediatric nursing.

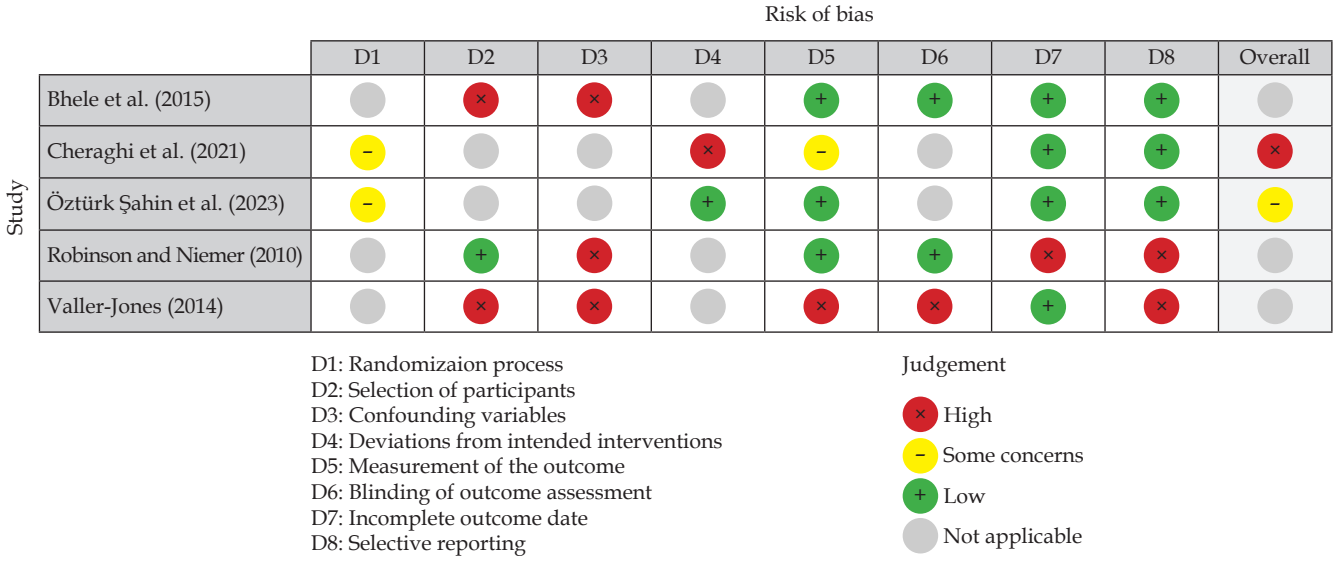

Figure 2. Risk of bias assessment using the revised Cochrane risk-of-bias tool for randomized trials and the risk of bias assessment tool for non-randomized studies.

The analyzed papers included two studies that aimed to improve theoretical learning abilities in pediatric nursing [22,25]. These studies reported that the participants exhibited significant improvements in exam scores [25] and knowledge [22] compared to the control group. Both studies employed HPT, where the mentors and mentees were undergraduates. HPT can reduce the burden of theoretical learning and improve learning outcomes by sharing information more easily and favorably based on the reliability shared among peers experiencing similar difficulties [22]. Given the challenging and rigorous nature of nursing education, which often causes students to struggle academically [25], employing HPT to improve cognitive learning in pediatric nursing education could be considered.

In the two studies utilizing HPT [22,25], the tutors were selected for their high academic performance and received training in tutoring during the pre-implementation phase of peer tutoring programs. Of particular note, in the study by Robinson and Niemer [25], the tutors were not only trained in advance but also regularly supervised during the mentoring process. This included the faculty providing the tutors with the latest learning materials and offering mentorship to the tutors themselves. Therefore, when employing HPT where both tutees and tutors are students, it is essential that educational benefits accrue to both parties. This approach can help prepare tutors for future roles as clinical nursing instructors [32]. However, the analyzed studies focused solely on the effects from the perspective of the tutees and did not assess the potential benefits for the tutors. A previous study on peer tutoring in high-risk neonatal nursing education demonstrated that peer tutoring enhanced the academic capabilities of both tutees and tutors through qualitative content analysis [5]. Although tutees and tutors are horizontal peers, their roles in the program differ, which suggests that the educational effects they experience might also vary. Future studies should consistently explore the specific educational benefits that each role can achieve.

In addition to its cognitive learning effects, peer tutoring has shown beneficial impacts on practical skills such as neonatal and pediatric resuscitation [26], communication skills with hospitalized children and their parents [23], and clinical pediatric medication administration [24]. As a result, the tutoring group showed improved communication skills compared to the control group [23], and there was no significant difference in self-efficacy in pediatric medication administration compared to the group that was instructed by clinical nurses [24]. Recent systematic reviews have reported that peer tutoring does not show a significant difference in educational effectiveness compared to expert and faculty-led education, with NPT being reported as the most effective type of peer tutoring [27]. Reflecting on these findings, the two studies [23,24] utilized NPT with graduate students as tutors, and it can be inferred that practical skill training in pediatric clinical settings for senior students led to positive outcomes. Therefore, employing NPT in clinical settings can be an effective instructional strategy to supplement the limited availability of faculty, especially when teaching pediatric nursing skills that require careful education.

The affective impacts identified in pediatric nursing education through the application of peer tutoring include satisfaction [26], clinical comfort, and anxiety [24]. Previous systematic reviews have reported that peer tutoring reduces mentees' stress [29], but the study by Öztürk Şahin et al. [24] found no significant difference compared to the clinical nurse-instructed group. This is presumed to be due to the use of NPT instead of HPT. Students reported feeling less anxious and more comfortable and confident when they learned through peer tutoring, free from the constant evaluation by faculty and concerns about potential biases from faculty members [5]. Therefore, to create a learner-centered, psychologically safe learning environment, HPT should be considered as a method that would be especially useful for junior students who experience high anxiety due to a lack of coping skills [29]. However, NPT can be considered as a way to focus on learning outcomes, and it would be beneficial for senior students who need to improve their practical skills. To clarify this, future research should explore whether the type of peer tutoring is closely related to its impact on cognitive, affective, and psychomotor learning outcomes.

Among the five analyzed studies, two utilized cooperative learning theory and situational learning theory to design peer tutoring programs [25,26]. Robinson and Niemer [25] faithfully applied the cooperative group approach by forming groups of 3–5 students, where the tutor continuously supported both academic and non-academic issues throughout the semester. The faculty checked attendance as a routine task and monitored changes in the exam scores of group members as an assessment task, thereby improving the exam scores of students with lower GPA. Additionally, Valler-Jones [26] combined situational learning theory with peer tutoring to use peer tutoring in simulations for the care of critically ill children, using the RPT method, which alternates the

tutor and tutee roles, to enhance nursing confidence and competence. Additionally, various models such as social cognitive theory, the goal-reality-options-will model, Kolb's cycle of experiential learning, Pintrich's model of self-regulated learning, an adapted version of the five senses of student success model, and the multidimensional model of nurse self-concept are being used in peer tutoring [29]. Therefore, utilizing these theories can help enhance the educational effectiveness of peer tutoring in pediatric nursing education.

This study is significant in systematically reviewing the effectiveness of peer education in pediatric nursing education for nursing students. However, the review included only five studies, which limits its scope. In the two RCTs [23,24], concerns about bias arose due to insufficient details on allocation sequence, group assignment concealment, and evaluator blinding, as well as inadequate descriptions of the intervention methods. The other three studies encountered high risks of bias because they lacked control groups, did not address confounding variables, and had issues such as imprecise statistical reporting, absence of blinding, reliance on self-reported outcomes, and high participant dropout rates [22,25,26]. Therefore, future research should implement peer tutoring across various educational topics in pediatric nursing, assess the educational effects, and adhere strictly to standardized intervention protocols.

CONCLUSION

This systematic review aimed to evaluate the effects of peer tutoring in pediatric nursing education for nursing students. Although only a few studies were available, they showed significant improvements in cognitive knowledge, communication skills, and clinical competencies. However, these studies demonstrated high risks of bias due to inadequate control groups, unaddressed confounding variables, and inconsistent reporting. Future research should employ more rigorous study designs, standardized intervention protocols, and comprehensive outcome assessments to more effectively validate the effectiveness of peer tutoring. Such improvements will enhance the educational strategies used in pediatric nursing education, ultimately improving the competency of nursing students.

ARTICLE INFORMATION

Authors' contribution

Conceptualization: all authors; Data collection, Formal analysis: all authors; Writing-original draft, Writing-review and editing: all authors; Final approval of published version: all authors.

Conflict of interest

Hyun Young Koo has been an editor of *Child Health Nursing Research* since 2016. She was not involved in the review process of this article.
Bo Ryeong Lee has been an editor of *Child Health Nursing Research* since 2024. She was not involved in the review process of this article.
No existing or potential conflict of interest relevant to this article was reported.

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Data availability

Please contact the corresponding author for data availability.

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Telehealth implementation for children with attention deficit hyperactivity disorder: a scoping review

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The objective of this research was to examine current telehealth practices in managing children with attention deficit hyperactivity disorder (ADHD) and to map existing implementations using the American Medical Association's Virtual Care Value Framework. A scoping review was conducted following the Arksey and O'Malley framework. The databases, CINAHL, PsycINFO, and PubMed, were searched with specific keywords related to telehealth and ADHD. The screening process followed the Preferred Reporting Items for Systematic reviews and Meta-Analyses guidelines. Inclusion criteria were restricted to articles published in English between January 2000 and July 2024, focusing on children with ADHD, their parents, caregivers, family members, teachers, healthcare professionals, and articles implementing telehealth interventions. As a result, out of 389 initially identified articles, 22 met the inclusion criteria. The studies were predominantly conducted in the United States. The most common telehealth methods included videoconferencing and telephone-based communications. Key areas of focus in these studies included clinical outcomes, access to care, patient and family experience, caregiver experience, clinician experience, and financial and operational impact. However, none of the studies addressed health equity. In conclusion, telehealth has shown effectiveness in improving ADHD assessment, treatment adherence, and parental education, leading to positive patient outcomes and experiences. However, the financial impact of telehealth remains uncertain. Further research is needed, particularly outside the United States, to explore emerging telehealth technologies and areas overlooked by the Virtual Care Value Framework, such as health equity.

Keywords: Adolescent; Attention deficit disorder with hyperactivity; Child; Telemedicine

INTRODUCTION

Attention deficit and hyperactivity disorder (ADHD) is a neurodevelopmental disorder characterized by hyperactivity, impulsivity, and inattentiveness [1]. Globally, the prevalence of ADHD ranges from 5.3% to 7.1% among children and adolescents and 2.6% to 2.8% among adults [2]. It persists into adulthood in two-thirds of patients diagnosed during childhood [3]. Challenges associated with ADHD extend beyond primary symptoms to encompass associated complications [4]. These include comorbidities such as anxiety, behavioral disorders, learning and language disorders, and Tourette syndrome [1]. As children with ADHD mature, environmental support decreases while academic, social, and

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environmental demands increase. Consequently, during adolescence, these individuals often exhibit academic and social skills below those of their peers and may additionally manifest emotional dysregulation, self-harm, mood disorders, and eating disorders [4].

ADHD treatment encompasses both pharmacotherapy and non-pharmacotherapy. First-line pharmacological treatments such as stimulants aid in concentration and demonstrate efficacy and safety in addressing ADHD [5]. Children are typically prescribed methylphenidate, while adults receive dextroamphetamine [6]. Non-pharmacological interventions include cognitive behavioral therapy, introduced at the age of six, which can be combined with pharmacotherapy if behavioral therapy is insufficient [7,8]. With the increasing digitalization of healthcare, innovative approaches such as telehealth are being embraced more frequently to assist in treating ADHD.

Telehealth has emerged as an increasingly prevalent tool for ADHD treatment, aligning with studies discussing its application in chronically ill children [9-11]. Telehealth employs communication and information technologies to extend access to healthcare services, including assessments, diagnoses, interventions, and remote communication [12]. Although often interchanged with telemedicine, a narrower term denoting real-time remote interaction between patients and healthcare professionals, telehealth has shown promise in enhancing healthcare for chronically ill children [13,14]. Telehealth offers significant benefits, including reduced office visits [10,13,15], improved patient compliance, reduced risk of infection from waiting room exposure [16], and increased time for at-home care [11]. These advantages are particularly evident among patients living in rural areas [10].

Studies in this population, including reviews on digital health and telehealth interventions for children with ADHD, have focused on treatment to alleviate [17,18] the feasibility and comparative effectiveness of virtual versus in-person visits, often overlooking the holistic value of digitally enabled care models [19]. This study aimed to narrow the gaps in telehealth research by thoroughly examining existing research on telehealth implementation to improve care delivery for children with ADHD by applying the American Medical Association (AMA) Virtual Care Value Framework.

The framework comprises six key aspects: clinical outcomes, quality and safety, access to care, patient, family, and caregiver experience, clinician experience, financial and operational impact; and health equity [19]. Clinical outcomes, quality, and safety highlight the effectiveness of care modalities in promoting health, maintaining care standards, and safeguarding patients. Access to care refers to the extent to which virtual care programs can minimize barriers, thereby enhancing the availability, suitability, and affordability of prompt medical care. Patient, family, and caregiver experiences accounted for the overall impressions of the clinical and technological facets of virtual care from the perspectives of patients and their support networks. The clinicians' experiences examine how virtual care adoption affects their work and technological interactions, potentially facilitating patient care, flexible work arrangements, and easy peer connections. Financial and operational impacts assess the effects of virtual care adoption on financial sustainability and operational efficiency by considering factors such as direct and indirect revenues, direct expenses, and operational efficiency. Finally, health equity seeks to understand and address the differential impacts of virtual care programs on historically marginalized patient groups across various value streams.

This scoping review aims to comprehensively understand telehealth practices for children with ADHD. The goal is to identify gaps in current research and practice and to provide insights that will inform future research and clinical practice, aiming to improve the quality of care and outcomes for children with ADHD. This study aims to achieve two objectives: first, to identify current telehealth practices in the clinical management of children diagnosed with ADHD, and second, to map existing implementations using the Virtual Care Value Framework.

METHODS

Ethical statements: As the study is a review study, IRB is not required.

1. Study Design

The research design details the general structure and methodology of this study, including the techniques employed for data collection and analysis. This ensures that the research questions are efficiently addressed. We adopted Arksey and O'Malley's five-stage approach for a comprehensive review [20]. This study followed the criteria of the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist [21].

2. Study Process

The study process included: (1) formulating the research question, (2) identifying relevant studies, (3) selecting studies, (4) organizing the data, and (5) summarizing and presenting the results [22].

3. Research Question

This review aims to explore current telehealth practices for managing children with ADHD and to assess how the Virtual Care Value Framework influences these practices. The selection of questions aligns with the increasing importance of telehealth in managing chronic conditions in the current healthcare landscape [23]. This scoping review aims to fill a gap in the literature on specific telehealth practices and frameworks for ADHD management. In doing so, they seek to optimize telehealth services [24,25], improve guidelines [26], develop training programs [27], and create tailored healthcare delivery strategies [24], ultimately enhancing patient outcomes and healthcare efficiency in children with ADHD.

The research questions were: (1) What are the current telehealth practices for managing ADHD in children? (2) How does the Virtual Care Value Framework inform the care provided to children with ADHD through telehealth services?

4. Inclusion and Exclusion Criteria

The criteria for inclusion in this review were established by selecting articles that met the following requirements: (1) published between January 2000 and July 2024 (as telehealth studies related to children with ADHD began to emerge from 2000 onwards); (2) written in English; (3) involved children with ADHD, their parents or caregivers, family members, teachers, and healthcare professionals; and (4) included telehealth interventions. Studies related to telehealth for children with ADHD began to emerge in 2000. Review articles, opinion-based articles, editorials, conference proceedings, and studies published in languages other than English were excluded. The search strategy adhered to the Joanna Briggs Institute's three steps: initial search, second search, and reference list search [28].

5. Finding Relevant Studies

A librarian formulated the search strategy and determined the appropriate databases to search for relevant studies. Initially, a preliminary search was conducted in the Cumulative Index to Nursing and Allied Health Literature (CINAHL) database to identify appropriate search terms. These terms were modified and refined to formulate the final accurate search terms. Subsequently, a comprehensive search was performed in the CINAHL, PsycINFO, and PubMed databases using the final search terms. CINAHL and PubMed are widely regarded as dependable and trustworthy databases unlikely to yield citations from predatory publications [29]. Additionally, PsycINFO can be used to locate specialized databases [29]. Table 1 presents the keyword search list.

6. Selecting Studies

To facilitate the selection of studies, the search results were exported to Endnote, a reference management tool, following PRISMA guidelines [22]. A four-step approach was adopted to ensure systematic and transparent screening. The initial screening involved evaluating the relevance of articles based on their titles. Subsequently, the abstracts of the potentially relevant articles were reviewed to determine their suitability for inclusion. For articles that passed the abstract screening, the full text was thoroughly examined. In addition, the reference lists of the selected articles were searched to identify additional relevant studies that may have been missed. Three reviewers were involved throughout the screening process,

Table 1. Keywords Search

Databases	Search terms
CINAHL	(Child OR Adolescent) AND (Attention Deficit Disorder with Hyperactivity) AND (Telemedicine OR Patient Portals OR Decision Making, Computer-Assisted OR Internet-Based Intervention OR Remote Consultation)
PsycInfo	((Adolescent Development) OR (Adolescent Psychology)) AND (Attention Deficit Disorder with Hyperactivity) AND ((Telemedicine) OR (Telepsychiatry) OR (Online Therapy) OR (Websites) OR (Digital Interventions))
PubMed	((Child[MH] OR Adolescent[MH]) AND (Attention Deficit Disorder with Hyperactivity[MH])) AND (Telemedicine[MH] OR Patient Portals[MH] OR Decision Making, Computer-Assisted[MH] OR Internet-Based Intervention[MH] OR Remote Consultation[MH])

CINAHL, Cumulative Index to Nursing and Allied Health Literature.

including the initial screening, to ensure consistency and minimize bias. In case of disagreement regarding the inclusion of certain papers, discussions were held to reach a consensus.

7. Organizing Data, Summarizing, and Reporting the Results

This scoping review included 22 articles that the research team carefully extracted and organized into a Microsoft Excel 2021 (Microsoft) spreadsheet. The data extraction form was initially tested in two articles for comprehensive information coverage [30,31]. Subsequently, this method was applied to the remaining articles, which were divided equally between two reviewers (SC and DS). The accuracy and consistency of the findings are verified. Discrepancies were resolved through consultation with a third reviewer (HS). The extracted information included key details such as author, title, year of publication, study aim, study design, sample size, and the specific telehealth device used in each study. Furthermore, the team identified and documented information related to telehealth implementation according to the framework of the AMA [19]. The studies were systematically delineated using tables that detailed demographic characteristics and provided a year-based chronology.

RESULTS

1. Search Result

A systematic review was conducted using the PRISMA flowchart, involving a comprehensive search across multiple databases (Figure 1). Initially, 389 articles were identified

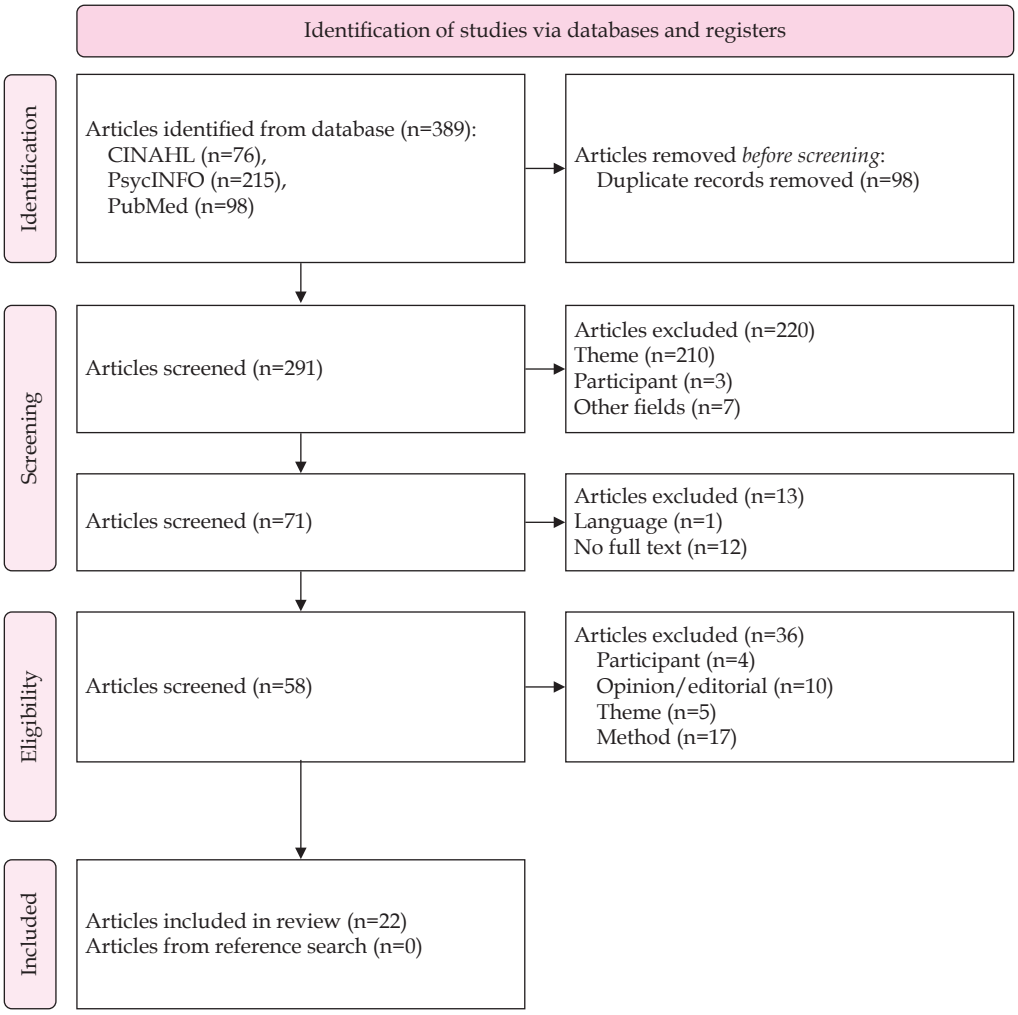

Figure 1. Preferred Reporting Items for Systematic reviews and Meta-Analyses flowchart for the scoping review.

from CINAHL (n=76), PsycINFO (n=215), and PubMed (n=98) databases. After eliminating duplicates, 291 articles underwent relevance screening, and 220 were excluded for various reasons, such as differing themes and participants. The remaining 71 articles underwent full-text screening, of which 13 were excluded because of language (not in English) or lack of full-text availability. Following the eligibility assessment, 36 articles were excluded based on participant-related factors, opinion/editorial content, misalignment with the study's theme, and methodological issues. Finally, the review included 22 articles, and no additional articles were identified through the reference list searches.

We divided the content into charting the data and collecting, summarizing, and reporting the results.

2. Charting the Data

Charting data involves organizing and systematically arranging the collected data to facilitate analysis. This step ensures that all relevant information is accurately captured and categorized. Twenty-two studies were included in this review. These studies employed diverse methodologies, including randomized controlled trials (n=16) [24,30-44], cluster randomized trials (n=3) [45-47], and quasi-experiments (n=3) [48-50]. Geographically, the studies were primarily conducted in the United States (US) (n=12), with additional locations including Germany (n=3), Australia, Brazil, China, Canada, Israel, Japan, and the United Kingdom (UK), each contributing to one study. The most frequently used methods of interaction were videoconferencing (n=8) and web-based platforms (n=8), followed by telephone-based interactions (n=6) and mobile apps (n=3). Regarding professional engagement, psychiatrists participated in 11 studies, followed by psychologists (n=8), physicians (n=8), and nurses (n=6). Telehealth usage was mainly as a means for treatment (n=22), and two for diagnostic purposes. Other key aspects of each study, such as authors, publication year, aims, participant demographics, devices used, and health professionals involved, and main findings are shown in Table 2.

3. Collating, Summarizing, and Reporting the Results

Collating, summarizing, and reporting results involve synthesizing organized data to draw meaningful conclusions and effectively communicate the findings. The implementation of telehealth services for children with ADHD has been

Table 2. Study Demographics (*N*=22)

Authors	Countries	Aims	Design	Sample size	Devices	The involved health professionals	Outcomes
Epstein et al. (2011) [45]	USA	To determine whether an ADHD QI intervention for community-based pediatric practices improves patient outcomes	CRT	49	Web-portal	Pediatricians and nurse practitioners	The intervention group had greater adherence to ADHD care practices, including the use of parent and teacher rating scales, documentation of DSM-IV criteria, and monitoring treatment responses. They also showed a reduced reliance on mental health referrals for ADHD diagnosis
Reese et al. (2012) [49]	USA	To measure the effectiveness of triple P (positive parenting program)	Quasi-experimental	8	Videoconference	Psychologist and pediatrician	The intervention group had significantly higher medication adherence, lower ADHD symptoms, greater improvements in knowledge and adherence intentions, and higher parental satisfaction

(Continued to the next page)

Table 2. Continued

Authors	Countries	Aims	Design	Sample size	Devices	The involved health professionals	Outcomes
Xie et al. (2013) [38]	USA	To evaluate the effectiveness of group parent training on ADHD treatment delivered via videoconferencing	RCT	22	Videoconference	Psychiatrist	The intervention group had similar improvements in parent-child disciplinary practices, greater improvement in hyperactive symptoms, similar gains in social skills, and comparable overall functioning in children
Myers et al. (2015) [24]	USA	To test the effectiveness of a telehealth service delivery model for the treatment of children with ADHD that provided pharmacological treatment and caregiver behavior training	RCT	223	Videoconference	Psychiatrist	The intervention group had greater improvements in inattention, hyperactivity, combined ADHD, and ODD symptoms, better role performance and overall impairment, and greater improvement in hyperactivity and combined ADHD symptoms according to teacher ratings.
Tse et al. (2015) [36]	USA	To examine the effectiveness of CATTS to families residing in their homes using distant technologies	RCT	37	Video teleconference	Psychiatrist	The intervention group had similar improvements in ADHD symptoms and role performance, as well as comparable global functioning and overall improvement in children. However, caregivers in the teletherapy group reported less improvement in caregiver strain and empowerment
Bai et al. (2015) [46]	China	To evaluate the efficacy of a psychoeducation program for parents of children with ADHD in enhancing adherence to pharmacological treatment and improving clinical symptoms	CRT	89	Website	All health professionals	The intervention group had significantly higher medication adherence, lower ADHD symptoms, greater improvements in parent knowledge and intentions, and higher parental satisfaction
Rockhill et al. (2016) [44]	USA	To examine the prescribing strategies that telepsychiatrists used to provide pharmacologic treatment in the CATTS	RCT	223	Videoconference	Psychiatrist	The intervention group had greater adherence to the treatment protocols, higher attainment of the treat-to-target goal, and more frequent medication adjustments based on ADHD severity and comorbidity status
Corkum et al. (2016) [31]	Canada	To evaluate the effectiveness of a five-session behavioral sleep distance intervention (delivered via written manual with telephone support by a paraprofessional coach) for parents of school-aged children with insomnia	RCT	61	Telephone	Paraprofessionals, psychologist	The intervention group had significantly greater improvements in sleep onset latency, bedtime resistance, and sleep duration, as well as improved psychosocial functioning. Parents in the intervention group also reported high satisfaction with the program

(Continued to the next page)

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Table 2. Continued

Authors	Countries	Aims	Design	Sample size	Devices	The involved health professionals	Outcomes
Epstein et al. (2016) [33]	USA	To determine whether an ADHD QI intervention for community-based pediatric practices improves patient outcomes	RCT	577	Web-portal	Pediatricians and nurse practitioners	The intervention group had more frequent patient contacts, greater collection of parent and teacher ratings, and a significantly greater reduction in parent-rated ADHD symptoms among children prescribed medication
Franke et al. (2020) [34]	Australia	To evaluate the efficacy of an online self-help program in a sample of parents of preschoolers with ADHD symptoms	RCT	53	Website and telephone	Psychologist	The intervention group had greater improvements in child hyperactivity/inattention, restlessness/impulsivity, social functioning, and defiance/aggression, as well as significant improvements in parenting practices, parenting satisfaction, and maternal well-being
Dose et al. (2017) [32]	Germany	To examine whether a TASH parenting behavioral intervention (written materials plus telephone counseling) enhanced the effects of methylphenidate treatment in children with ADHD	RCT	103	Telephone	Psychiatrist	The intervention group showed significant improvements in ADHD symptoms, particularly inattention, and functional impairment. However, when controlling for medication effects, the improvement in ADHD symptoms was less clear
Fiks et al. (2017) [47]	USA	To evaluate a distance-learning, quality improvement intervention to improve pediatric primary care provider use of ADHD rating scales	CRT	105	Website, telephone	Pediatricians and nurse practitioners	The intervention group showed no significant improvement in ADHD rating scale use compared to the control group
Vander Stoep et al. (2017) [37]	USA	To evaluate the CATTS on caregiver's outcomes	RCT	223	Videoconference	Psychiatrist	The intervention group had significantly greater improvements in ADHD symptoms, including inattention and hyperactivity
DuPaul et al. (2018) [43]	USA	To examine parent engagement and program acceptability of F2F and online BPT, as well as the efficacy of both formats relative to a WLC group	RCT	47	Website	Psychologist	The intervention group had greater improvements in ADHD symptoms, including inattention and hyperactivity, along with better treatment fidelity and parent knowledge of behavioral strategies. Both face-to-face and online formats showed similar efficacy, but face-to-face had higher parent satisfaction
Hollis et al. (2018) [35]	UK	To evaluate the impact of QbTest on clinical diagnostic decision-making when added to routine clinical assessment of ADHD compared to assessment as usual using a pragmatic diagnostic RCT design	RCT	250	Website	Consultant psychiatrists, paediatricians, nurse specialists and healthcare assistants	The intervention group had significantly greater improvements in diagnostic decision-making efficiency, with more participants receiving an ADHD diagnosis, reduced consultation times, and higher clinician confidence. However, there was no significant difference in diagnostic accuracy between the groups
Weisman et al. (2018) [40]	Israel	To assess the utility and effectiveness of a mobile app in improving adherence to stimulants among children with ADHD	RCT	39	Mobile apps	Psychiatrist	The intervention group (using the mobile app) had significantly higher medication adherence, as indicated by pill counts, but the app did not significantly impact ADHD symptom severity

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Table 2. Continued

Authors	Countries	Aims	Design	Sample size	Devices	The involved health professionals	Outcomes
Dose et al. (2020) [30]	Germany	To examine change in individually defined problem behaviors during a TASH intervention for parents of children with ADHD	RCT	103	Telephone	Psychiatrist	The intervention group had significantly greater improvements in ADHD symptoms, including inattention and hyperactivity, as well as better functional impairment outcomes when controlling for medication effects
Fried et al. (2020) [48]	USA	To examine the effectiveness of a novel ADHD-centric text messaging-based intervention aimed to improve adherence to stimulant medications in children with ADHD	Quasi-experimental	333	Text message/ mobile	Nurse, doctor, psychologist	The intervention group had significantly higher medication adherence. However, the intervention did not significantly impact the severity of ADHD symptoms
Breaux et al. (2021) [50]	USA	To evaluate the feasibility, acceptability, and efficacy of RELAX across in-person and telehealth groups	Quasi-experimental	32	Videoconference	Psychologist	The intervention group had similar improvements in emotion dysregulation (ED) and family conflict. However, the intervention group showed greater improvements in clinician-reported adolescent ED, while the in-person group had more significant reductions in caregiver-adolescent conflict
Kurokawa et al. (2024) [39]	Japan	To examine the result similarity between the remote and face-to-face ADHD assessment	RCT	74	Mobile apps	Psychologist	There was a similarity between remote and face-to-face ADHD-RS-IV assessment
Paiva et al. (2024) [41]	Brazil	To compare symptoms, parental style, quality of life, and perceived stress; children's quality of life	RCT	57	Website	Psychologist	Online and face-to-face parent training were effective in reducing symptom, and online intervention is effective for parenting and enhancing children's social acceptance
Wähnke et al. (2024) [42]	Germany	To examine the utilization and acceptance of WASH	RCT	276	Website and telephone	Psychiatrist and pediatrician	The intervention group (web-assisted self-help with and without telephone support) had high acceptance and utilization rates, with significant improvements in ADHD symptoms, including inattention and hyperactivity, as well as in parental stress and parenting practices

ADHD, attention deficit hyperactivity disorder; BPT, behavioral parent training; CATTS, children's ADHD telemental health treatment study; CRT, cluster randomized trial; DSM-IV, diagnostic and statistical manual of mental disorders, fourth edition; ED, emotion dysregulation; QbTest, computerized test of attention and activity; ODD, oppositional defiant disorder; QI, quality improvement; RCT, randomized controlled trial; RELAX, regulating emotions like an expert; RS-IV, rating scale-IV; TASH, telephone-assisted self-help; WASH, web-assisted self-help parent management training; WLC, waitlist control.

evaluated using a Virtual Care Value Framework [19]. This framework considers six aspects: (a) patient clinical outcomes, quality, and safety; (b) access to care; (c) patient, family, and caregiver experience; (d) clinician experience; (e) financial and operational impact; and (f) health equity. Studies were classified into these categories by examining their purpose, method, intervention, and results. Most studies focused on patients' clinical outcomes (19 studies), while other areas included access to care (4 studies), patient, family, and caregiver experiences (12 studies), clinician experience (2 studies), and financial and operational impact (5 studies). However, no study has examined health equity.

The reviewed studies on patient clinical outcomes, quality, and safety explored the impact of telehealth interventions in improving diagnostic accuracy, promoting treatment adherence, and alleviating ADHD symptoms. Research on access to care has primarily focused on evaluating attendance and participation rates. Studies on the experiences of patients, families, and caregivers have examined satisfaction, levels of engagement, and overall perceptions of telehealth services. Additionally, research on clinicians' experiences has assessed health professionals' behavior following educational programs and psychiatrists' adherence to evidence-based protocols when utilizing telehealth. Finally, studies on the financial and operational impacts have investigated the cost-effectiveness and key operational factors associated with telehealth implementation. Detailed information on the implementation of telehealth services in each study is presented in Table 3.

Table 3. Classification of Studies According to Virtual Care Value Framework

Authors	Patient's clinical outcome, quality, and safety	Access to care	Patient, family, and caregiver experience	Clinician experience	Financial and operational impact	Health equity
Epstein et al. (2011) [45]	None	None	None	None	The effectiveness of a quality improvement program (operational)	None
Reese et al. (2012) [49]	Child behavior	None	Parents' distress	None	None	None
Xie et al. (2013) [38]	Parent ratings of ADHD, oppositional defiant disorder, and conduct disorder symptoms, and the children's global functioning	None	Parents' disciplinary practices	None	None	None
Myers et al. (2015) [24]	ADHD-related symptoms and behaviors, role performance, and functional impairment	None	None	None	None	None
Tse et al. (2015) [36]	Children's ADHD-related behaviors and functioning	Attendance to care	Caregivers' outcomes, specifically their distress, include measures of depression, stress, strain, and empowerment	None	None	None
Bai et al. (2015) [46]	Child ADHD symptoms, medication adherence	None	Parents' knowledge about ADHD, parents' satisfaction	None	None	None

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DISCUSSION

This scoping review analyzed the literature on telehealth implementation for children with ADHD. Using the Virtual Care Value framework, telehealth studies were assessed and categorized, providing a comprehensive overview of telehealth research in children with ADHD.

1. The Development of Telehealth Practice

The study revealed that majority of studies were conducted in the US, which has emerged as a pioneer in this field, as is evident from the work exemplified by Epstein's investigation into the use of internet portals to enhance care in community settings for children diagnosed with ADHD [45]. This trend aligns with a systematic review of telehealth implementation in neurodevelopmental disorders, which

Table 3. Continued

Authors	Patient's clinical outcome, quality, and safety	Access to care	Patient, family, and caregiver experience	Clinician experience	Financial and operational impact	Health equity
Rockhill et al. (2016) [44]	The attainment of the treat-to-target goal that is reducing ADHD-related symptoms	None	None	The decision-making process of telepsychiatrists in making medication changes for patients with ADHD	The fidelity of telepsychiatrists to evidence-based protocols in medication management	None
Corkum et al. (2016) [31]	Children's sleep and psychosocial functioning	None	Parents' satisfaction	None	None	None
Epstein et al. (2016) [33]	Parent- and teacher-rated ADHD symptoms	None	None	None	A quality improvement intervention that involves training sessions, office flow modification, and the use of an ADHD Internet portal	None
Franke et al. (2016) [34]	Mother-rated child hyperactivity/inattention, restlessness/impulsivity, defiance/aggression, social functioning, and teacher-rated prosocial behavior	None	Maternal over-reactivity, verbosity, laxness, positive parenting, parenting satisfaction, self-efficacy, stress, and depression	None	None	None
Dose et al. (2017) [32]	Functional impairment, ADHD symptoms, ODD symptoms	None	Parenting behavior, parental satisfaction	None	None	None
Fiks et al. (2017) [47]	None	None	None	The impact of web-based education, collaborative consultation, and performance feedback reports on clinician behaviour	The impact of an electronic health record-linked system on rating scale use and explores its potential role in improving care.	None
Vander Stoep et al. (2017) [37]	Child ADHD and ODD symptoms and role performance	None	Caregiver's distress	None	None	None
DuPaul et al. (2018) [43]	Child behavior (restlessness, impulsivity, improved self-control, affect, mood)	Attendance to care	Parent engagement and acceptability	None	None	None
Hollis et al. (2018) [35]	The speed and accuracy of diagnostic decision-making	None	None	None	The cost savings and efficiency	None
Weisman et al. (2018) [40]	Children or patient's experience or behavior in adherence	None	None	None	None	None
Dose et al. (2020) [30]	The severity of target problems, ADHD symptoms, and oppositional symptoms	None	Parental satisfaction	None	None	None
Fried et al. (2020) [48]	Stimulant medication adherence	None	None	None	None	None

(Continued to the next page)

Table 3. Continued

Authors	Patient's clinical outcome, quality, and safety	Access to care	Patient, family, and caregiver experience	Clinician experience	Financial and operational impact	Health equity
Breaux et al. (2021) [50]	Adolescent's emotion dysregulation and communication	Attendance to care	Caregiver-adolescent conflict, caregiver emotion dysregulation	None	None	None
Kurokawa et al. (2024) [39]	Remote and face-to-face ADHD assessment	None	None	None	None	None
Paiva et al. (2024) [41]	ADHD symptoms, quality of life	None	Parenting style, parent's quality of life	None	None	None
Wähnke et al. 2024 [42]	None	Frequency and intensity of using WASH	None	None	None	None
Total	19	4	12	2	5	0

ADHD, attention deficit hyperactivity disorder; ODD, oppositional defiant disorder; WASH, web-assisted self-help parent management training.

showed that most studies were conducted in the US (64%), Asia (17%), and Europe (14%) [51]. Given that telehealth in the US has already been extensively used for various conditions such as cardiovascular disease [52], the application of this technology to ADHD management in the US. is a logical progression. However, telehealth studies on the care of children with ADHD have also been conducted in countries such as Australia, Brazil, Canada, China, Israel, and the UK. Nonetheless, there remains a lack of studies conducted in other countries. This gap can be attributed to various factors, including variations in technological infrastructure, healthcare systems, and government support for telehealth initiatives.

Additionally, excluding non-English articles may have contributed to this gap, as significant research in other languages may have been overlooked. An examination of telehealth implementation across Asia, Latin America, and Europe revealed a complex landscape of challenges including regulatory hurdles, technological limitations, resistance due to attitudes, ethical dilemmas, and geographic disparities, all of which significantly impede the rapid integration of telehealth [53]. This has resulted in a different pace of research on telehealth, particularly regarding its implementation in children with ADHD.

Notably, despite setting the search criteria from 2000 to 2024, the earliest article retrieved was published in 2011. Over the past decade, the reviewed studies have indicated a heightened level of research activity in telehealth for children with ADHD, with notable exceptions in 2014, 2019, 2021, and 2022. Although the onset of the COVID-19 pandemic might be expected to stimulate telehealth studies owing to the increased demand for remote healthcare services, it is interesting to note that no studies were published in 2021 and 2022. This delay may be attributed to barriers, such as logistical challenges, shifting research priorities, and publication delays.

Web portals and videoconferencing were used in 2011 and 2012, respectively. Although these technologies enable remote access and communication, privacy concerns have emerged [45]. With advances in telehealth, both devices and interventions have progressed. From 2015 to 2017, telehealth options expanded significantly, such as web-based interventions [33,34,46,47] and video teleconferencing [24,36,37,44]. This change signifies growing confidence in employing technology to support the care of children with ADHD. In 2018, the introduction of computerized tests and mobile applica-

tions advanced telehealth to a new level of ADHD assessment and management. These advances have enabled accurate diagnostic decision-making [35], facilitated symptom monitoring, and supported medication adherence [40]. Progress persisted until mid-2024 with studies incorporating text messaging, mobile applications, and web-based interventions in telehealth for ADHD management. Text messages and mobile applications have emerged as valuable tools for providing timely reminders [48], delivering educational content, and offering personalized support [30,34] and diagnostic purposes [39], resulting in increased patient engagement and improved adherence to treatment regimens.

In the reviewed studies, telehealth programs for children with ADHD emphasized parental education [24,30-32,34,36,38,41-43,46,49], behavioral therapy [30,50], support for medication adherence [40,46,48], quality improvement [33,45,47], diagnostic evaluations [35,39], and consultation [31]. These programs align with the comprehensive treatment approach for ADHD, which includes multimodal treatment, pharmacological interventions, and non-pharmacological strategies [54]. Ten reviewed studies on telehealth for children with ADHD have highlighted the importance of parental education, including psychoeducation, which is a multimodal treatment. Psychoeducation should be provided not only to individuals diagnosed with ADHD but also to their families and caregivers, aligning with established guidelines [54,55]. Ongoing telehealth-based education is essential because its effectiveness is comparable to face-to-face method [32,34,36,38,41-43,49]. Their results highlighted the importance of ongoing parental education during and after the pandemic. Regarding diagnostic assessment, one study utilized telehealth to administer a computerized test of attention and activity (QbTest) for diagnostic decision-making, which was found to be efficient in the ADHD assessment process [35]. Another study employed remote assessment, with results aligned with face-to-face evaluations, enabling the accurate identification of ADHD in children [39]. Further studies are required to validate the effectiveness of telehealth in diagnosing ADHD.

2. Telehealth Implementations According to Virtual Care Value Framework

A more comprehensive assessment of telehealth implementation in children with ADHD was conducted based on the AMA's virtual care value stream framework [19]. Patient clinical outcomes, quality, and safety have emerged as prominent areas of investigation, with 19 studies examining these aspects. These studies explored the effectiveness of telehealth interventions in improving clinical outcomes, such as alleviating ADHD symptoms, promoting treatment adherence, and improving diagnostic accuracy. Studies on decision-making in diagnostics [35,39] are classified in this aspect, as they reduce the number of visits required for diagnosis correction [19]. Seven of these 19 studies showed similar or less favorable results from the intervention compared to the control groups [36,38-40], while the remaining studies demonstrated positive results. While the primary focus of a scoping review is not determining intervention efficacy [28], the positive outcomes observed in most of these studies suggest that telehealth could be a promising approach for managing children with ADHD. However, extensive research is warranted to validate these findings and establish definitive guidelines for telehealth interventions.

Four studies examined access to ADHD care services. The AMA defines access to care as an evaluation of a program's influence on the availability, suitability, and cost-effectiveness of care. This can be assessed by considering variables such as the average time patients travel to receive care, the availability of insurance coverage, and the percentage of individuals who stop seeking treatment because of various obstacles [19]. Four studies reported attendance and participation rates [36,42,43,50]. Wähnke et al. [42] indicated high utilization and acceptance of a web-assisted self-help program, whereas Tse et al. [36] showed comparable attendance between teletherapy and in-person sessions, with over 90% attendance in both groups. In addition to the need for further studies to validate these findings, research on the factors influencing the high patient attendance rate is crucial for reinforcing and enhancing these factors.

Patient, family, and caregiver experiences were addressed in 12 studies exploring the implementation of telehealth services for ADHD. These studies have explored the satisfaction, engagement, and overall experiences of families receiving telehealth services. This study focuses on the distress caused by clinical and technological experiences. Six studies examined parent satisfaction [30-32,38,46,50]. Parent satisfaction is pivotal because it describes the acceptability of telehealth interventions [56] in situations involving underserved families [49]. This satisfaction resonates with the broader benefits of telehealth such as improved convenience, reduced disruptions to daily routines, and increased engagement in

treatment [57]. Although quantitative studies provide valuable insights, qualitative research can provide a more comprehensive understanding of family experiences. For instance, a qualitative study in the US involving parents of children with developmental delays revealed barriers to access, Internet connectivity, and digital literacy [58]. Analogous qualitative studies in the context of ADHD could reveal the challenges that families encounter when utilizing telehealth services, thereby promoting the development of more effective solutions. Consequently, further qualitative research that focuses on the acceptance of telehealth and its perceived benefits is imperative.

Regarding clinician experience, two studies examined this aspect in the context of telehealth for ADHD [44,47]. These studies investigated health professionals' behavior in post-education programs and psychiatrists' fidelity in using evidence-based protocols with telehealth. The sub-streams of clinician experience include technology and work experience [19]. Clinicians' experiences with telehealth are mixed, with telepsychiatrists demonstrating effectiveness and competence [44], while other interventions indicate the need for additional support and engagement strategies [47]. With only two studies, more research is needed to identify the experiences of healthcare professionals. Health professionals are expected to be competent in telehealth because of its quality and security [59].

Five studies explored the financial and operational effects of telehealth services. These studies assessed cost-effectiveness [35] and operational considerations associated with the implementation of telehealth services for ADHD [33,44,45,47]. They provide insights into the potential financial savings, quality improvements, and workflow modifications resulting from telehealth adoption in ADHD care. Notably, one study in this scoping review reported "cost neutral" implying that providing the QbTest report within the trial neither significantly increased nor decreased the overall cost of the health services [35]. However, this finding necessitates further analysis, as other studies have reported cost savings attributed to telehealth [60], citing per-visit savings ranging from $141.1 to $222.8, depending on the visit type and the model utilized [61]. According to a scoping review that compared the costs of telehealth and the healthcare system, telehealth may reduce costs by eliminating the need for patient travel and costly procedures while providing effective remote care. Furthermore, it enables healthcare providers to deliver efficient and high-quality care, thereby reducing overall expenses [62]. Limited research on cost and operational impacts, coupled with contradictory findings, necessitates further investigation and validation. Such an exploration is crucial for establishing clear guidelines on the cost-effectiveness of telehealth in ADHD care, potentially informing policies and service delivery improvements.

In this scoping review, no study explicitly examined health equity within the context of telehealth among children with ADHD. Health equity is defined as having the conditions, resources, opportunities, and agencies needed to achieve optimal health. This implies the need to examine health equity across all five aspects of the AMA framework. Although no study has specifically addressed this aspect, the inherent characteristics of telehealth include health equity. This is particularly evident in a study focusing on underserved populations [49], in which telehealth interventions have the potential to bridge healthcare gaps and ensure equitable care delivery. Therefore, a more thorough examination is required to fully understand and quantify the impact of telehealth on health equity in children with ADHD.

According to the results of this study, the Virtual Care Value Framework is a suitable tool for analyzing the telehealth environment of children with ADHD. This framework comprehensively organizes a review of the key elements. For example, the framework's focus on patients' clinical outcomes, access to care, and patients' and caregivers' experiences allowed for a structured evaluation of how telehealth interventions improved ADHD symptoms, increased treatment adherence, and ensured high levels of family satisfaction. This structured approach highlights the strengths of telehealth and identifies areas in which further research is required, thereby making the review more comprehensive and focused.

3. Nursing Implications

This scoping review has important implications for both research and clinical practice. The geographic disparity in telehealth research and implementation for children with ADHD necessitates extensive research in countries other than the US, where the pace of telehealth development may be hindered by challenges such as regulatory, technological, and provisional issues. Additionally, as evidenced by the growing variety of telehealth devices and interventions, the evolution of telehealth technologies suggests a need for research on using new and current technologies in ADHD

treatment. As telehealth technologies advance, the skills and competencies of healthcare professionals, including nurses, also evolve. Consequently, research focusing on the development and implementation of telehealth training programs is imperative to ensure that healthcare professionals possess the skills required to provide effective telehealth care. Future telehealth research should focus on treatments for ADHD, including multimodal, pharmacological, and non-pharmacological approaches. This entails evaluating how telehealth platforms can be modified to improve adherence to these treatments, enhance parental education, and effectively deliver non-pharmacological interventions, such as psychoeducation and cognitive behavioral therapies. A deeper understanding of the patients', families', and caregivers' experiences is needed, particularly through qualitative studies. The mixed results of the clinician experience studies highlight the need for further confirmation. Additionally, more research is required to investigate and validate the cost and operational impacts, given the limited and contradictory findings of existing studies. Future studies should also aim to comprehensively cover the Virtual Care Value Framework, particularly the health-equity component, which has not yet been examined.

The results of this study have significant implications for clinical practice. Initially, the findings emphasized the essential function of nurses, who play a vital role in recognizing, intervening, and providing continuous support for children with ADHD. Furthermore, the findings of the ADHD interventions offer guidance for clinical settings. By incorporating evidence-based ADHD interventions, healthcare providers can enhance the care and support offered to children with ADHD. Implementing these interventions as part of regular practice enables nurses to effectively address the complex needs of vulnerable children, resulting in improved general health and developmental outcomes. It is essential for clinicians to engage in ongoing research and education on ADHD interventions to establish a comprehensive and effective approach to pediatric care.

4. Strengths and Limitations

To the best of our knowledge, this study is the first to map the landscape of telehealth research in children with ADHD and evaluate existing research gaps using a virtual care value stream framework. These findings provide a strong foundation for future research in this field. However, this study had some limitations. The exclusion of non-English literature may introduce a language bias, thereby potentially overlooking valuable research conducted in other languages. Additionally, the specific terms used for telehealth in this study may have excluded relevant studies using different terminologies.

CONCLUSION

This scoping review provides an extensive overview of telehealth research on children with ADHD. Utilizing the virtual care value stream framework, the findings emphasized the predominance of telehealth research in the US, underscoring the need for global representation. Furthermore, it highlights the potential of telehealth technologies to improve ADHD assessment, enhance treatment adherence, and enrich parental education. Future research should focus on health equity and other unexplored aspects of the Virtual Care Value Framework of the AMA. These efforts will enhance our understanding of the effectiveness of telehealth and inform the development of treatment guidelines and policies for ADHD.

ARTICLE INFORMATION

Authors' contribution

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Effectiveness of cryotherapy in preventing oral mucositis in pediatric cancer patients in Jordan: a randomized controlled trial

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Purpose: The study aimed to evaluate the effectiveness of cryotherapy in preventing oral mucositis in pediatric patients receiving chemotherapy. **Methods:** An evidence-based practice project utilized a randomized control trial design with two groups (experimental and control groups). Fifty-nine pediatric patients with cancer in Jordan, aged 8–18 years, were randomly assigned to the experimental group (n=29) or the control group (n=30). The intervention was conducted from June 2022 to December 2022. The severity of oral mucositis among pediatric cancer patients was assessed using the World Health Organization oral mucositis grade. **Results:** There were no significant differences in sex or disease type among the groups. On days 7, 14, and 21, we observed notable between-group differences in treatment responses and the intensity of oral mucositis, highlighting the efficacy of cryotherapy in diminishing the severity of oral mucositis. **Conclusion:** This study supports the use of cryotherapy as a preventive measure for oral mucositis among pediatric oncology patients in Jordan. The findings suggest that cryotherapy effectively reduces the severity of oral mucositis. Further research is necessary to investigate the broader impacts of cryotherapy.

Keywords: Cryotherapy; Neoplasms; Pediatrics; Prevention and control; Stomatitis

INTRODUCTION

Oral mucositis, which is characterized by severe inflammation and sores in the mouth, commonly affects young cancer patients undergoing chemotherapy or radiation therapy [1]. This condition significantly impacts their quality of life and the effectiveness of treatment outcomes [2]. Addressing oral mucositis continues to be a significant challenge in pediatric oncology, as conventional treatments frequently fail to provide substantial relief [3].

Cryotherapy, which involves the application of cold therapy, has gained recognition as a potential method for both preventing and managing oral mucositis [4]. Applying cold temperatures to the oral cavity before, during, or after cancer treatments aims to reduce the severity and duration of mucositis symptoms [5,6]. Although cryotherapy has shown promising results in some studies, its effectiveness and the optimal protocols for use in pediatric cancer patients remain subjects of ongoing research.

This research is significant because it has the potential to improve the quality of life for pediatric cancer patients by reducing the frequency and severity of oral mucositis. As demonstrated by Correa et al. [5], cryotherapy has been recognized for its effectiveness in reducing the severity of mucositis, potentially enhancing patient comfort and adherence to treatment. Should cryotherapy be validated as an effective

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preventive strategy, its integration into standard care protocols could significantly improve patient outcomes and minimize disruptions or delays in treatment. Such integration would be in line with current clinical guidelines and recommendations, supporting a proactive approach to managing complications induced by chemotherapy [7]. Furthermore, gaining a deeper understanding of the most effective protocols and techniques for applying cryotherapy in young patients could enable more tailored and specific treatment approaches [8].

The research findings will serve as a valuable resource for healthcare professionals involved in pediatric oncology, assisting them in making evidence-based decisions about incorporating cryotherapy into clinical practice. Additionally, the study may highlight areas for future research and innovation, potentially leading to the development of novel therapies or enhancements to existing cryotherapy techniques. Furthermore, this study aims to enhance the quality of care and overall health of pediatric cancer patients by exploring the potential benefits of this intervention. This could help mitigate the impact of oral mucositis on their treatment journey. In recent years, numerous studies have explored the effectiveness of oral cryotherapy in preventing oral mucositis. One study evaluated the efficacy of oral cryotherapy in preventing this condition among cancer patients following chemotherapy. The findings indicated that oral cryotherapy significantly reduced the risk of developing oral mucositis, regardless of its severity [9]. Another study, employing a controlled randomized trial (RCT) design, aimed to confirm that oral cryotherapy is an effective solution for managing oral mucositis in patients treated with 5-fluorouracil. The results of this study provide strong evidence supporting the use of oral cryotherapy in the prevention of oral mucositis [10].

A study was conducted to assess the impact of cryotherapy on preventing oral mucositis in pediatric patients undergoing autologous stem cell transplantation with a melphalan-etoposide-carboplatin regimen. This research demonstrates the significant effectiveness of cryotherapy as a preventive measure against melphalan-induced oral mucositis in pediatric patients, with notable clinical significance [11].

A systematic review by the Mucositis Study Group of the Multinational Association of Supportive Care in Cancer/International Society of Oral Oncology (MASCC/ISOO) has demonstrated that oral cryotherapy is an effective method for preventing oral mucositis [7]. This recommendation specifically targets two patient groups: (1) those undergoing autologous hematopoietic stem cell transplant with high-dose melphalan conditioning protocols, and (2) patients receiving bolus 5-fluorouracil chemotherapy [5]. A study confirmed that oral cryotherapy effectively prevents oral mucositis [6]. Research indicates that fluorouracil-based chemotherapy for solid tumors can prevent oral mucositis in adults.

Furthermore, it has been effective in preventing severe oral mucositis in adults undergoing high-dose melphalan-based chemotherapy prior to hematopoietic stem cell transplantation [7,12,13].

The cryotherapy protocol employed in this study involves the application of ice packs within the oral cavity, starting five minutes before chemotherapy and continuing for 30 minutes at temperatures ranging from -1°C to 1°C. This approach differs from previous protocols, such as those used by Katrancı et al. [10], which did not specify the timing relative to chemotherapy or the exact temperature range. The idea behind our protocol comes from previous research showing that early application and careful temperature control are crucial for maximizing the effectiveness of cryotherapy in preventing oral mucositis [5,14]. Additionally, the World Health Organization (WHO) oral mucositis scale was employed to provide a standardized assessment of mucositis severity, ensuring consistency and reliability in outcome measurement.

This study sets itself apart from earlier research by specifying when cryotherapy should begin in relation to chemotherapy and by maintaining a precise temperature range. These methodological specifics are grounded in evidence that indicates the importance of early and controlled application for effectively preventing oral mucositis. In contrast, previous studies frequently did not include these detailed specifications, which may have led to inconsistent outcomes. By following a standardized protocol and using the WHO oral mucositis scale, this study seeks to deliver more consistent and reliable results, thus enhancing the effectiveness of cryotherapy practices in pediatric oncology.

The importance of cryotherapy in pediatric oncology is underscored by the considerable discomfort and complications arising from oral mucositis, which can hinder nutritional intake and elevate the risk of infections. Cryotherapy offers a non-invasive and cost-effective method to alleviate these negative outcomes, thus improving the overall treatment experience for children. Safety remains a critical consideration; the protocol implemented in this study ensures a temperature range that is both effective and safe, reducing the possi-

bility of cold-induced injury to the oral tissues.

Further studies will be necessary to confirm these findings across various pediatric populations and different chemotherapy regimens. Further research should investigate the long-term effects of cryotherapy on quality of life and treatment adherence, as well as any potential side effects not identified in the initial studies. Additionally, larger sample sizes and multicenter trials would aid in generalizing the results and refining the protocol for wider applications.

1. Aim

The goal of this study was to determine whether cryotherapy can prevent oral mucositis in pediatric cancer patients by examining its impact on the severity, frequency, and duration of mucositis episodes. Effectiveness was assessed based on the incidence and severity of mucositis, using the WHO Oral Mucositis Scale. Additionally, this study monitored the frequency of mucositis episodes and the duration of each episode from onset to resolution. This comprehensive evaluation will help establish the viability of cryotherapy as a standard preventive treatment in pediatric oncology.

2. Hypothesis

The hypothesis of this study was that cryotherapy significantly reduces the severity, incidence, and duration of oral mucositis episodes in pediatric cancer patients compared to a control group not receiving cryotherapy.

METHODS

Ethical statements: This study was approved by the Institutional Review Board (IRB) of King Hussein Cancer Center (IRB No. 21-KHCC-076). Informed consent was obtained from all participants.

1. Design

The present study was an evidence-based practice that employed an RCT design with two groups: experimental and control. RCTs are pivotal in evidence-based practice as they assist clinicians, policymakers, and healthcare professionals in making informed decisions. They produce high-quality evidence that substantiates the efficacy and safety of interventions, thereby guiding clinical guidelines, treatment recommendations, and healthcare policies [15]. Randomization was rigorously implemented to maintain a robust scientific protocol, utilizing a computer-generated list of random numbers. Allocation was managed by an independent administrator who was not involved in the direct care of the patients, aligning with the research objectives.

To reduce bias, the study employed a single-blind technique in which only the outcome assessors were unaware of the group assignments—either cryotherapy or standard care. This approach ensured unbiased evaluations, despite participants being aware of their treatment type due to the interventions' evident characteristics.

The reporting of this study was based on the Strengthening the Reporting of Observational Studies in Epidemiology reporting guidelines [16].

2. Sampling and Setting

We approached pediatric cancer patients receiving chemotherapy at a specialized cancer center in Jordan. With a statistical power of 0.8 and assuming a medium effect size and a significance level (α) of 0.05, the total sample size was determined to be 59; these participants were divided into two distinct groups [17]. Throughout the study, there were no dropouts, which is likely attributable to the comprehensive support and follow-up provided.

The study enrolled pediatric patients aged 8 to 18 who had been diagnosed with cancer and were undergoing treatment with either high-dose methotrexate or etoposide chemotherapy regimens. These patients were receiving care at a specialized cancer center in Jordan. However, the study excluded patients with open wounds, oral cavity issues, hypersensitivity to cold, or vascular disease. The safety of cryotherapy in the pediatric population was ensured through meticulous monitoring and carefully designed exclusion criteria to prevent adverse effects.

Exclusion criteria: (1) Patients presenting with open wounds or oral complications were excluded to avoid exacerbating these conditions through cryotherapy. (2) Hypersensitivity to cold was also a crucial exclusion criterion, as it could lead to adverse reactions. (3) Furthermore, individuals with vascular disease were not included in the study, as cryotherapy could adversely impact their blood flow.

3. Data Collection and Procedure

A total of 59 patients were randomly divided into two groups: the experimental group (n=29) and the control group (n=30). The purpose of this randomization was to ensure equivalence between the groups, thereby minimizing bias related to participant characteristics that could affect the study's internal validity. This random assignment aimed to attribute any differences in outcomes specifically to the intervention rather than to extraneous factors. Simple randomization (1:1) was employed, assigning patients with odd numbers to the experimental group. In this group, cryotherapy was administered, while the control group received standard treatment (Figure 1). The intervention period spanned from June 2022 to December 2022.

We ensured the reliability of the oral mucositis assessments by employing healthcare professionals who were both trained and calibrated as assessors, separate from the caregiving team. Standardized assessment procedures were strictly adhered to, and assessors were blinded to the participants' treatment groups to maintain objectivity. Regular inter-rater reliability checks were conducted to ensure consistency across assessments.

In this study, the experimental group underwent a carefully structured cryotherapy protocol. This intervention involved placing ice packs inside the oral cavity, starting 5 minutes before chemotherapy and continuing for a continuous 30-minute period. The ice packs were consistently maintained at temperatures ranging narrowly from -1°C to 1°C. This regimen was followed for each chemotherapy session throughout the duration of the study. To ensure uniform application of cryotherapy across all participants, our nursing staff underwent extensive training on this protocol. We implemented systematic supervision to maintain strict adherence to the specified temperature and timing guidelines. A detailed checklist was used by our medical team to precisely record the start and end times of each session, as well as the temperature of the ice packs. This method was crucial in reducing variability in the intervention, thereby enhancing the credibility and replicability of our findings.

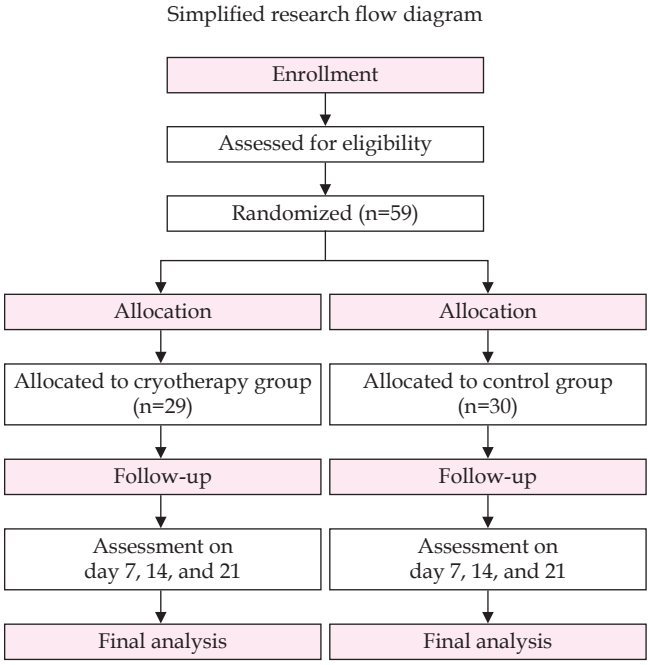

Figure 1. Research flow diagram.

In this study, the control group received the standard care typically administered to pediatric cancer patients undergoing chemotherapy, which did not include cryotherapy. This usual treatment includes several key components: basic oral care, which involves routine oral hygiene using a soft toothbrush and mild toothpaste to minimize mucosal irritation; pain management, where standard analgesics are provided as needed to manage pain associated with oral mucositis; nutritional support, which consists of dietary adjustments and supplementation to ensure adequate nutrition despite oral discomfort; and infection control, involving prophylactic measures such as the use of antimicrobial mouthwashes prescribed by the treating oncologist. These components collectively represent the comprehensive supportive care protocols aimed at managing the side effects of chemotherapy, with a particular focus on the prevention and management of oral mucositis.

4. Outcome Measures

The primary outcome of the study was the prevention of oral mucositis using oral cryotherapy. The WHO oral mucositis scale served as a standardized system to assess the severity of oral mucositis among participants [18]. Trained healthcare professionals evaluated the severity of oral mucositis using the WHO oral mucositis scale at specified intervals. This scale provides a framework for healthcare professionals to evaluate and categorize the extent and severity of oral mucositis in patients. It includes five grades or levels, ranging from 0 to 4, with each grade representing a specific degree of mucositis: grade 0 (no mucositis), grade 1 (mild mucositis), grade 2 (moderate mucositis), grade 3 (severe

mucositis), and grade 4 (life-threatening mucositis). Assessments of oral mucositis were conducted at four different times during the treatment. The initial assessment occurred upon patient admission, establishing a baseline. On day 7, following chemotherapy, patients were evaluated for oral mucositis in the pediatric clinic. Subsequent assessments were carried out on days 14 and 21, corresponding to the second and third cycles of treatment, respectively.

5. Ethical Considerations

Participants were fully informed about the purpose of the study, and it was emphasized that their participation was voluntary and that they could withdraw at any time. The consent process varied depending on the age of the participants. For children aged 8–12, only parental written consent was required, without the need for patient assent. For those aged 12– 15, verbal assent from the patients was obtained in addition to the parental written consent. Participants aged 15–18 provided their own written assent as well as written consent from their parents.

6. Statistical Analysis

Statistical analyses were conducted using SPSS Statistics software version 25.0 (IBM Corp.). The study utilized both descriptive and inferential statistics to analyze the demographic characteristics of the sample. Univariate analysis was used to compare mucositis scores between the experimental and control groups, employing the chi-square test for categorical variables. To account for multiple comparisons resulting from various tests across different days and variables, a Bonferroni correction was applied, adjusting the significance level based on the number of tests conducted.

Control variables in our analysis, including age, sex, type of chemotherapy, and baseline severity of oral mucositis, were matched across the experimental and control groups to minimize confounding factors. These variables were selected due to their known influence on the incidence and severity of oral mucositis among pediatric oncology patients.

RESULTS

1. Overview of Participant Demographics

The study involved 59 participants, who were predominantly males (59.3%), with females making up 40.7%. These participants were diagnosed with various diseases, among which acute lymphoblastic leukemia (ALL) was the most common, representing 61.0% of the cases. Less prevalent conditions, such as Ewing sarcoma, accounted for only 1.7% of the sample. In terms of chemotherapy treatments, high-dose methotrexate was the most commonly used, as it was administered in 66.1% of the cases (Table 1). The participants had an average age of approximately 12.1 years, with ages ranging from 8.0 to 18.0 years. The median age was 12.0 years, with a standard deviation of 3.06 years (Table 2).

2. Sex and Diagnosis-Comparisons

Table 3 illustrates the relationship between different chemotherapy treatment groups, specifically the control and experimental groups, in relation to various factors. Our initial analysis focused on the gender distribution, revealing that the control group, comprising 36.7% females and 63.3% males, did not significantly differ from the experimental group, which consisted of 44.8% females and 55.2% males ($p=0.52$). Additionally, no significant differences were found ($p>0.05$) when examining the incidence of diagnoses such as ALL, acute myeloid leukemia, and B-cell lymphoma, we observed no significant differences between the groups.

3. Reduction in Severity and Incidence Rate of Mucositis

We present data demonstrating a reduction in the severity of mucositis episodes and a decreased incidence rate among patients in the cryotherapy group compared to the control group. These findings are crucial as they confirm the effectiveness of cryotherapy in a clinical setting. The most significant differences between the control and experimental groups were observed during evaluations on days 7, 14, and 21. These evaluations revealed marked differences in treatment responses over time. On day 7, the difference was statistically significant, with a p-value of 0.03. This trend became more pronounced in the day 14 assessment ($p=0.01$), and the day 21 assessment further confirmed the ongoing disparity in response ($p=0.04$). This indicates that the control and experimental groups experienced distinctly different responses to chemotherapy, particularly as the treatment progressed (Table 4).

Table 1. Descriptive Statistics for Categorical Variables (*N*=59)

Variables	Frequency (%)
Sex	
Female	24 (40.7)
Male	35 (59.3)
Diagnosis	
Hematological	
ALL	36 (61.0)
AML	4 (6.8)
Lymphoma	
B-cell lymphoma	10 (16.9)
Solid tumors	
Ewing sarcoma	1 (1.7)
GCT	1 (1.7)
HD	2 (3.4)
Osteosarcoma	5 (8.5)
Hematological total	40 (67.8)
Solid tumors total	9 (15.3)
Type of CTX	
Methotrexate	
COPAD-M3	4 (6.8)
Consolidation III	1 (1.7)
HDMTX	39 (66.1)
Maintenance course #1	2 (3.4)
R-COPAD M3	1 (1.7)
Methotrexate total	47 (79.7)
Etoposide	
ETOPSIDE	4 (6.8)
GCT	1 (1.7)
ICE	1 (1.7)
IE	1 (1.7)
RICE	1 (1.7)
Etoposide total	8 (13.6)
Other	
IGEV	1 (1.7)
Modified UKALL R3	1 (1.7)
Re-induction week III	2 (3.4)
Other total	4 (6.8)
Group	
Control	30 (50.8)
Experimental	29 (49.2)
Assessment on day 7	
No	50 (84.7)
Yes	9 (15.3)
Oral mucositis degree on day 7 (yes)	
First degree	9 (100.0)
Assessment on day 14	
No	45 (76.3)
Yes	14 (23.7)
Oral mucositis degree day 14 (yes)	
First degree	9 (64.3)
Second degree	3 (21.4)
Third degree	2 (14.3)
Assessment on day 21	
No	43 (72.9)
Yes	16 (27.1)
Oral mucositis degree on day 21 (yes)	
First degree	11 (68.8)
Second degree	4 (25.0)
Third degree	1 (6.3)

(Continued to the next page)

Table 1. Continued

"Yes" indicates the presence of oral mucositis on the given day, and "No" indicates the absence of oral mucositis on the given day; ALL, acute lymphoblastic leukemia; AML, acute myeloid leukemia; GCT, germ cell tumor; HD, Hodgkin disease; COPAD, cyclophosphamide, oncovin (vincristine), prednisone, adriamycin (doxorubicin); HDMTX, high-dose methotrexate; ETOPSIDE, etoposide; ICE, ifosfamide, carboplatin, etoposide; IE, Ifosfamide, etoposide; RICE, rituximab, ifosfamide, carboplatin, etoposide; IGEV, ifosfamide, gemcitabine, vinorelbine.

Table 2. Descriptive Statistics for Continuous Variables

Variable	Number	M	Median	Range	Max	Min	SD
Age (year)	59	12.1	12.0	10.0	18.0	8.00	3.06

M, mean; SD, standard deviation.

4. Hypothesis: Cryotherapy Reduces the Severity of Oral Mucositis

The study carefully monitored the progression of oral mucositis. Initially, on day 7, all cases of mucositis were classified as first-degree. By day 14, the severity levels varied, with 64.3% remaining at first-degree, 21.4% escalating to second-degree, and 14.3% advancing to third-degree. By day 21, the majority of cases (68.8%) were still first-degree, while 25.0% had progressed to second-degree, and a smaller fraction (6.3%) had reached third-degree (Table 1). This trend demonstrates a clear increase in the severity of oral mucositis throughout the treatment period. Overall, these findings underscore the significant differences in treatment responses and side effects between the control and experimental groups, highlighting the impact of treatment type on patient outcomes in chemotherapy (Table 4).

DISCUSSION

This study investigated the role of cryotherapy in preventing oral mucositis among pediatric chemotherapy patients, building on existing research while uniquely focusing on a younger demographic. This approach aligns with findings from previous studies [10,14], and the systematic review by

Table 3. Associations Between Variables (Univariate)

Variables	Experiment (n=29)	Control (n=30)	Total (*N*=59)	*p*-value
Sex				0.52
Female	13 (44.8%)	11 (36.7%)	24 (40.7%)	
Male	16 (55.2%)	19 (63.3%)	35 (59.3%)	
Diagnosis				0.78
ALL	19 (65.5%)	17 (56.7%)	36 (61.0%)	
AML	2 (6.9%)	2 (6.7%)	4 (6.8%)	
B-cell lymphoma	3 (10.3%)	7 (23.3%)	10 (16.9%)	
Ewing sarcoma	1 (3.4%)	0 (0.0%)	1 (1.7%)	
GCT	1 (3.4%)	0 (0.0%)	1 (1.7%)	
HD	1 (3.4%)	1 (3.3%)	2 (3.4%)	
Osteosarcoma	2 (6.9%)	3 (10.0%)	5 (8.5%)	
Specific diagnosis				0.42
Hematological	21 (72.4%)	19 (63.3%)	40 (67.8%)	
Lymphoma	3 (10.3%)	7 (23.3%)	10 (16.9%)	
Solid tumors	5 (17.2%)	4 (13.3%)	9 (15.3%)	
Type of CTX				0.63
Etoposide	4 (13.8%)	4 (13.3%)	8 (13.6%)	
Methotrexate	22 (75.9%)	25 (83.3%)	47 (79.7%)	
Other	3 (10.3%)	1 (3.3%)	4 (6.8%)	

ALL, acute lymphoblastic leukemia; AML, acute myeloid leukemia; GCT, germ cell tumor; HD, Hodgkin disease; COPAD, cyclophosphamide, oncovin (vincristine), prednisone, adriamycin (doxorubicin); HDMTX, high-dose methotrexate; ETOPSIDE, etoposide; ICE, ifosfamide, carboplatin, etoposide; IE, ifosfamide, etoposide; RICE, rituximab, ifosfamide, carboplatin, etoposide; IGEV, ifosfamide, gemcitabine, vinorelbine.

Table 4. Univariate Analysis of Oral Mucositis Assessment over Three Time Intervals

Variables	Experiment (n=29)	Control (n=30)	Total (*N*=59)	*p*-value
Assessment on day 7				0.03
No	28 (96.6%)	22 (73.3%)	50 (84.7%)	
Yes	1 (3.4%)	8 (26.7%)	9 (15.3%)	
Assessment on day 14				0.01
No	27 (93.1%)	18 (60.0%)	45 (76.3%)	
Yes	2 (6.9%)	12 (40.0%)	14 (23.7%)	
Assessment on day 21				0.04
No	25 (86.2%)	18 (60.0%)	43 (72.9%)	
Yes	4 (13.8%)	12 (40.0%)	16 (27.1%)	

"Yes" indicates the presence of oral mucositis on the given day, and "no" indicates the absence of oral mucositis on the given day.

the Mucositis Study Group of MASCC/ISOO [7], which have similarly reported positive outcomes with cryotherapy. The observed reduction in mucositis severity is critical as it decreases patient discomfort and potentially improves adherence to cancer therapy. The implications of mitigating oral mucositis are significant, including reduced pain, improved nutritional intake, and a decreased risk of infection [19].

This study closely examined the time-sensitive benefits of cryotherapy for managing oral mucositis in pediatric cancer patients, observing significant results on days 7, 14, and 21 after treatment. The notable early improvement on day 7 highlights the critical importance of initiating cryotherapy promptly. This approach aligns with the findings of Al-Rudayni et al. [14] and is pivotal for mitigating the advancement of mucositis. The early application of cryotherapy has been consistently recommended in various studies, emphasizing its importance in the initial stages of treatment [4].

Over the course of the study, the experimental group showed improvement in mucositis, beginning on day 14 and continuing through day 21. This indicates that cryotherapy was effective throughout the entire study period.

These findings are consistent with the conclusions of the systematic review by the Mucositis Study Group of MASCC/ISOO, demonstrating that the benefits of cryotherapy are not limited to immediate relief but also extend to the ongoing management of oral mucositis. Moreover, the results

observed, especially on day 21, strongly support the incorporation of cryotherapy into standard care protocols for young cancer patients. In line with recent research, these outcomes reinforce the notion that cryotherapy can be effectively used to prevent and treat oral mucositis across various stages of chemotherapy [5,6,11,20].

The consistency of these results with other studies in this field underscores the significant role of cryotherapy in enhancing treatment experiences for pediatric oncology patients. This study advocates for the incorporation of cryotherapy into pediatric cancer care practices, emphasizing its effectiveness in managing one of the most common and challenging side effects of chemotherapy treatments. However, a randomized controlled study by Kamsvåg et al. [21] indicated that oral cryotherapy did not significantly reduce the incidence of severe oral mucositis, oral pain, or the need for opioid medication in young patients undergoing various conditioning treatments for hematopoietic stem cell transplantation.

The current findings align with the broader research landscape, highlighting the effectiveness of cryotherapy in managing oral mucositis, especially within pediatric oncology. This study adds a crucial pediatric-specific viewpoint to the existing body of research, addressing the distinct challenges and needs of children undergoing chemotherapy. The evidence presented supports cryotherapy as an effective, manageable, and child-friendly option for supportive cancer care [22]. By providing data on the effectiveness of cryotherapy in children, this study improves our approach to personalized and age-appropriate treatment strategies in pediatric oncology, emphasizing the significance of proactive and non-pharmacological interventions in the care of young cancer patients.

In summary, this research not only corroborates existing evidence on the benefits of cryotherapy but also enhances our understanding by exploring its application in pediatric cancer care. This significant contribution aids in refining cancer treatment protocols and improving the quality of life for pediatric patients undergoing chemotherapy.

1. Recommendations

1) Clinical application

It is strongly recommended to include cryotherapy in the standard therapeutic protocols for children undergoing chemotherapy. To ensure its effective use, detailed guidelines should be developed. These guidelines must address specific aspects of cryotherapy application, including optimal duration, temperature settings, and timing relative to chemotherapy sessions. Importantly, these protocols should be adapted to meet the unique needs of pediatric patients, considering their distinct physical and psychological responses to treatments.

2) Future research

Extending research into various aspects of cryotherapy is necessary. Future studies should explore its efficacy across different chemotherapy treatments, varying dosages, and diverse patient demographics. Additionally, it is important to focus research on understanding the long-term impacts and quality of life outcomes for patients after cryotherapy to fully appreciate its extended benefits and any potential lasting effects.

2. Limitations

Our study offers valuable insights into the effectiveness of cryotherapy for preventing oral mucositis in pediatric cancer patients, yet it comes with several limitations. The restricted sample size and diversity may hinder the generalizability of our findings to a broader population and other pediatric oncology settings. Additionally, our research did not examine all possible factors influencing the occurrence of mucositis, such as genetics, previous mucositis episodes, or individual oral hygiene practices, which could impact the applicability of our results across different demographic groups. The use of self-reported outcomes for some secondary measures might also introduce response bias. These issues highlight the necessity for future studies to involve larger, more diverse populations and to consider using objective biomarkers of mucositis severity. This approach would not only improve the reliability and relevance of the findings to a wider demographic but also deepen our understanding of the multifactorial nature of mucositis development and prevention.

CONCLUSION

This study highlights the notable effectiveness of cryotherapy in preventing oral mucositis among pediatric cancer patients, demonstrating notable benefits at various stages of their treatment journey. The findings carry important implications for pediatric oncology practice. By incorporating

cryotherapy into treatment protocols, there is a strong potential to enhance the standard of patient care and improve the quality of life for young cancer patients, representing a substantial advancement in their treatment experience.

In conclusion, there is a compelling need to integrate cryotherapy into standard pediatric oncology care practices. Additionally, it is crucial to persist in researching this field to continuously refine and optimize pediatric cancer treatment strategies, ultimately aiming to improve patient outcomes and enhance their quality of life.

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Authors' contribution

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Conflict of interest

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Data availability

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The influencing factors of pediatric nurses' perception of patient safety culture and partnership with patients' parents on patient safety nursing activities in South Korea: a descriptive study

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Purpose: This study aimed to identify the effects of pediatric nurses' perception of patient safety culture and their partnership with patients' parents on pediatric patient safety nursing activities. **Methods:** This descriptive study was conducted over a two-month period, from October to November 2022, utilizing self-reported questionnaires. The study included 165 nurses, each having at least 6 months of working experience in wards where children were admitted. These nurses were selected from 13 pediatric specialty hospitals, general hospitals, and university hospitals across seven regions. The data analysis was performed using the SPSS/WIN 26.0 program (IBM Corp.) for descriptive statistics, t-test, One-way ANOVA, Scheffé test, Pearson correlation coefficients, and multiple regression analysis. **Results:** The average scores for awareness of patient safety culture, partnership with patients' parents, and pediatric patient safety nursing activities were 3.37±0.41, 3.94±0.41, and 4.50±0.38, out of 5 points respectively. The factors influencing pediatric patient safety nursing activities were identified as a partnership with patients' parents (β=.41, p<.001). Among hospital-related characteristics, safety management committee (β=.16, p=.029) and safety management regulations (β=.17, p=.016) were also analyzed as factors influencing patient safety nursing activities. These factors accounted for 29.2% of the explanatory power for pediatric patient safety nursing activities. **Conclusion:** Based on the above study results, we found that to promote safe nursing activities for pediatric patients, developing and implementing training programs that enhance partnerships with patient's parents was imperative, and establishing work regulations and a safety management committee to systematically manage safety management tasks was deemed important.

Keywords: Parents; Patient safety; Pediatric nursing; Safety management

INTRODUCTION

Patient harm resulting from unsafe care is a significant and increasing global public health concern that ranks high among the leading causes of death and disability [1]. Safety incidents encompass any errors, mistakes, events, accidents, ordeviations, irrespective of whether they result in harm to patients [2]. The types of patient safety incidents in hospitals are drug-related incidents, accounting for 43.3%, followed by falls (38.8%) and injuries (3.3%); the safety incident rate for hospitalized children under 10 years old in South Korea was reported as 7.1% in 2022 [3]. Considering that safety acci-

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dents among hospitalized children not only impact the health of this population but also cause prolonged hospital stays and additional cost burdens associated with examinations and treatments, preventing safety accidents among hospitalized children is crucial [4].

Safety nursing activities aim to prevent patient injury and accidents during the delivery of medical services [2]. This is a fundamental principle of healthcare provision, determines the quality of healthcare, and is a foremost activity for enhancing patient safety, which is the duty of all healthcare practitioners [5]. Children, due to their developmental characteristics, have strong impulses of curiosity and exploration. However, since their physical functions are not fully developed, they often lack the ability to cope with risks, leaving them constantly exposed to the dangers of accidents [6]. Therefore, safety nursing activities for hospitalized children are emphasized more than for any other group [7]. Patient safety culture is defined as the outcome of interactions between values, attitudes, perceptions, abilities, and behavioral patterns, which together determine the commitment of organizational members and individual or organizational capabilities for managing health and safety in the workplace [2]. Organizations that cultivate a positive safety environment are marked by open communication built on mutual trust, collective beliefs in the importance of safety, and confidence in the effectiveness of proactive measures [2]. In other words, safety culture encompasses the perception of fostering unconscious expressions of safety consciousness and establishing the value of safety first, as well as activities that induce primary changes in behavior patterns [8]. Nurses in hospitals play a crucial role in reducing the incidence of safety accidents through safety nursing activities [8]. Thus, nurses' awareness of safety culture plays a vital role in enhancing patient safety [9]. Especially in pediatric wards, where children may have a lower perception of danger, safety culture awareness among members is more significant than that in other nursing units [7]. The perception of patient safety culture [9,10] significantly influences nurses' patient safety nursing activities and has been observed to enhance healthcare quality by increasing the performance rate of these safety-related activities [10]. However, as previous studies primarily focused on investigating nurses in adult patient wards, it is necessary to determine whether the perception of pediatric nurses regarding patient safety culture affects the performance of pediatric patient safety practices.

The partnership between pediatric nurses and the parents of hospitalized children (referred to as the nurse-parent partnership) refers to a cooperative relationship between nurses and parents with a common goal of providing optimal care to their child [11]. Hospitalized children often display limited verbal proficiency, lack the capability to make judgments and decisions regarding their health issues, and rely on their parents for support [11]. Furthermore, unforeseen or adverse events associated with medical care can induce physical and mental challenges for pediatric patients and their families [12]. Therefore, the nurse-parent partnership holds significant importance in mitigating such difficulties [11]. The World Health Organization's Global patient safety action plan 2021–2030 also emphasizes the significance of involving patients and their families at all levels of healthcare to ensure safe healthcare practices [1]. According to a previous study, when parents of pediatric patients participated in prevention activities by observing and reporting inappropriate behaviors in procedures such as medication administration, line management, and infection prevention, as well as communicating with healthcare providers, errors were reduced [13]. Such partnerships with parents of pediatric patients are relevant to the safety of hospitalized children. However, research on partnerships between nurses and parents of pediatric patients and the safety of hospitalized children has mainly been conducted in foreign countries [13,14]. In South Korea, research has been conducted on the safety nursing activities of nursing students for hospitalized children [7], and most of previous studies pertain to the safety nursing activities of general ward [8-10].

Accordingly, this study aims to identify the influence of pediatric nurses' perceptions of patient safety culture and their partnership with parents of child patients on pediatric patient safety nursing activities. The findings will serve as foundational data for the development of strategies to promote patient safety nursing activities for hospitalized children.

METHODS

Ethical statements: This study was approved by the Institutional Review Board (IRB), designated by the Donnguk University (IRB No. DGU IRB 20220022-1). All participants provided informed consent.

1. Study Design

This descriptive study aimed to investigate the effects of the perception of patient safety culture and pediatric nurse-parent partnership on patient safety nursing activities among pediatric nurses. This study followed the guidelines established by the Strengthening of the Reporting of Observational Studies in Epidemiology [15].

2. Participants

This study involved nurses with more than 6 months of experience working in wards where children are hospitalized, including children's hospitals, general hospitals, and university hospitals. These criteria were based on a study showing that nurses with fewer than 6 months of experience differed from their more experienced pediatric counterparts, as they were new to the profession or had moved from another ward, and were thus in the process of adapting to such a new environment [16].

The sample size for this study was caculated using the G*power 3.1.9.7 program [17]. Assuming a medium effect size of .15, a significance level of $\alpha = .05$, a power (1-β) of .90, and twelve predictors in a multiple regression analysis, a minimum of 157 participants was required. To account for a potential dropout rate of 15%, the survey questionnaires were distributed to 181 participants. However, only 165 participants were included in the final analysis, as 16 questionnaires were incomplete and therefore excluded.

3. Measurements

1) Perception of patient safety culture

The perception of patient safety culture was assessed using the Korean version of the Hospital Survey on Patient Safety Culture 2.0 (K-HSOPSC 2.0), which was originally designed by the Agency for Healthcare Research and Quality and subsequently translated into Korean. This tool was used to assess reliability, content validity, and construct validity in Lee and Dahinten's study [18]. K-HSOPSC 2.0 consists of 31 items with 10 subdomains, with each rated on a 5-point Likert scale ranging from 1 point ("not at all or never happens") to 5 points ("strongly agree or always happens"). Among the 31 items, three were related to teamwork; three to staffing and work pace; three to organizational learning–continuous improvement; four to response to error; three to supervisor, manager, or clinical leader support for patient safety; three to communication about error; four to communication openness; two to reporting patient safety event; three to hospital management support for patient safety; and three to handoffs and information exchange. Examples of items in the tool include "Our department has sufficient staff to handle the workload," "Similar patient safety issues continue to occur in our department," "Adequate time is provided to exchange important patient information during handovers," and "Hospital administrators provide sufficient resources for improving patient safety." Twelve negatively worded questions were reverse scored, with a higher score indicating a more positive perception of patient safety culture. The original reliability of this tool at the time of its development was measured with Cronbach's α coefficient, yielding a value of .77 [19]. The K-HSOPSC 2.0, which was translated into Korean and modified by Lee and Dahinten [18], obtained a Cronbach's α value of .67–.89. However, the overall reliability was not indicated. In this study, this instrument obtained a Cronbach's α value of .87.

2) Nurse-parent partnership

The nurse-parent partnership was evaluated using the Pediatric Nurse Parent Partnership Scale designed for nurse use, which was developed by Choi and Bang [11]. This tool consists of 34 items across 7 subdomains: 9 items related to reciprocity, 2 items related to cautiousness, 3 items related to collaboration, 6 items related to sensitivity, 3 items related to shared information, 4 items related to communication, and 7 items related to professional knowledge and skills. Each item is rated on a 5-point Likert scale, from 1 point ("not at all") to 5 points ("strongly agree"), with higher score indicating a more positive perception of nurse-parent partnership. The tool had Cronbach's α values of .96 at the time of development [11] and .93 in this study.

3) Pediatric patient safety nursing activities

Pediatric patient safety nursing activities were assessed using a tool developed by Park, Oh, and Kim [7], which consists of 8 subdomains with a total 60 items related to hospitalized pediatric patient safety nursing activities. These items were derived from 119 items designed to evaluate nurses' patient safety nursing activities, developed by the Korea Health Industry Development Institute [20]. This tool includes of 8 subdomains with a total of 60 items, including falls (12 items), safety education (4 items), infection (11

items), firefighting (4 items), patient identification (4 items), medication (8 items), blood transfusion (10 items), and injury prevention (7 items). Each item was rated on a 5-point Likert scale, from 1 point ("not very important") to 5 points ("very important"). A higher score indicates a more positive perception of patient safety nursing activities. The tool demonstrated Cronbach's α values of .87 in a study by Park et al. [7] and .95 in the present study.

4. Data Collection

Data were collected from October 2022 to November 2022 using structured questionnaires. The study involved four children's hospitals and nine general hospitals and university hospitals in seven regions (Seoul, Gyeonggi, Gyeongbuk, Gyeongnam, Busan, Ulsan, and Daegu). For in-person data collection, the researchers either contacted or visited the head of the nursing department at each hospital; explained the study's purpose, data collection methods, and related details; and obtained verbal consent for data investigation. Then, the head nurse in the pediatric ward explained the purpose of this study to nurses with at least half a year of experience, obtained written consent, and collected the necessary data.

In instances where face-to-face meetings were declined due to the risk of contracting Coronavirus disease 2019, data from pediatric nurses were collected using snowball sampling. The researchers sent a uniform resource locator (URL) containing the structured questionnaires to acquaintances, allowing nurses with over 6 months of working experience in children's hospitals, general hospitals, and university hospitals to complete the questionnaire. Upon clicking the URL, the initial screen describes the necessity, purpose, procedures, and methods of the study; an anonymity and confidentiality guarantee; voluntary consent and withdrawal option; and other relevant details. The nurses were instructed to click on a separate study participation consent URL, where they were prompted to input their names directly on the screen to provide consent. Subsequently, the participants were asked to participate in the survey, which typically required approximately 10 minutes to complete. Individuals encountering difficulty understanding the content of the questionnaire were encouraged to reach out to the researchers, allowing the researchers to provide guidance and support in understanding and completing the questionnaire.

5. Data Analysis

Data analysis was performed using the SPSS/WIN 26.0 program (IBM Corp.). Descriptive analysis was used to assess participants' general and hospital-related characteristics, perception of patient safety culture, nurse-parent partnership, and patient safety nursing activities. Independent t-tests and one-way ANOVA were employed to determine differences in key variables based on participants' general and hospital-related characteristics. Post-hoc test was performed using the Scheffé test. Pearson's correlation coefficients were used to examine relationships between major variables, and multiple regression analysis was performed to identify factors affecting patient safety nursing activities among pediatric nurses.

RESULTS

1. General and Hospital-Related Characteristics of the Participants

Of the 165 participants, 96.4% (n=159) were women. The mean age was 33.0±7.4 years, and the proportion of those aged 30– 39 years old was the highest (49.7%, n=82). In terms of marital status, 59.4% (n=98) were unmarried, and 63.6% (n=105) had no children. In terms of education level, 57.6% (n=95) of the participants completed a 4-year nursing degree, while 30.3% (n=50) only 3-year nursing program. In terms of position, 87.9% of the participants were staff nurses (n=145), 8.5% (n=14) were charge nurses, and 3.6% (n=6) were head nurses. The mean working experience was 8.59±7.02 years. Approximately 37.6% (n=62) of the participants had over 10 years of working experience, while 23.6% (n=39) had a working experience of over 5 years to less than 10 years. Meanwhile, 81.8% (n=135) of the participants had safety training experience, 97% (n=160) reported the presence of safety management work regulations, and 84.2% (n=139) reported the existence of a safety management committee (Table 1).

2. Perception of Patient Safety Culture, Nurse-Parent Partnership, and Pediatric Safety Nursing Activities

Out of 5 points, the participants obtained mean scores of 3.37±0.41 for the perception of patient safety culture, 3.94±0.41 for nurse-parent partnership, and 4.50±0.38 for

Table 1. Differences of Main Variables according to General & Hospital related Characteristics (*N*=165)

Characteristics	n (%)	Patient safety culture		Nurse-parent partnership		Patient safety nursing activities	
		M±SD	t/F (*p*)	M±SD	t/F (*p*)	M±SD	t/F (*p*)
Sex							
Male	6 (3.6)	3.39±0.34	0.16 (.870)	4.16±0.34	1.35 (.178)	4.42±0.54	0.55 (.583)
Female	159 (96.4)	3.36±0.41		3.93±0.41		4.51±0.37	
Age (year)							
≤29[a)]	59 (35.8)	3.48±0.36	5.58 (.005) a)>b)	4.03±0.38	2.63 (.075)	4.55±0.37	0.76 (.468)
30–39[b)]	82 (49.7)	3.26±0.44		3.87±0.40		4.47±0.39	
≥40[c)]	24 (14.5)	3.43±0.35		3.93±0.46		4.51±0.36	
Marital status							
Single	98 (59.4)	3.42±0.39	1.91 (.058)	3.97±0.38	1.20 (.231)	4.52±0.35	0.56 (.579)
Married	67 (40.6)	3.29±0.42		3.89±0.44		4.48±0.41	
Presence of children							
Yes	60 (36.4)	3.33±0.41	-0.80 (.423)	3.92±0.45	-0.53 (.596)	4.51±0.41	0.29 (.775)
No	105 (63.6)	3.39±0.41		3.95±0.38		4.50±0.36	
Education level							
College	50 (30.3)	3.29±0.43	1.15 (.330)	3.84±0.42	2.39 (.071)	4.49±0.43	0.83 (.480)
University	95 (57.6)	3.42±0.37		4.01±0.38		4.54±0.35	
RN-BSN	11 (6.6)	3.30±0.35		3.89±0.43		4.40±0.34	
≥Master degree	9 (5.5)	3.34±0.65		3.81±0.48		4.38±0.43	
Position							
Staff nurse	145 (87.9)	3.36±0.40	1.90 (.154)	3.94±0.39	0.69 (.506)	4.50±0.39	0.59 (.553)
Charge nurse	14 (8.5)	3.32±0.48		3.83±0.46		4.44±0.31	
Head nurse	6 (3.6)	3.68±0.45		4.03±0.56		4.65±0.22	
Length of total career (year)							
>1	14 (8.5)	3.56±0.45	2.02 (.095)	3.94±0.48	1.57 (.184)	4.57±0.40	0.50 (.740)
1 to <3	26 (15.8)	3.39±0.35		4.08±0.48		4.49±0.50	
3 to <5	24 (14.5)	3.37±0.31		3.96±0.41		4.55±0.29	
5 to <10	39 (23.6)	3.44±0.44		3.96±0.39		4.53±0.39	
≥10	62 (37.6)	3.27±0.42		3.85±0.36		4.46±0.35	
Safety education experience							
Yes	135 (81.8)	3.39±0.40	1.71 (.089)	3.95±0.40	0.95 (.341)	4.52±0.37	1.52 (.130)
No	30 (18.2)	3.25±0.43		3.87±0.42		4.41±0.42	
Work regulation for safety management							
Yes	160 (97.0)	3.37±0.41	1.53 (.127)	3.93±0.41	-0.68 (.498)	4.52±0.37	2.77 (.006)
No	5 (3.0)	3.09±0.47		4.06±0.22		4.05±0.30	
Safety management committee							
Yes	139 (84.2)	3.39±0.41	1.95 (.053)	3.96±0.41	1.32 (.190)	4.55±0.35	3.54 (.001)
No	26 (15.8)	3.22±0.38		3.84±0.36		4.27±0.44	

[a),b),c)]Post hoc test using Scheffé's test. M, mean; SD, standard deviation; RN-BSN, registered nurse-bachelor of science in nursing.

patient safety nursing activities (Table 2).

3. Differences in Major Variables According to the General and Hospital-Related Characteristics of the Participants

The results of participants' general and hospital-related characteristics revealed significant differences in a few major variables (Table 1). A significant difference was found in the perception of patient safety culture according to "age" among the general characteristics of the participants (F=5.58, *p*=.005). Post-hoc test results indicated that participants aged 29 or older scored higher in the perception of patient safety culture item (3.48±0.36 points) compared with those aged 30–39 years (3.26±0.44 points).

No significant differences were observed in the nurse-parent partnership. In terms of patient safety nursing activities, participants who reported the availability of "safety management work regulations" scored higher (4.52±0.37 points) than those who reported the unavailability of such regulations (4.05±0.30 points), indicating better performance in patient safety nursing activities (t=2.77, *p*=.006). Additionally,

Table 2. The level of Patient Safety Culture, Nurse-Parent Partnership and Patient Safety Nursing Activities (*N*=165)

Variables	M±SD	Min.	Max.	Range
Patient Safety Culture (total)	3.37±0.41	2.16	4.29	
Teamwork	3.92±0.53	2.33	5.00	
Supervisor, manager, or clinical leader support for patient safety	3.79±0.61	1.00	5.00	
Handoffs and information exchange	3.63±0.67	2.00	5.00	
Communication about error	3.52±0.73	2.00	5.00	
Organizational learning–continuous improvement	3.39±0.63	1.33	4.67	1–5
Reporting patient safety events	3.34±0.87	1.00	5.00	
Communication openness	3.34±0.65	1.50	4.75	
Response to error	3.09±0.68	1.00	4.75	
Staffing and work pace	2.89±0.69	1.00	4.33	
Hospital management support for patient safety	2.82±0.81	1.00	5.00	
Nurse-parent partnership (total)	3.94±0.41	2.85	4.97	
Sensitivity	4.14±0.46	2.83	5.00	
Professional knowledge & skill	4.01±0.45	2.86	5.00	
Cautiousness	3.97±0.60	2.00	5.00	1–5
Communication	3.92±0.49	2.75	5.00	
Shared information	3.88±0.55	2.67	5.00	
Reciprocity	3.84±0.61	1.33	5.00	
Collaboration	3.72±0.71	1.33	5.00	
Patient safety nursing activities (total)	4.50±0.38	3.00	5.00	
Blood transfusion	4.81±0.44	1.00	5.00	
Identifying patient	4.60±0.55	2.00	5.00	
Infection	4.59±0.44	2.91	5.00	
Medication	4.58±0.45	3.00	5.00	1–5
Safety education	4.56±0.50	2.75	5.00	
Falls	4.52±0.40	3.00	5.00	
Firefighting	4.47±0.60	2.50	5.00	
Injury prevention	3.75±0.96	1.57	5.00	

M, mean; SD, standard deviation; Min., minimum; Max., maximum.

participants who reported the presence of a "safety management committee" obtained a higher mean score (4.55±0.35 points) compared with those who reported the unavailability of such a committee (4.27±0.44 points), indicating enhanced performance in patient safety nursing activities. A significant difference was found between the groups (t=3.54, p=.001).

4. Correlation Between the Perception of Patient Safety Culture, Nurse-Parent Partnership, and Patient Safety Nursing Activities

Upon analyzing the correlations between the major variables, the results indicated a significant positive correlation between pediatric nurses' patient safety nursing activities and the perception of patient safety culture (r=.30, p<.001) and nurse-parent partnership (r=.45, p<.001). A significant positive correlation was also found between the perception of patient safety culture and nurse-parent partnership (r=.37, p<.001) (Table 3).

5. Factors Affecting Patient Safety Nursing Activities

To identify the factors influencing patient safety nursing activities in the participants, a multiple regression analysis was performed. The perception of patient safety culture and nurse-parent partnership (which demonstrated a significant correlation with patient safety nursing activities) were used as independent variables. Meanwhile, the presence or absence of safety management work regulations and the presence or absence of a safety management committee were assigned as dummy variables (which showed significant differences in safety nursing activities) (Table 4).

Before performing the regression analysis, the assumptions were evaluated to ensure they were met. The Durbin–Watson statistic stood at 1.99, suggesting no autocorrelation. The tolerance limit was .84–.88, which was above 0.1, while the variance inflation factor was 1.13–1.19, which was below the standard value of 10. These values indicated the absence of multicollinearity. The multiple regression analysis indicated

Table 3. Correlation between Perception of Patient Safety Culture, Nurse-Parent Partnership and Patient Safety Nursing Activities (*N*=165)

Variables	Perception of patient safety culture	Nurse-parent partnership	Patient safety nursing activities
		r (*p*)	
Perception of patient safety culture	1		
Nurse-parent partnership	.37 (< .001)	1	
Patient safety nursing activities	.30 (< .001)	.45 (< .001)	1

Table 4. Factors Influencing Perception of Patient Safety Nursing Activity (*N*=165)

Variables	B	SE	β	t	*p*-value
Constant	2.18	0.31		7.04	< .001
Safety management committee (yes)	0.16	0.07	.16	2.21	.029
Work regulation for safety management (yes)	0.38	0.16	.17	2.44	.016
Perception of patient safety culture	0.10	0.07	.10	1.44	.153
Nurse-parent partnership	0.38	0.07	.41	5.61	< .001
R^2 = .29, Adjusted R^2 = .28, F = 16.52, *p* < .001					

SE, standardized error.

that the regression model was significant (F = 16.52, *p* < .001); in terms of the variables affecting patient safety nursing activities, nurse-parent partnership emerged as the most influential variable (β = .41, *p* < .001), followed by the presence of safety management work regulations (β = .17, *p* = .016) and safety management committee (β = .16, *p* = .029). The explanatory power of this regression model was 29.2%.

DISCUSSION

This study examined pediatric nurses' perceptions of patient safety culture, nurse-parent partnership, and pediatric patient safety nursing activities, and determined the effects of these variables on pediatric patient safety nursing activities. The participants obtained a mean score of 3.37 ± 0.41 points (67%) out of 5 points in the perception of patient safety culture. In a study assessing nurses working in internal medicine/surgical wards using the same tool, a score of 66% was obtained for the perception of patient safety culture and similar to our study results [21]. In a study evaluating nurses working in intensive care units [22], a score of 77% was obtained for the perception of patient safety culture, which is higher than our study results. One reason for this discrepancy may be that the previous study collected data from nurses in the intensive care unit of a single hospital, while our study surveyed pediatric nurses from a variety of hospitals (pediatric specialty, general, and university hospitals) of different sizes and types across seven regions. This difference in the characteristics of the participants and their working conditions is likely to have contributed to the variations observed [22]. Therefore, it is speculated that differences in nurses' perceptions of patient safety culture may emerge because of patient characteristics and type of hospital in which they work [23]. Further research is warranted to explore the perceptions of patient safety culture among pediatric nurses, considering the work environment and patient characteristics.

The subdomains of patient safety culture perception were analyzed. Results revealed that the teamwork domain had the highest mean score (3.92 ± 0.53 points), which was consistent with the results of a study involving pediatric nurses [24]. Considering the collaborative nature of nursing work, quality nursing care is attained through the facilitation of effective teamwork [25]. Compared with nurses in general wards who provide nursing care to mentally and physically mature adult patients, nurses in pediatric wards must remain vigilant to the conditions of pediatric patients, emphasizing the need for skilled nursing care. Consequently, teamwork may play an critical role in delivering quality nursing care to pediatric patients. In this study, the subdomain score for hospital management support for patient safety was the lowest (2.82 ± 0.81 points). This result was consistent with the results of a study involving general hospitals in Seoul and Gyeonggi [21] and another study involving large hospitals with over 1,000 beds [26]. This observation indicates that despite the variations in regional and hospital size, the perceived adequacy of hospital management support for patient safety culture is insufficient. Hence, the hospital management's in-

creased interest and substantial support for safety culture is required.

The study participants obtained a mean score of 3.94±0.41(78.8%) out of 5 points in the nurse-parent partnership item. This was slightly higher than the 75% to 77% obtained in studies [27,28] involving pediatric nurses using the same tool, indicating a positive perception of nurse-parent partnership. This finding is consistent with previous study, showing that pediatric nurses perceived nurse-parent partnership as important due to the numerous opportunities available for forming nurse-parent partnerships [28]. Among the subdomains of the nurse-parent partnership, the sensitivity scored the highest, which was consistent with the results of a previous study involving pediatric nurses [27]. This could be attributed to participants closely observing changes in, paying close attention to, and responding sensitively to pediatric patients' conditions while providing nursing care. Given that these attitudes of pediatric nurses positively impact the hospitalization experience of patients and their parents, continuous efforts are required to ensure sensitivity [11]. Among the subdomains, collaboration with pediatric patients' parents obtained the lowest mean score (3.72±0.71). The study by Shin and Kim [29] similarly reported low scores for the collaboration subdomain (3.36±0.56), supporting the results of this study. To provide quality nursing care to pediatric patients, pediatric nurses need to have a positive attitude to provide family-centered nursing care, collaborating with parents in developing and implementing care plans [29]. Pediatric nurses need to recognize the importance of establishing collaborative relationships with parents of pediatric patients and make various efforts to enhance this collaboration. Additionally, specific strategies for building collaboration should be discussed for pediatric nursing practice policies [11].

The participants scored relatively high in the pediatric patient safety nursing activities (4.50±0.38 out of 5 points, 90%). This suggests that the participants were proficient in executing safety nursing activities. A previous study involving nurses in general wards [9] also reported a safety nursing activity performance rate of 88%. As medical institutions undergo hospital accreditation evaluation, they improved the nurses' perception of patient safety based on the patient safety-related assessment criteria [9]. This process involved the activation and monitoring of autonomous reporting of patient safety events, which are believed to have positive effects on patient safety nursing activities [10]. Among the subdomains of the patient safety nursing activities, the score for blood transfusion was the highest. However, the score in this domain was only slightly higher than that in previous studies [7,9], which reported the highest score for blood transfusion. Given the potential serious risks associated with blood transfusion, such as transfusion-associated circulation overload accompanied by lung injury, the participants in this study were conscientious about adhering to the blood transfusion procedure. They closely monitored and managed patients receiving blood transfusions, contributing to the high score in the blood transfusion domain. Meanwhile, the score for injury prevention was the lowest. This can be attributed to the survey items, indicating that the dedicated washbasins and toilets for children are only available in select hospitals. Medical institutions should proactively conduct facility safety and environment management. To prevent pediatric patient safety accidents, organizational support, such as developing guidelines for the installation and operation of washbasins and toilets, is needed.

This study found a significant positive correlation between patient safety nursing activities, perception of patient safety culture, and nurse-parent partnership in pediatric nurses. A number of previous studies [9,10] have reported a positive correlation (r=.22–.55) between the perception of patient safety culture and patient safety nursing activities in nurses, supporting the results of this study. However, due to the limited research examining the correlation between partnerships with patients' parents and patient safety nursing activities, and between partnerships with patients' parents and awareness of patient safety culture among pediatric nurses, there are limitations to specific discussion. Therefore, further follow-up studies are needed.

When exploring the factors affecting pediatric safety nursing activities in pediatric nurses, results showed that nurse-parent partnership, safety management work regulations and a safety management committee were significant contributors. Specifically, better nurse-parent partnership (β=.41) and the presence of safety management work regulations (β=.17) and a safety management committee (β=.16) were associated with improved patient safety nursing activities. Due to the limited availability of studies examining the nurse-parent partnerships and pediatric patient safety nursing activities, direct comparisons with previous research are challenging. However, a study by Khan et al. [14] found that children's families improved patient safety by monitoring and reporting patient safety accidents that were not detected

by healthcare professionals. In the Khan et al. [14]'s study, the families of hospitalized children were solicited to voluntarily report hospital accidents using a patient safety monitoring tool. As a result, the error reports and reports of adverse events received by pediatric centers were five times higher and three times higher, respectively, than those received by hospitals that did not involve hospitalized children's families in voluntary hospital incident reporting [14]. In the future, pediatric nurses can contribute to reducing patient safety incidents by developing various strategies to enhance nurse-parent partnerships and by devising ways for parents to participate as collaborators in patient safety activities.

A previous study [30] of general nurses using different tools found that safety management work regulations and a safety management committee were factors affecting patient safety nursing activities, supporting the results of this study. Following the implementation of the Patient Safety Law in South Korea, medical institutions were mandated to engage in patient safety-related activities. Safety management work regulations and committee operations significantly influenced safety nursing activities [5,30]. Therefore, policy management is required to ensure that hospital safety management work regulations and a safety management committee are established in all hospitals.

Meanwhile, the perceived patient safety culture, which had a significant correlation with patient safety nursing activities in this study, was identified as not an influential factor for pediatric patient safety nursing activities. One of many reasons for this result is thought to be attributed to the increased need for support in terms of the facilities for pediatric nurses compared with general nurses' patient safety nursing activities. This may be related to the fact that the scores for facility support such as toilet bowls, floors, and wash basins as indicated in the injury prevention subdomain in this study were the lowest.

This study is significant as it explored the effects of nurse-parent partnerships on pediatric patient safety nursing activities in pediatric nurses. This significance arises from a lack of previous studies exploring nurse-parent partnerships and pediatric patient safety nursing activities. However, this results of this study revealed that the combined explanatory power of nurse-parent partnership, safety management work regulations and a safety management committee for pediatric nurses' pediatric patient safety nursing activities was only 29.2%. A study by Jeong and Jeong [5] identified the perception of the importance of patient safety management and patient safety competence in nurses as major variables directly affecting patient safety nursing activities. This suggests that other variables may have an important influence. As such, this implies that other major factors, in addition to nurse-parent partnership and the perception of patient safety culture, can affect pediatric patient safety nursing activities. Hence, further studies are needed to identify and understand these additional factors. In addition, the patient safety culture perception level of the participants was lower compared with other variables and did not affect patient safety nursing activities. Therefore, future studies in different regions are essential to confirm the relationship between the two variables.

This study has some limitations. First, despite the availability of various tools for measuring patient safety nursing activities and the significance of nurse-parent partnerships in pediatric nursing, the number of related domestic studies is limited. Hence, it was difficult to directly compare the results of this study with those of other previous studies. Second, pediatric patient safety nursing activities were assessed based on the participants' self-report, thus introducing subjectivity. Hence, subjectivity should be considered when interpreting the results of this study. Third, the participants in this study were convenience sampling, and some data were collected online through URL access. An online self-report survey offers convenience and a representative sample, one drawback is the potential for participants' attention to be diverted by environmental stimuli during survey participation, leading to insincere responses [31]. Hence, further studies are needed to validate and supplement these findings.

CONCLUSION

The investigation into the effects of the perception of patient safety culture and nurse-parent partnership on pediatric patient safety nursing activities in pediatric nurses showed that nurse-parent partnership, safety management work regulations and a safety management committee significantly influenced such activities. Although the nurse-parent partnership domain scored relatively high in this study, enhancing this domain requires the development and implementation of nurse-parent partnership enhancement education programs that emphasize the necessity and process of forming positive collaborative relationships between pediatric nurses and pediatric patients' parents. Additionally, this study confirmed that pediatric patient safety nursing activi-

ties were performed better when safety management work regulations and a safety management committee were implemented. Therefore, establishing such regulations and a safety management committee and offering situation-specific preparedness education programs are essential to prevent safety accidents and facilitate the effective implementation of patient safety nursing activities. Furthermore, improving the working environment of nurses in pediatric hospitals and establishing organizational environmental and institutional support such as facility assistance will be necessary to enhance pediatric nurses' patient safety nursing activities.

ARTICLE INFORMATION

Authors' contribution

Conceptualization: all authors; Data collection: Seo Jin Lee; Formal analysis: Seo Jin Lee; Interpretation of data: all authors; Writing-original draft: Seo Jin Lee; Writing-review and editing: all authors; Final approval of published version: all authors.

Conflict of interest

The authors have no existing or potential conflicts of interest to declare.

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Data availability

For information regarding data availability, please reach out to the corresponding author.

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Unveiling the dynamics of stunting: a qualitative exploration of parenting patterns and toddlers aged 6–59 months in Bejiharjo, Indonesia

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Purpose: This research was conducted to explore the experience of mothers in raising stunted toddlers aged between 6–59 months. It also examined the perceptions of parenting styles shaped by socio-cultural contexts and time constraints affecting the nutritional status as well as growth in Bejiharjo Village, Java, Indonesia. **Methods:** A qualitative method was used and data were collected through in-depth interviews, diary recording, and focus group discussions with mothers of toddlers, stakeholders, and healthcare professionals. Transcript data from recorded interviews were processed using qualitative content analysis. **Results:** The results showed that there were four emergent themes, namely "Toddler parenting patterns," "Family and environmental health," "Eating patterns and consumption habits of toddlers," as well as "Literacy and understanding of parenting and child health." Furthermore, eight related theme clusters were yielded from the analysis of parenting experiences. Differences between stunted and non-stunted toddlers in parenting patterns and daily activities were recorded. Interactions between toddlers and mothers as well as productive activities had a shorter average duration. **Conclusion:** Mothers experience various challenges and limitations in raising toddlers with the risk of stunting. Therefore, increasing understanding and knowledge about the importance of healthy parenting and good nutrition are necessary to prevent stunting.

Keywords: Growth disorders; Parenting; Child care; Mother-child relations

INTRODUCTION

Stunting is a global child health problem in various parts of the world, especially in developing countries, including Indonesia. It affects 25% of toddlers under five globally, significantly impacting cognitive outcomes [1]. Currently, stunting is a strategic issue in Indonesia, with a high prevalence rate of 21.6% in 2022 [2]. Most countries in Southeast Asia were recorded to have a considerably high percentage of stunted toddlers, and Indonesia was among those with 'very high' thresholds compared to other countries worldwide, which have achieved rates below 2.5% (very low), including Chile, Estonia, Greece, Japan, Netherlands, Poland, Republic of Korea, Latvia, Germany, Lebanon, and Tonga [3].

According to various reports, stunting is a global health problem related to growth and development. It has a long-term impact on cognitive development, school performance, economic productivity, and maternal reproductive outcomes. Therefore, preventing this problem should be a top priority in global health and economic development [4]. Indonesia has diverse regional variations, hence, the main factors causing stunting could differ across different areas. Based on pre-

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vious research, determinants of stunting include low levels of maternal education, household income, environmental factors (source and access to clean water, sanitation, and hygiene), social and familial support, as well as healthcare services [5].

Stunting is not solely caused by malnutrition but also associated with poor parenting practices as well as inadequate health and nutrition before and after birth [6]. Several factors influence this problem in toddlers, including maternal knowledge, parenting styles, nutritional intake, low birth weight, and family economic status [7]. Diet, provision of nutrition, feeding practices, parental attention, and stimulation also play crucial roles [8]. Effective caregiving significantly impacts growth and development mainly through feeding practices, dietary variation, and maintaining hygienic living conditions to enhance nutritional levels and prevent stunting [9]. Parenting style is related to the dietary practices of toddlers [10], and poor eating patterns increase the risk of stunting due to unmet nutritional needs [11]. Furthermore, stunting can be caused by infectious diseases such as acute respiratory infection and diarrhea with high frequency [12].

Parenting style plays an important role in realizing optimal health in toddlers. The parenting function includes knowledge, competence, effort, responsibility, partnership, caring, teaching, and communication, which can improve the management of stunting [13]. Parenting or nurturing patterns include feeding and hygiene practices, as well as the use of medical services [14]. Poor knowledge about nutritional intake is associated with increased stunting at 36–60 months [15]. Furthermore, cultural values impact Indonesian parenting and child development, necessitating an understanding of how traditional cultural values influence parenting style [16]. In-depth knowledge of growth factors, including parenting patterns, allows healthcare professionals to play a proactive role in increasing understanding and providing education on how parents can improve stunting management [13]. This effort will support the development of holistic and sustainable treatment or intervention programs for stunting, thereby increasing the contribution of nurses to pediatric nursing practice and public health. In-depth qualitative research is needed to explore the experiences of parenting styles of mothers with stunting toddlers. With a deeper understanding, research can provide new insights that can be used to develop more effective interventions in preventing stunting and improving the well-being of toddlers.

METHODS

Ethical statements: This research was approved by the Research Ethics Commission of Gadjah Mada University (No. KE/UGM/025/EC/2024). Informed consent was obtained from all participants.

1. Qualitative Approach and Research Paradigm

This research used a qualitative descriptive phenomenological design, in line with a constructivist/interpretivist paradigm, to analyze and interpret data. This approach is primarily aimed at understanding the experience and perceptions of mothers regarding parenting patterns of stunted toddlers aged 6–59 months. This research followed the Standards for Reporting Qualitative Research guidelines [17].

2. Characteristics and Reflexivity

In-depth interviews and focus group discussions (FGDs) were conducted by the principal investigator, a female currently pursuing a master's degree with vast experience in conducting interviews and qualitative interpretation. Support was offered by a research team with doctoral backgrounds in demography. The interaction started when participants were invited and briefed on the objectives of the research, which focused on educational needs. The interviewer assumed that social and economic factors play a significant role in parenting and toddler health. The interest in this topic was driven by concerns about the high prevalence of stunting in the research area.

3. Composition of Research Participants

The participants were selected based on data from maternal and child health records in the local area. The purposive sampling method was used with considerations given to variations in the severity of stunting and socio-economic conditions. The research focused on mothers with toddlers aged 6–59 months in the complementary feeding period. Eligibility was confirmed by participants based on predefined criteria, and the research objectives were reiterated during the data collection process. Local stakeholders and community health workers assisted in identifying and recommending suitable participants from available data.

A total of nine individuals participated in FGDs in group 1 and seven individuals in group 2. Additionally, five stakeholders and two healthcare professionals participated in in-depth interviews, and diary entries were collected from seven mothers with non-stunted and stunted toddlers each (Table 1). The diversity of backgrounds aimed to capture various perspectives and experiences regarding childcare practices and stunting occurrences. The selection aimed to ensure a broad representation of experiences relevant to the research objectives while adhering to ethical guidelines and respecting participant privacy as well as consent.

Table 1. General Characteristics of Research Participants

Data collections	Number	Age (year)	Education	Job
FGDs	Group 1: Housewife (n=9)			
	1	30	High	Housewife
	2	23	Intermediate	Housewife
	3	38	High	Housewife
	4	24	High	Housewife
	5	30	High	Housewife
	6	38	High	Housewife
	7	25	Intermediate	Housewife
	8	28	High	Housewife
	9	42	High	Housewife
	Group 2: Working mother (n=7)			
	1	36	High	Officer
	2	31	Intermediate	Community health volunteer
	3	25	High	Private employee
	4	42	High	Community health volunteer
	5	27	Basic	Laborer
	6	47	Intermediate	Laborer
	7	38	High	Trader
Personal in-depth interview	Stakeholder (n=5)			
	1	48	High	Community health worker
	2	47	Master's	Consultant and task force for accelerating stunting reduction
	3	50	Master's	Sub-coordinator of the local government for the health and social substance group
	4	37	Advanced	Local government's planning analysis division
	5	58	Bachelor's	Coordinator of the family planning agency at the district level
	Healthcare professional (n=2)			
	1	26	Advanced	Nutritionist
	2	27	Advanced	Nutritionist
Research diaries	Mother has a non-stunted (n=7)			
	1	31	Intermediate	Housewife
	2	38	Intermediate	Laborer
	3	41	High	Housewife
	4	36	High	Officer
	5	39	High	Trader
	6	42	High	Housewife
	7	29	Intermediate	Housewife
	Mother has a stunted toddler (n=7)			
	1	38	Intermediate	Laborer
	2	26	High	Housewife
	3	38	High	Trader
	4	40	High	Farmer
	5	33	Basic	Trader
	6	31	High	Housewife
	7	37	High	Housewife

FGDs: focus group discussions.

4. Data Collection

Data were collected through a series of pre-research survey stages, research, and participant verification processes against interim results. In-depth interviews, research diaries, and FGDs were used to collect data. Generally, in-depth interviews and FGDs are standard data collection methods in qualitative research, providing insight into social, emotional, and experimental phenomena [18]. In this research, in-depth interviews were conducted using a semi-structured questionnaire to understand basic information about stunting, mothers experiences in caring for stunted toddlers, and healthcare professionals perspectives. Diary recordings were maintained for 7 days to monitor the activities of mothers and toddlers, ensuring representative data on behavior and activity patterns [19]. Meanwhile, FGDs were conducted using a semi-structured guide and card sorting activity to facilitate participant interaction and dynamic group discussion. This method also allowed participants to share experiences, views, childcare practices, and collaboratively discuss issues related to stunting. All data were recorded audio and transcribed in full adhering to research ethical principles, including respect for participant privacy and consent. In addition, the participants received tokens of appreciation for participation.

5. Theoretical Framework

Among the 37 invited participants, four mothers withdrew from the FGDs due to health issues and family commitments. Data collection was conducted at the participants homes in Kalurahan Bejiharjo, Kapanewon Karangmojo, and Gunungkidul, to ensure comfort and privacy. In some interview sessions, toddlers were present but did not participate. The sample consisted of mothers with toddlers, including stunted and non-stunted. The characteristics recorded include age, education level, and occupation. Interviews lasted between 40 and 60 minutes, while FGDs lasted approximately 70 minutes.

6. Data Analysis

This research used Colaizzi's descriptive phenomenological method, which entailed researching phenomena based on individual experiences, interviews, and diaries [20]. Data in transcribed results were identified for significant statements related to caring for stunted toddlers through repeated data readings to observe consistency. Relevant information units were extracted and grouped into more prominent themes including clusters and emergent [21]. The qualitative data analysis process was aided by using NVivo software (Lumivero) to facilitate the coding and categorization of structured data. Subsequently, detailed descriptions were compiled based on these results. Data triangulation strengthened validity by comparing and confirming results from different sources. Saturation was marked by the presence of redundant themes or repeated development of meanings, indicating insignificant new information reappearing from the data.

7. Trustworthiness

Various qualitative research from diverse literature sources were explored and discussion sessions were also conducted to gain insights into the application of this research. The accuracy of the results was ensured through reliability and validity evaluations, including triangulation processes, reflexivity, member checking, and audit trails. Consistency in data interpretation was reinforced through triangulation, using data from various sources such as FGDs, in-depth interviews, diaries, and observation notes. The credibility and confirmability of the research were ensured through result verification with participants (member checking) [20,21] and the role of experts (audit trail) to enhance objectivity, evaluate data interpretation, and aid in increasing confirmability. Research dependability was achieved through direct and cross-confirmation with participants to mitigate bias. This method systematically documented the entire research process, including decisions made during data analysis.

RESULTS

This research obtained experience of parenting stunted toddlers in three parts, comprising 27 formulated meanings, eight theme clusters, and four emergent themes. The emergent themes consisted of "Toddler parenting patterns," "Family and environmental health," "Eating patterns and consumption habits of toddlers," and "Literacy and understanding of parenting and child health." as shown in Table 2.

After the initial analysis was completed, several participants were contacted to clarify and validate the results. Participants provided positive feedback and confirmed the accuracy of the results analyzed.

Table 2. Differences in the Perceptions of Knowledge

Formulated meanings (n=27)	Theme clusters (n=8)	Emergent themes (n=4)
•The application of traditional knowledge-based parenting patterns by the grandmother. •The toddlers predominant interaction with the grandmother is due to the working mothers limited time. •The grandmother provides nutrition intake and parenting without adequate and appropriate knowledge. •Decision interventions by the grandmother related to childcare. •The grandmother childcare is based solely on ensuring the toddler is fed and calm. •Technological distractions, especially smartphones, during childcare activities diminished the quality of interaction with toddlers in intensive childcare.	Alternative parenting interventions	Toddler parenting patterns
•There was a lack of maternal participation in healthcare services. •Mothers were less responsive to activities aimed at preventing stunting.	Mothers participation and responsiveness	
•Insufficient training or stimulation was provided to toddlers to develop their fine and gross motor skills. •Toddlers were often left to watch television and smartphones to aid in their caregiving activities.		
•The family smoking habit was allowed to persist, resulting in the mother and child becoming passive smokers. •The father smoked in the area where the toddler growth and development occurred. •The toddler experienced respiratory tract diseases due to the presence of active smokers in the family.	Family smoking habits	Family and environmental health
•The predominant intake consisted of carbohydrates without being balanced with the appropriate protein requirement. •Allergy to animal protein occurred due to the delayed introduction of such foods during the early phase of complementary feeding.	Nutritional imbalance due to insufficient intake of animal protein	Eating patterns and consumption habits of toddlers
•Vegetable-based foods were still considered more important than animal protein. •The toddler was selective about specific types of food. •The portions of food consumed by the toddler were minor and did not meet their ideal nutritional needs. •The toddler preferred snacks over nutritious staple foods. •The toddler tended to prefer refined, instant, and fast food options.	Issues with food preferences and acceptance	
•The family had a habit of drinking tea together. •In the mornings, the toddler used to prefer drinking tea over having a nutritious breakfast.	Risky drinking habits of toddlers	
•There needed to be more willingness to seek information. •The mother needed a higher literacy level regarding the Maternal and Child Health Handbook. •The mother did not actively seek information regarding good parenting practices for her toddler.	Mother's involvement and awareness of literacy	Literacy and understanding of parenting and child health
•Stunting was still understood as a condition where a child has both a short stature and low weight. •The mother needed help understanding information related to parenting.	Limitations and understanding of mothers about parenting and child health	

1. Toddler Parenting Patterns

1) Alternative parenting interventions

Parenting interventions based on traditional experience and the limited knowledge of grandmothers as caregivers put toddlers at risk of stunting. In most cases, the mothers need to be more of the primary controller in child rearing and feeding becomes disrupted. The reluctance of mother and grandmother in toddler caregiving arrangements arose due to the potential for conflict or tension between different generations.

Poor parenting is sometimes due to interference from parents still in the same house as the mother. Sometimes you want to give food, and can't google it, like tea that is not allowed. But my parents said it was okay. Later, if we reply, we will make a case with our parents. (Group 1, Mother 4)

2) Mothers participation and responsiveness

Most participants indicated the presence of technological distractions for mothers, such as smartphone usage, leading to a lack of attention toward toddlers engaging in passive activities due to being directed to watch television. This resulted in reduced interaction and diminished motor skill training obtained. Furthermore, mothers with stunted toddlers sometimes showed less responsiveness to stunting intervention programs, leading to a lower level of participation in healthcare services activities.

If my child eats, it has to be while watching television (TV) or using a smartphone...if not watching TV, they refuse to eat. (Group 1, Mother 5)

Sometimes I got reports from Community Health Volunteers that there was a mother who didn't give a positive response to the child health service program, even though our goal was to improve her child's health so that his nutritional status would be good. (Healthcare professional 2)

2. Family and Environmental Health

1) Family smoking habits

The continuous smoking habit within the family led to mothers and toddlers becoming passive smokers. This was due to family members, including the father, smoking within reach of toddlers, which poses the risk of developing respiratory tract diseases due to constant exposure to active smokers in the environment.

When looking at the majority, some are exposed to active and passive smoking, which can come from family members or other individuals. There are also indications that the mothers or father smoke. There are no rules and agreements within the family. (Stakeholder 2)

3. Eating Patterns and Consumption Habits of Toddlers

1) Nutritional imbalance due to insufficient intake of animal protein

The predominant intake consisted of carbohydrates without being balanced with the appropriate protein requirement. Allergy to animal protein occurred due to the delayed introduction of foods during the early phase of complementary feeding. Vegetable-based foods were still considered more important than animal protein.

Due to a lack of nutritional intake, he continues to eat carbohydrates instead of animal protein, and so on. Lack of protein, lack of minerals, lack of balanced nutritional intake. (Stakeholder 2)

Many still need to understand that they must be complete, even when given for the first time in 6 months. It has to contain carbohydrates, protein, fat, and vegetables; they only give rice and vegetables on average. Or just rice and tempeh. Or maybe he's afraid to give animal protein because he's afraid his child will be allergic, usually like that. (Healthcare professional 1)

2) Issues with food preferences and acceptance

The toddlers showed selective eating habits, consuming small portions that did not fulfill nutritional requirements. Mothers often followed toddlers preferences, opting for snacks, processed, and fast food over nutritious staples.

Perhaps like other mothers, when the parents are working and the child is left alone, just to keep the child calm, they are given whatever they want, such as if they only want noodles or snacks, then they don't want rice and vegetables. (Group 2, Mother 1)

The risky parenting style is that the child eats according to taste, not to need. (Group 2, Mother 7)

3) Risky drinking habits of toddlers

Most families in the research had a tradition of drinking tea together, with the toddler often preferring tea over a nu-

tritious breakfast in the morning. Additionally, some mothers mentioned providing toddlers with tea as a habitual practice, indicating that breaking this routine would have required discontinuing tea consumption altogether.

The culture of people here is to drink tea every morning. Then, the toddlers habitually join (drinking tea) with the grandparents in the morning. (Group 1, Mother 3)

If my child always asks for tea in the morning and afternoon, they use their own glass. Because it's a habit, if it's not made, the child will ask for it. But if you want to eliminate it, not drinking tea is not an option either, so every day we still always drink tea. (Group 1, Mother 7)

4. Literacy and Understanding of Parenting and Child Health

1) Mothers role and awareness of literacy

Mothers still needed more desire to gather information about parenting, such as having low literacy regarding the Maternal and Child Health Handbook (MCH) and not taking advantage of available access to information through the internet. The passive approach to acquiring knowledge about good parenting practices further hindered the ability to care for toddlers effectively. This gap in information-seeking behavior negatively impacted the quality of parenting provided.

Now, everyone has cellphones; all you have to do is be willing to open up the information. The MCH book is also available for mothers knowledge. (Group 1, Mother 6)

2) Limitations and understanding of mothers about parenting and child health

The mother still misunderstood stunting as merely a condition causing short stature and low weight. This misconception can be attributed to the limited comprehension of parenting information. Therefore, the ability to address and prevent stunting was compromised.

Lack of understanding about giving food to toddlers is the most common cause of stunting; ultimately, the feeding is wrong, and the intake could be more optimal. (Healthcare professional 1)

Every mother has a different busy schedule and activity patterns. This research summarized conditions in the average data on activities carried out by mothers and toddlers in one day. Therefore, the data showed the time allocation of activities carried out, as well as toddlers daily interactions.

The average interaction time between stunted toddlers and mothers was smaller than that of normal. Compared to normal, stunted toddlers spent much more time with grandmother in parenting (Figure 1). Furthermore, mothers with stunted toddlers tended to have less time for care compared to those with normal (Figure 2). The majority of stunted toddlers spent the daily time watching television, cell phones, and playing more than normal (Figure 3). The results also showed that normal toddlers had more study time on average than stunted ones. In this case, learning activities were aimed at supporting cognitive abilities as well as motor and sensory training.

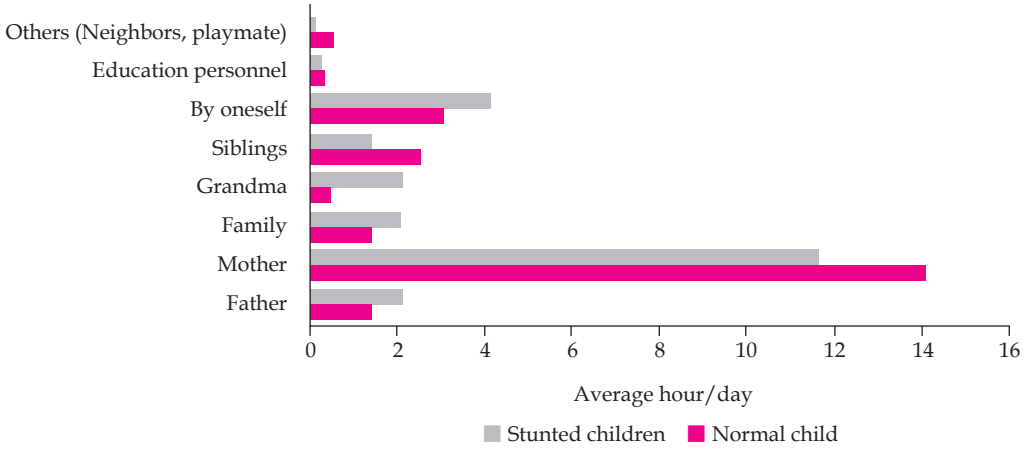

Figure 1. Average daily interaction time for toddlers.

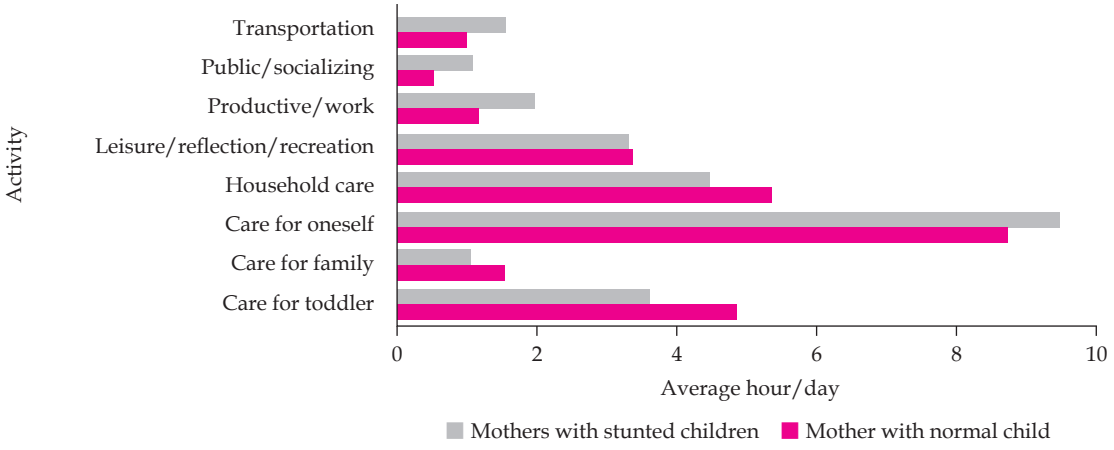

Figure 2. Average daily activities of mothers.

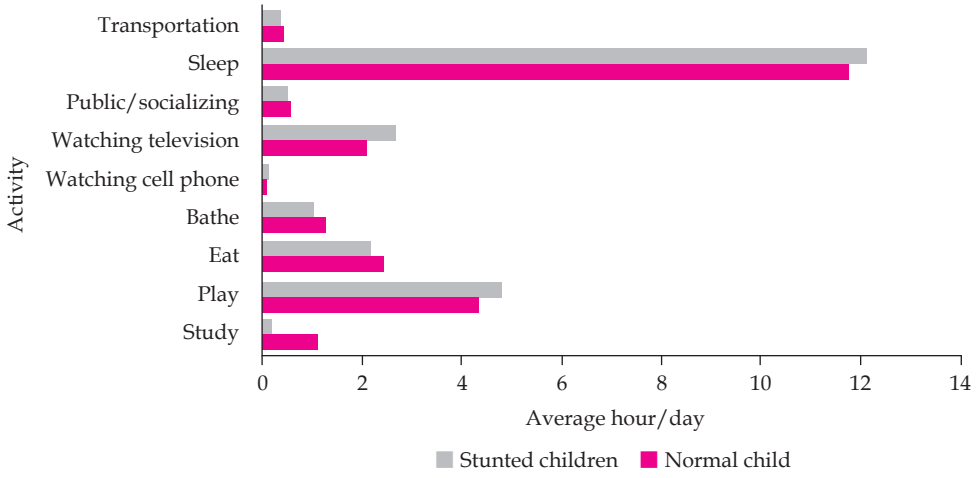

Figure 3. Average daily activities of toddlers.

DISCUSSION

Through qualitative analysis, this research extracted four emergent themes, exploring mothers experiences caring for stunted toddlers. In the first theme, mothers shared parenting experiences concerning "Toddler parenting patterns." Regarding alternative parenting interventions, parental styles can lead to stunting within the extended family, particularly related to grandmothers and the socio-cultural structures that give rise to traditional practices, especially in feeding patterns [22]. Other results showed that interactions between stunted toddlers and mothers tended to be less frequent than those with normal (Figure 1). This may be due to various factors, such as mother health, schedule, or the additional needs in caring for a stunted toddler, which limits interaction time. It was also found that parental role in childcare limited the mothers complete control. The grandmother participation in caring for grandchildren impacts parenting dynamics due to differences in socio-economic backgrounds and life experiences [23]. Grandmother intervention in childcare is part of risky parenting practices due to a lack of knowledge. This affects all decisions made, including feeding preferences for toddlers. Common issues include a need for nutritional knowledge, improper parenting guidelines, and physical limitations. Therefore, family members must communicate openly and agree regarding childcare and feeding. Shared understanding and consensus will help reduce potential conflicts and create an environment that supports the growth and development of toddlers.

Regarding mothers participation and responsiveness in toddler care, it was found that awareness of active role in health services still needs to be improved, especially for

mothers with stunted toddlers. More attention should be given to enhancing interaction and emotional intelligence. This condition is consistent with results showing that mothers with non-stunted toddlers focus more on child and family care needs, while those with stunted toddlers tended to spend more time on other activities, including traveling and engaging in productive activities/work (Figure 2). Parent-child interaction in caring for and feeding toddlers is a part of the parenting style [24]. Additionally, stunted toddlers tend to spend more time engaging in activities such as sleeping, watching television, watching on smartphones, and playing than normal (Figure 3). Non-stunted or normal toddlers have better basic motor skills than stunted ones [25]. On average, normal toddlers engage more in learning activities, including motor and sensory training provided by parents, than stunted. Excessive television exposure increases the risk of delays in cognitive, language, and motor development [26]. Stunted toddlers may experience cognitive, motor, and sensory development limitations due to a lack of provided stimulation, while normal are more likely to achieve optimal growth and development.

The second theme category pertains to "Family and environmental health." In this context, the smoking habits of family members and neighbors within the toddlers vicinity have the potential to disrupt growth and development. Exposure to cigarette smoke also increases the risk of respiratory infections, and the constituent substances affect nutrient absorption as well as hemoglobin function, thereby inhibiting nutrient absorption and increasing the risk of stunting [27].

In the third identified theme category, "Eating patterns and consumption habits of toddlers," it was found that mothers were not yet fully aware of the balanced nutritional intake needed, such as consuming too many carbohydrates and insufficient animal protein, along with inadequate food variety. Incorrect parental feeding practices can lead to stunting in toddlers [28]. The preference for less nutritious food types by toddlers also posed a challenge for mothers in implementing a healthy diet. Additionally, the habit of drinking tea as part of regional traditions and family customs, is a risky parenting practice. The risk of microcytic anemia is higher in toddlers who consume tea [29]. This habit typically develops after toddlers complete the breastfeeding phase, which is after the age of 2 years. Despite the awareness that drinking tea can hinder iron absorption and is not an optimal nutritional choice, this habit is difficult to eliminate and has become a part of cultural identity.

The fourth theme category, "Literacy and understanding of parenting and child health," showed that limited knowledge poses a challenge in implementing healthy parenting practices, with social support playing a crucial role. Mothers with access to productive information tend to have normal toddlers free of stunting [30]. Parents knowledgeable about stunting tend to actively acquire information about balanced nutrition and apply appropriate parenting practices [31]. Based on the results, participants felt mothers still lacked the initiative to obtain child health information through various media, books, and the Internet. Therefore, efforts to educate and empower parents regarding healthy parenting practices are essential to reducing the incidence of stunting and enhancing the overall well-being of toddlers.

Based on previous research, parenting dynamics in Indonesia are influenced by customs, habits, communication patterns, and local cultural values [32]. In cross-cultural research, it was found that parents in Indonesia tended to prefer an authoritarian parenting style compared to those in Australia, who were more inclined to use an authoritative style, impacting emotional and behavioral issues among toddlers [33]. Furthermore, parenting styles in Indonesia are often associated with strong family traditions and culture, which play an essential role in decision-making related to dietary patterns and social interactions.

In this research, interviews with participants were conducted in Indonesian with some inclusion of local dialects. The interviewer possessed expertise in the local dialects and nuance in the translation. Consistency in understanding meaning was ensured through discussions with the research team. Additionally, the back-translation validation method was used to ensure the accuracy of the translation and consistency of meaning with the original language version. This approach ensured that the translations used were accurate and faithfully reflected the intended meanings of the participants.

CONCLUSION

In conclusion, based on the qualitative research results obtained through in-depth interviews, focused group interviews, and diaries, four categories were identified namely "Toddlers parenting patterns," "Family and environmental health," "Eating patterns and consumption habits of toddlers," and "Literacy and understanding of parenting and child health." Parenting patterns play a crucial role in the

growth and development of toddlers. Based on the experiences of mothers raising stunted toddlers, at-risk parenting patterns, environmental health, inadequate eating patterns, and lack of maternal knowledge are significant contributors. Therefore, education, counseling, and guidance for parents and families are essential in enhancing community awareness about the importance of childcare practices, nutrition provision, and providing a healthy environment for toddlers. Although this research has limitations, such as the inability to determine the causal relationship between parenting patterns and stunting in specific value units, the results significantly contribute to understanding the aspects contributing to stunting. Further research using longitudinal designs and larger samples is needed to explore causal relationships and test the effectiveness of different intervention strategies.

ARTICLE INFORMATION

Authors' contribution

Conceptualization: all authors; Data collection: Intan Azzahra; Formal analysis: all authors; Writing-original draft: Intan Azzahra; Writing- review and editing: all authors; Final approval of the published version: all authors.

Conflict of interest

No existing or potential conflict of interest relevant to this article was reported.

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Data availability

Please contact the corresponding author for data availability.

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Development and effect of hybrid simulation program for nursing students: focusing on a case of pediatric cardiac catheterization in Korea: quasi-experimental study

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Purpose: Hybrid simulation has emerged to increase the practicality of simulation training by combining simulators and standardized patient (SP) that implement realistic clinical environments at a high level. This study aimed to develop a hybrid simulation program focused on case of pediatric cardiac catheterization and to evaluate its effectiveness. **Methods:** The hybrid simulation program was developed according to the Analyze, Design, Develop, Implement, and Evaluate (ADDIE) model. And deep learning-based analysis program was used to analyze non-verbal communication with SP and applied it for debriefing sessions. To verify the effect of the program, a quasi-experimental study using a random assignment design was conducted. In total, 48 nursing students (n=24 in the experimental group; n=24 in the control group) participated in the study. **Results:** Knowledge (F=3.53, p=.038), confidence in clinical performance (F=9.73, p<.001), and communication self-efficacy (F=5.20, p=.007) showed a significant difference in both groups and interaction between time points, and the communication ability of the experimental group increased significantly (t=3.32, p=.003). **Conclusion:** Hybrid simulation program developed in this study has been proven effective, it can be implemented in child nursing education. Future research should focus on developing and incorporating various hybrid simulation programs using SP into the nursing curriculum and evaluating their effectiveness.

Keywords: Communication; Heart defects, congenital; High fidelity simulation training; Pediatric nursing; Students, nursing

INTRODUCTION

Nursing education aims to prepare professional nurses with the competency to provide nursing care through theoretical and practical courses [1]. In particular, nursing practicums are vital for developing critical thinking and clinical skills as they enable nursing students to effectively apply their theoretical knowledge to real clinical settings [2]. However, owing to an increasing emphasis on patient rights and safety along with a shortage of hospitals offering diverse clinical experiences, nursing students find it challenging to apply their theoretical knowledge to limited clinical-practice settings [3]. Simulation nursing education has been introduced to address this challenge. In South Korea, the Korean Accreditation Board of Nursing Education has recognized simulation education as a clinical practice [1]. Simulation practice refers to the provision of nursing care and debriefing the process using a simulator or standardized patient (SP) for

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scenarios that may occur in clinical settings [1]. High-fidelity patient simulators (HPS) are advanced models that realistically replicate clinical situations. In simulation education, HPS allows nursing students to enhance their clinical skills by integrating theoretical knowledge and performing nursing techniques directly in realistic scenarios [4]. An SP is an individual trained to simulate a real patient's history, personality, psychological reactions, and physical examination results [5]. Simulation practice using SPs is employed to enhance communication skills because it involves direct interactions with patients or family members in scenarios that closely mimic real-life situations [6]. Recently, hybrid simulation training, which incorporates simulators with various fidelities and SP, has emerged. This approach reflects the realism and practicality of simulation training by combining an HPS with an SP to create scenarios that closely mimic actual clinical environments. This method offers nursing students practical experiences that are often challenging to obtain in traditional clinical practice [7]. Previous studies have shown that hybrid simulation education, which involves creating and communicating with SP in realistic environments, significantly increases nursing students' confidence in their clinical performance and enhances their learning satisfaction [8,9].

In the field of child nursing education, nursing students have fewer opportunities to encounter pediatric cases and often do not experience a variety of nursing interventions that focus primarily on observation or simple tasks. Therefore, simulation education using pediatric cases is crucial for providing students with the necessary practical experience and skills [10]. Simulation programs for various pediatric nursing scenarios have been developed to evaluate their impact on clinical performance, problem-solving abilities, critical thinking tendencies, self-efficacy, and communication skills [2]. In particular, in pediatric wards, nurses primarily interact with children and their parents, who are the main caregivers. Therefore, skills to effectively communicate with children and their parents are crucial for pediatric nurses [11]. Therefore, hybrid simulation practice is recommended for integrating pediatric nursing knowledge, which is often difficult to acquire in clinical settings, enhancing clinical performance, and developing essential communication skills.

Nursing care for pediatric cardiac catheterization is a critical area of child nursing education. Special attention is required before and after the procedures to ensure children's safety and minimize complications [12]. However, encountering clinical cases during educational courses is challenging for nursing students. Additionally, parents, who are primary caregivers, play a crucial role in their children's recovery. Therefore, nurses must educate and support parents before and after procedural care to foster cooperative and trusting relationships. Effective communication skills are essential for nurses to achieve this goal. Communication involves both verbal and nonverbal elements. If nursing students lack strong communication skills, they may also struggle with nonverbal communication, such as the one that uses facial expressions or body language [5]. In fact, in uncertain situations, patients tend to trust nonverbal cues from health professionals more than verbal messages [13]. Therefore, developing nursing students' nonverbal communication skills in addition to their verbal skills is crucial. Recently, educational methods utilizing deep-learning-based facial expression analysis have been introduced to enhance communication skills. This approach suggests the potential of objective nonverbal communication analysis in educational programs [14]. When nursing students communicate with patients during simulation practice, their facial expressions and body posture are objectively analyzed through a computer program. The debriefing process using this objective analysis can provide nursing students with reflective learning opportunities.

Therefore, this study aimed to develop a hybrid simulation program with a focus on pediatric cardiac catheterization and assess its effects on nursing students' knowledge, clinical-performance confidence, communication self-efficacy, and communication ability. The research hypotheses are as follows:

Hypothesis 1: The experimental group that participated in the hybrid simulation program will have a difference in knowledge scores over time compared to the control group.

Hypothesis 2: The experimental group that participated in the hybrid simulation program will have a difference in clinical performance confidence scores according to time compared with the control group.

Hypothesis 3: The experimental group that participated in the hybrid simulation program will have a difference in communication self-efficacy scores according to time compared with the control group.

Hypothesis 4: Communication ability of the experimental group participating in the hybrid simulation program will improve.

METHODS

Ethical statements: This study was approved by the Institutional Review Board (IRB) of Kangwon National University (IRB No. 2022-05-003-001). Informed consent was obtained from all participants.

1. Study Design

This quasi-experimental study performed random allocation to develop a hybrid simulation program focusing on pediatric cardiac catheterization and confirm its effectiveness. This study followed the Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) reporting guidelines [15].

2. Participants

The participants of this study included nursing students of the third and fourth grades of the Department of Nursing at K University in C City, South Korea, who had completed more than a semester of theory courses in child nursing. The participants had experience in clinical and simulation practice but lacked experience in simulation practice using SPs. They understood the purpose of the study and voluntarily agreed to participate. The number of participants for the independent t test and one-sided test was calculated using G*power 3.1.9.2 program. It was found that when the significance level (α) = . 05, power (1-β) = .80, and effect size (d) = .80 [16], a minimum of 42 participants were required—21 per group. Overall, 52 people were recruited, with a dropout rate of 10%, and 48 people who met the criteria for the target selection were finally selected. Using a random number generator, 24 participants were assigned to experimental and control groups. There were no dropouts; therefore, all participants were included in the final analysis (Figure 1).

3. Measurements

1) Knowledge

The researcher developed 20 questions based on the learning materials from theory classes. The developed tool was tested for content validity of the evaluation items by two child-nursing professors, two pediatric-cardiology nurses with more than 10 years of work experience, and one tool-development expert. The scale-level content validity index was determined to be 0.94. Each question had four choices, with one point scored for a correct answer and zero for an incorrect answer, for a total of 20 points. Higher scores indicated

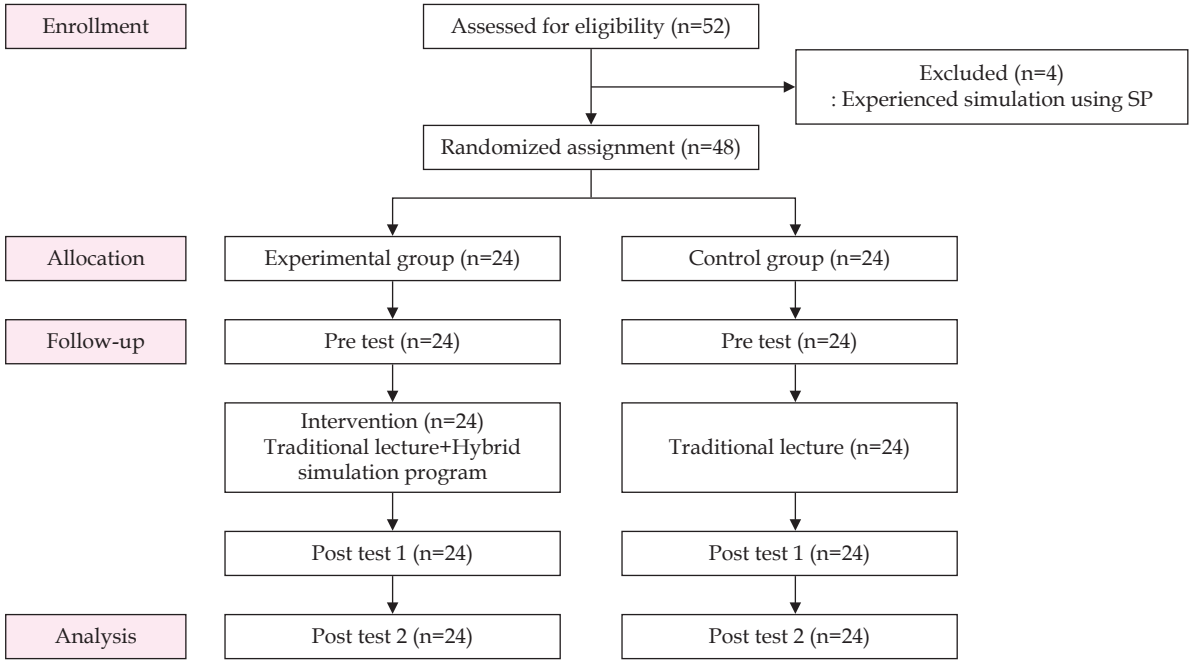

Figure 1. Flow diagram of participant allocation, follow-up, and analysis. SP, standardized patient.

the participants' enhanced knowledge.

2) Clinical performance confidence

This study used a clinical performance measurement tool developed by Lee at al. [17] and modified by Park [18]. It is rated on a 5-point Likert scale, ranging from "very well" to "very poorly," with higher scores indicating greater confidence in clinical performance abilities. Cronbach's α was .94 in Park's study [18] and .95 in this study.

3) Communication self-efficacy

The Korean version of the Communication Self-Efficacy Measurement Tool (KSE-12) was used for nursing students [19]. It uses a 10-point scale, ranging from 1 ("very uncertain") to 10 ("very confident,") with higher scores indicating greater communication self-efficacy. At the time of development, Cronbach's α was .95 for SE-12 and .98 for KSE-12; in this study, Cronbach's α was .95.

4) Program satisfaction

To measure program satisfaction, the researcher modified the educational satisfaction tool developed by Kim [20] by supplementing it with items. It is a 5-point Likert scale ranging from 5 for ("very much so") to 1 for ("not at all.") The higher the score, the greater the level of satisfaction with the educational program. At the time of development, Cronbach's α was . 93; in this study, it was .83.

5) Communication ability

The Korean version of the revised and supplemented communication ability assessment tool (K-HCAT) [21] was used to evaluate communication ability in a simulated situation. The tool uses a 5-point Likert scale ranging from 1 ("not at all") to 5 ("very much,") with higher scores indicating better communication abilities. The tools available for evaluation by instructors and SP were K-HCAT's evaluator. Cronbach's α of .73–.84 and SP Cronbach's α of .78. Intra-class correlation (ICC) between instructors with experience in simulating child nursing and SP evaluators was 0.78 in the first session and 0.75 in the second. In this study, Cronbach's α was .88 by the first session instructor, .83 for SP, .84 by the second session instructor, and.82 by SP, respectively.

4. Procedure

1) Development of hybrid simulation program

To develop the hybrid simulation program, an Analyze, Design, Develop, Implement, and Evaluate (ADDIE) model was applied. First, the researchers conducted an online survey of 21 third-year nursing students to identify the need to experience a simulation education program to provide nursing care for patients with congenital heart disease and to learn how to communicate with patients. Additionally, the laboratory environment for the simulation was analyzed. Second, the learning objectives and educational content were based on the learning objectives of the Korean Academy of Child Health Nursing and the learning outcomes of the Korean Accreditation Board of Nursing Education [1].

To design the hybrid simulation, the following learning goal for direct nursing intervention was established: to be able to assess the patient assessment and provide appropriate nursing intervention before and after pediatric catheterization to children with atrial septal defect. The educational content using HPS was created accordingly. We also established the learning goal for communication with parents as being able to carry out therapeutic communication with the parents of patients, and we used an SP for the role of parents to construct educational content for actual communication.

Third, the simulation program included nursing cases before and after pediatric cardiac catheterization. Pre-pediatric cardiac catheterization nursing involves preparing patients just before moving them to the procedure room and providing supportive care to children and mothers who are anxious because of delays in the procedure. Post-pediatric cardiac catheterization nursing includes post-procedure medication, diet, and posture maintenance for children who arrive at the ward in a sedated state, education of mothers who are anxious about the child's condition, and maintaining an open airway. The participants were divided into two groups and played the role of nurses while driving the scenario, and the instructor coordinated and monitored the simulation process, The program was designed to help the participants reflect on the simulation through debriefing after the simulation driving was completed. A deep-learning-based facial expression and motion analysis program was used to analyze and debrief learners' verbal and non-verbal communication [14]. This pilot computer program was developed in 2022 by our research team and engineers specializing in artificial intelligence. It can analyze facial expressions (neutral, happi-

ness, sadness, surprise, fear, disgust, anger) and movements (eye contact, light touch, distance, tilted upper body) using video file of nursing students communicating with patients [14]. In this study, the program's analysis of nursing students' interactions with mother was used as an auxiliary tool to help students objectively reflect on their non-verbal communication during debriefing. The overall content of the simulation program was designed using the National League for Nursing/Jeffries Simulation Framework as the conceptual framework [22]. Expert reviews were conducted to validate the program's content. The team of expert reviewers included a professor of child nursing with simulation teaching experience and two nurses who had worked in pediatric cardiology for more than 10 years. The final program was developed after applying the pilot program to six fourth-grade nursing students with experience in simulation classes using SPs and checking the overall scenario flow, operating time, movement, appropriateness of child patient voice recordings, and angle of video cameras for non-verbal communication analysis programs.

2) Pre test

Data were collected from July 27 to October 19, 2022. After announcing recruitment through social networking sites, the participants were recruited on a first-come-first-served basis. A preliminary survey was conducted on the general characteristics, knowledge, clinical-performance confidence, and communication self-efficacy of those who signed the consent form to participate in the study. Participants were randomized into experimental and control groups.

3) Intervention

After online lectures, the experimental group participated in a hybrid simulation program, which consisted of ten sessions, including nursing care, before and after cardiac catheterization. One group of six nursing students and two nursing students played nurses' roles during the course of the study. Each group discussed the scenario and practiced nursing skills (90 minutes), followed by simulation running for the first nurse role (30–45 minutes), intermediate debriefing and group discussion (30 minutes), simulation running for the second nurse role (30–45 minutes), and team debriefing (30 minutes) for a total of 450 minutes (Table 1). The researcher developed online lecture content, program guidelines, reflection diaries, and scenario scripts. In the clinical setting, the lower limb purse was changed and a physical reaction high-fidelity child simulator was used. The SP were performed by a pretrained professional actor. The control group participated only in online lectures on pediatric catheterization. Data from the control group were first collected at different time intervals so that the treatment of the experimental group did not spread to the control group.

4) Post test

The first post-test evaluation of knowledge, clinical-performance confidence, communication self-efficacy, program satisfaction, and communication ability was performed in the experimental group immediately after the end of the program. In the control group, knowledge, clinical performance confidence, and communication self-efficacy were surveyed in the third week after the lecture, which was the same time point as the experimental group, and there were no dropouts. For the second post-test evaluation, the experimental and control groups were surveyed for knowledge, clinical performance confidence, and communication self-efficacy 3 weeks after the first post-test.

5. Data Analysis

Data were analyzed using the IBM SPSS Statistics ver. 26.0 (IBM Corp.). The general characteristics of the participants were analyzed using real numbers, percentages, means, and standard deviations. The general characteristics of the experimental and control groups and the homogeneity test for research variables were analyzed using the chi-square test, Fisher's exact test, and independent t test. Repeated-measures ANOVA confirmed the effectiveness of the program and the sphericity assumption, referring to Wilks' lambda value if sphericity was not satisfied. Knowledge, clinical performance confidence, and communication self-efficacy at each time point were analyzed using independent t tests. The reliability of the measurement tool was obtained through Cronbach's α and the reliability between evaluators through ICC.

RESULTS

1. General Characteristics of the Participants and Homogeneity of Study Variables

Among the general characteristics, there were no significant differences between the two groups in terms of age, sex,

Table 1. Hybrid Simulation Program for Nursing Students Focusing on a Case of Pediatric Cardiac Catheterization

Parts	Process	Contents	Time
1: Care of before catheterization	1: Pre simulation activity	• Review of child condition and nursing care before cardiac catheterization • Practice of nursing skills • Group formation and setting roles of two nurses (2 person/group)	90 min
	2: First simulation running & facial expression recording	• Assessment of child condition (using HPS) • Preparation for cardiac catheterization (using HPS) • Communication and support with mother (with SP)	30 min
	3: Short debriefing	• Group debriefing about nursing intervention	30 min
	4: Second simulation running	• Repeat first simulation running contents • Switch the role of nurses within group	30 min
	5: Post simulation activity	• Team debriefing about Part 1 simulation practice (3 group/team) • Debriefing and discussion with SP • Feedback and discussion for non-verbal communication using analysis of participants' facial expression during practice	30 min
2: Care of after catheterization	1: Pre simulation activity	• Review of child condition and nursing care of after cardiac catheterization • Practice of nursing skills	90 min
	2: First simulation running & pose recording	• Assessment and intervention for airway maintenance and blood circulation in sedation (using HPS) • Education and support mother (with SP)	45 min
	3: Short debriefing	• Group debriefing about nursing intervention	30 min
	4: Second simulation running	• Repeat first simulation running contents • Switch the role of nurses within group	45 min
	5: Post simulation activity	• Team debriefing about Part 2 simulation practice (3 group/team) • Debriefing and discussion with SP • Feedback and discussion for non-verbal communication using analysis of participants' pose during practice	30 min

HPS, high-fidelity patient simulators; SP, standardized patient.

academic performance, satisfaction with major, satisfaction with clinical practice, nursing education related to congenital heart disease, or communication education for children and parents. However, interpersonal relationships differed significantly between the two groups (p=.017). All study variables were confirmed to be normally distributed using the Shapiro–Wilk test. There were no statistically significant differences between the two groups in knowledge, clinical performance ability, or communication self-efficacy. Therefore, the two groups were confirmed to be homogeneous (Table 2).

2. Effects of Hybrid Simulation Program for Nursing Students

For repeated-measures analysis of variance, interpersonal relationships that demonstrated significant differences among general characteristics were treated as covariates, and the estimated marginal mean values and standard errors were confirmed.

For Hypothesis 1 the interaction between time and groups was significant (F=3.53, p=.038). Compared with the control group, the experimental group had a significantly higher change in knowledge after the intervention (t=2.23, p=.031) and 3 weeks after the intervention (t=2.14, p=.038). Therefore, Hypothesis 1 is supported (Table 3).

For Hypothesis 2 the interaction between time and groups was significant (F=9.73, p<.001). Compared with the control group, the experimental group had a significantly higher change in confidence in clinical competence after the intervention (t=3.78, p<.001) and 3 weeks after the intervention (t=3.81, p<.001). Therefore, Hypothesis 2 is supported (Table 3).

For Hypothesis 3 the interaction between time and group was significant (F=5.20, p=.007). Compared with the control

Table 2. General Characteristics of Study participants and Homogeneity of Study Variables between Two Groups (*N*=48)

Characteristics	Categories or Range	Exp. (n=24)	Cont. (n=24)	χ^2 / t (*p*)
		n (%) or M±SD	n (%) or M±SD	
Age (y)		21.13±1.15	21.42±1.25	0.84 (.405)
Sex	Female	21 (87.5)	21 (87.5)	0.00 (.667[a])
	Male	3 (12.5)	3 (12.5)	
Academic performance	>4.0	10 (41.7)	6 (25.0)	1.79 (.080[a])
	3.5–3.9	11 (45.8)	8 (33.3)	
	3.0–3.4	2 (8.3)	10 (41.7)	
	<3.0	1 (4.2)	0 (0)	
Satisfaction with major	Very satisfied	11 (45.8)	5 (20.8)	1.26 (.216[a])
	Satisfied	8 (33.3)	12 (50.0)	
	Neutral	4 (16.7)	7 (29.2)	
	Dissatisfied	1 (4.2)	0 (0)	
Satisfaction with clinical practice	Very satisfied	6 (25.0)	6 (25.0)	0.65 (.521[a])
	Satisfied	15 (62.5)	12 (50.0)	
	Neutral	3 (12.5)	6 (25.0)	
	Dissatisfied	0 (0)	0 (0)	
Interpersonal relation	Good	19 (79.2)	11 (45.8)	2.48 (.017)
	Neutral	5 (20.8)	13 (54.2)	
	Bad	0 (0)	0 (0)	
CHD family history or past history	Yes	0 (0)	0 (0)	-
	No	24 (100.0)	24 (100.0)	
Nursing education experience related to congenital heart disease	Yes	2 (8.3)	4 (16.7)	0.76 (.666[a])
	No	22 (91.7)	20 (83.3)	
Communication education experience for children and parents	Yes	6 (25.0)	2 (8.3)	2.40 (.245[a])
	No	18 (75.0)	22 (91.7)	
Knowledge	0–20	13.46±2.17	13.08±2.13	0.61 (.548)
Clinical performance confidence	15–75	53.71±8.91	56.33±11.19	0.90 (.373)
Communication self-efficacy	12–120	83.17±13.55	87.92±14.30	1.18 (.244)

[a]Fisher's exact test; CHD, congenital heart disease; Cont., control group; Exp., experimental group; M, mean.

Table 3. Results of Repeated Measured ANOVA for Study Variables between the Experimental and Control Groups (*N*=48)

Variables	Time	Exp. (n=24)	Cont. (n=24)	Sources	F or t (*p*)
		M±SE or M±SD			
Knowledge	Pre	13.35±0.45	13.19±0.45	Time	7.49 (.009)
	Post 1	16.12±0.48	13.84±0.48	Group	0.11 (.989)
	Post 2	16.07±0.67	13.51±0.67	T×G	3.53 (.038)
	Post 1-Pre	2.58±2.72	0.83±2.73		2.23 (.031)
	Post 2-Pre	2.54±3.36	0.50±3.26		2.14 (.038)
Clinical performance confidence	Pre	53.34±2.15	56.70±2.15	Time	0.34 (.563)
	Post 1	62.38±1.56	58.21±1.56	Group	4.99 (.009)
	Post 2	64.41±1.68	60.01±1.68	T×G	9.73 (<.001)
	Post 1-Pre	9.42±7.10	2.13±6.23		3.78 (<.001)
	Post 2-Pre	10.79±6.74	3.58±6.38		3.81 (<.001)
Communication self-efficacy	Pre	82.08±2.90	89.01±2.90	Time	0.10 (.751)
	Post 1	91.74±2.85	91.84±2.85	Group	4.96 (.009)
	Post 2	96.50±3.13	93.21±3.13	T×G	5.20 (.007)
	Post 1-Pre	10.75±10.67	1.75±10.43		2.96 (.005)
	Post 2-Pre	14.21±11.03	4.42±12.65		2.86 (.006)

Cont., control group; Exp., experimental group; M, mean; Post 1, immediately after the program; Post 2, three weeks after the program; Pre, before intervention; SD, standard deviation; SE, standard error; T×G, time×group.

Table 4. Changes in Communication Ability of the Experimental Group during Participation in the Program (*N*=48)

Variable	Part 1 simulation M±SD	Part 2 simulation M±SD	t (*p*)
Communication ability	55.06±4.52	57.83±4.61	3.32 (.003)

M, mean.

group, the experimental group had a significantly higher change in communication self-efficacy after the intervention (t=2.96, *p*=.005) and 3 weeks after the intervention (t=2.86, *p*=.006). Therefore, Hypothesis 3 is supported (Table 3).

For Hypothesis 4 communication ability increased significantly after the program compared to the situation before it (t=3.32, *p*=.003). Therefore, Hypothesis 4 is supported (Table 4).

DISCUSSION

This study developed a hybrid simulation program focusing on pediatric cardiac catheterization and assessed its effectiveness. The discussion is divided into two parts: the development of the program and its effectiveness.

First, simulation programs must include scenarios that consider nursing students' educational needs and learning levels. These scenarios provide nursing students with a variety of experiences and opportunities to fully demonstrate their capabilities [23]. A clinical environment and situation similar to those in a real clinical setting should be created to allow nursing students to fully immerse themselves in a simulation program. In this study, the educational needs of nursing students were assessed before the program was developed. We created simulation scenarios by modifying real cases based on the nursing manual for pediatric cardiac catheterization used in hospitals. The learning objectives of simulations reflected the characteristics of the hybrid simulation program. This enabled the assessment and intervention in changing patient conditions using HPS and communication and interaction with SP who played the role of mothers. Before pediatric catheterization, participants were encouraged to easily assess the child's condition and mother's anxiety and provide supportive nursing care. Participants were guided to perform nursing skills in a simulation, which allowed them to directly experience nursing interventions for pediatric cardiac catheterization. In another session, after pediatric catheterization, the simulation scenario was more advanced and was designed to allow nursing students to independently solve problems with the child's condition, provide education for the mother, and provide emotionally supportive nursing care, thereby increasing communication opportunities through interactions with the SP. When nursing students perform assigned roles within the team, the learning effect may diminish if roles are not properly allocated because of the nature of simulation classes [24]. Therefore, in each scenario in our program, nurses' roles were divided into nursing skills, education, and supportive care. The simulation was repeated with role changes, allowing students to experience all the roles. Since nurses in pediatric wards experience more stress than those in other wards when they communicate with patients and caregivers, sufficient communication training and practice with pediatric patients or their caregivers is essential [25]. Simulations showed that increased confidence in this hybrid program improved communication self-efficacy. This study provided opportunities for communication with the SP by repeating simulation practices in the same situation. To ensure that nursing students remain focused on and engaged in the simulation, the actions of the SP must be realistic [26]. Therefore, professional actors with experience in SP roles, specifically as mothers, were recruited for this study, and an objective analysis of non-verbal communication focusing on the faces and poses of nursing students was conducted [14]. During debriefing, individual feedback was provided to the participants to encourage them to reflect on verbal and non-verbal communication. The hybrid simulation program developed in this study focused on communication with parents, which is crucial in child nursing. It involves analyzing nursing problems and providing appropriate direct nursing care through scenarios based on real clinical cases. Additionally, it includes analysis and reflection on both the verbal and non-verbal elements of communication.

The next aspect is the program's effectiveness. First, the knowledge scores of the experimental group varied over time compared to those of the control group, showing a pattern of maintaining a high level. It was reaffirmed that knowledge gained through simulation practice is retained longer than that acquired through theoretical education [22]. This outcome is thought to result from the internalization of theoretical knowledge through simulation practice, which directly involves educating patients and parents. Since the simulation practice is not merely meant for acquiring knowledge, but for applying and integrating it, clearly defining learning goals is essential. When evaluating the effects of simulation, the focus should be on assessing how knowledge

is used and applied rather than simply measuring the knowledge itself. Second, the clinical performance confidence scores of the experimental group varied over time compared to those of the control group, showing a pattern of maintaining a high level. A direct comparison is challenging because of the lack of previous studies measuring confidence in clinical performance. However, previous studies measuring clinical performance have shown an increase in clinical performance [5,27]. However, a study using SP and HPS did not show an increase in clinical performance, indicating the need for further research on the effects of simulations [28]. As this study did not include instructors' clinical performance evaluations, future research should involve comparative studies on actual clinical performance capabilities by simultaneously conducting instructors' and students' self-evaluations. Additionally, the students participated more actively in the second session than in the first session. This increased engagement is, perhaps, because the participants provided the necessary nursing care to the child and mother, leading to simulation based on their own judgment and thoughts. A simulation scenario running method that provides an open practice environment for students to proactively judge and cope with open learning opportunities to try various interventions is suggested. Third, self-efficacy scores for communication ability in the experimental group varied over time compared with the control group, showing a pattern of maintaining a high level. Communication self-efficacy is the confidence in nurses' ability to effectively communicate with patients while providing nursing care [18]. This is improved by repeated simulation practice training in situations similar to SPs and clinical sites rather than in practice using simple models [29]. In this study, the use of SP allowed participants to experience communication similar to real-world scenarios. Communication self-efficacy improved as the participants reflected on both verbal and non-verbal communication through intermediate and team debriefings. Finally, the experimental group showed improved communication skills compared to their levels before participating in the program. This is similar to previous studies showing that communication ability can increase as communication self-efficacy increased [30]. Communication skills are an important nursing competency; communication-related courses are often limited to theoretical classes, but communication requires both theoretical learning and practical application training. The results suggest that hybrid simulation practice is an effective educational method for integrating theoretical nursing knowledge, improving communication skills, and providing practice and training opportunities in nursing care.

One limitation of this study is that it is difficult to generalize the results because the research was conducted with nursing students from one university. In addition, this effect may have been exaggerated because the participants were volunteers, who were more likely to be actively engaged in the simulation program. There is no absolute standard for acceptable inter-rater reliability when evaluating communication skills, but a value of 0.8 or higher is recommended [31]. The inter-rater reliability results of this study show that a better understanding of the evaluation items and measurement methods is needed before starting the simulation.

This study confirmed the effectiveness of a hybrid simulation program that combines the HPS and SP with a focus on pediatric cardiac catheterization, which is difficult to encounter in clinical practice. The program developed in this study can be used as an educational module to develop practical competencies in pediatric nursing interventions and to train communication with parents.

CONCLUSION

This developed a hybrid simulation program focusing on pediatric cardiac catheterization and confirmed its effectiveness. The results showed that the program effectively improved nursing students' knowledge and abilities in clinical performance, confidence, communication self-efficacy, and communication ability. This program can be used as an educational intervention in pediatric nursing education and practice to enhance nursing competencies, including communication with children and their parents. Future research should focus on developing and incorporating various hybrid simulation programs using SP into the nursing curriculum and evaluating their effectiveness. Further studies are needed to assess competencies of nursing students participating in these programs in clinical practice settings.

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Authors' contribution

Conceptualization: all authors; Data collection and Formal analysis: Eunju Jin; Writing-original draft: Eunju Jin; Writing-review and editing: Hyunju Kang; Final approval of published version: all authors.

Conflict of interest

Hyunju Kang has been an editor of *Child Health Nursing Research* since 2024. She was not involved in the review process of this article. No existing or potential conflict of interest relevant to this article was reported.

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CHNR

Effects of nurse's knowledge and self-efficacy on nursing performance in pediatric intravenous fluid management in South Korea: a descriptive study

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Purpose: This study aimed to identify the effects of nurse's knowledge and self-efficacy on nursing performance in pediatric intravenous fluid management and provide the primary data necessary for the efficient intravenous injection management of hospitalized children. **Methods:** This study was a descriptive study design with 141 nurses who perform pediatric intravenous therapy care at eight hospitals in the S, C, D, and S regions. Data were collected from September 1, 2023, to September 30, 2023. **Results:** Nursing performance of pediatric intravenous injection management was significantly positively correlated with knowledge (r=.44, p<.001) and self-efficacy (r=.19, p=.022). Nurses' knowledge (β=.42, p<.001) and self-efficacy (β=. 22, p=.004) of pediatric intravenous injection management and care were identified as significant predictors of nursing performance thereof, with these two factors explaining 21.9% of the variance. **Conclusion:** This study found that knowledge and self-efficacy of pediatric intravenous injection management are significant predictors of the practice of intravenous care among pediatric nurses. Therefore, considering these factors, education and intervention programs should be developed to enhance pediatric nurses' knowledge and self-efficacy regarding intravenous injection management.

Keywords: Child, hospitalized; Injections, intravenous; Nurses, pediatric; Self efficacy

INTRODUCTION

Intravenous therapy (IVT), widely used to administer medication, fluids, parenteral nutrition, and blood products to treat patients, is an invasive procedure performed most frequently on hospitalized patients [1]. IVT is the most common medical practice for hospitalized adults and children. According to a previous study, 63.8% of children hospitalized in pediatric wards in Korea received IVT [2], indicating that most children receive IVT. IV injections require special management since complications, such as phlebitis and redness, pain, swelling, blockage, and infiltration at the injection site, are common occurrences due to the nature of such injections [3-5].

Children have anatomically thin and immature blood vessels and a thicker subcutaneous fat layer than adults, which presents difficulty in inserting an IV catheter [2]. Moreover, even if an IV catheter is successfully inserted, it is not easy to maintain the IV catheter owing to a lack of patient cooperation, as younger children have difficulty communicating in the early developmental stages [2]. The latest guidelines for IV infusion management for children recommend that IV catheters do not need to be replaced as long as there are no complications; however, in practice, IV catheters are con-

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stantly replaced for hospitalized children as they cannot be maintained for 72 hours due to blockage, infiltration, and swelling in more than half of children [6,7]. A previous study has reported that the mean IV catheter indwell time among hospitalized children was 51.3 hours, and the IV catheter indwell time was even shorter among younger children with lots of body movement [6]. Accordingly, efforts to prevent IV injection-related complications and safely maintain the IV catheter insertion site are emphasized in clinical nursing practice. Moreover, nurses must manage IV injections with accurate knowledge and standardized methods [2].

IV injection management knowledge is an essential component that must be acquired for the overall management of IV injections, proper nursing practice, and complication prevention. Nurses must be able to manage the entire IV injection process by developing skills and knowledge about IV injection management [8].

Clinical guidelines for IVT have been developed and presented by various specialty societies in Korea and abroad. Furthermore, the United States Centers for Disease Control and Prevention (CDC) provides ongoing education for IV line maintenance at the beginning of each year [9]. Nonetheless, the developed IV injection management protocol for children is not being applied in actual clinical practice [10], and hospitals are creating and using in-house IV injection management methods; therefore, standardized guidelines are not being used. Consequently, the contents of IV injection management nursing vary among hospitals and wards. Management guidelines passed down by apprenticeship training do not reflect the latest knowledge and can act as a barrier that prevents proper IV injection management due to lack of knowledge. In clinical practice, nurses must promote enhanced patient safety and quality of care by actively accepting the latest evidence-based nursing knowledge and information to develop their specialization.

Nursing knowledge is an essential component of scientific nursing; however, having a high level of knowledge does not necessarily lead to proper nursing practice [11,12]. According to previous studies, self-efficacy is an important variable influencing nursing performance. Yoo [13] has found a positive correlation between self-efficacy and nursing performance in pediatric nursing, and Jang and Yeom [14] have found a positive correlation between self-efficacy and nursing performance in hospice-palliative care nurses. Accordingly, self-efficacy has been reported to motivate and improve the activities of individuals in nursing practice while positively affecting nursing performance [15].

Therefore, knowledge and self-efficacy can be considered critical variables for enhancing IV injection management among pediatric nurses, and studies should be conducted to investigate the relationship between these variables. Most studies on IV injection management performance have focused on nurses' job satisfaction, infection control, and complication prevention. Furthermore, studies on pediatric nurses have focused on job satisfaction, nurses' stress, caregiver satisfaction, and children's anxiety [16,17]. Accordingly, this study aims to identify the factors influencing nursing performance in pediatric nurses' intravenous injection management and provide the primary data for efficiently managing peripheral IV injections in hospitalized children.

METHODS

Ethical statements: This study obtained approval from the Institutional Review Board (IRB) of Chungbuk National University Hospital (IRB approval number: 2023-06-001-001). Informed consent was obtained from all participants.

1. Study Design

This descriptive study identifies the effects of nurse knowledge and self-efficacy on nursing performance in pediatric intravenous fluid management. The reporting of this study was based on the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines [18].

2. Participants

This study used convenience sampling to recruit nurses from eight hospitals (one tertiary hospital from the S region, one tertiary hospital, one general hospital, three children's hospitals from the C region, one general hospital from the D region, and one children's hospital from the S region). The eligibility criteria for participants in this study included having at least 6 months of experience working in a pediatric ward, performing IV injection management for children, and providing informed consent to participate in the study. The eligible participants required for this study were calculated using G*power 3.1.9.7 statistical software. The minimum sample size was 131, calculated using a two-tailed test at a significance level of . 05, power of .80, effect size of .15, and 13 pre-

dictor variables (10 general characteristics, nurses' knowledge of pediatric intravenous injection management, nurses' self-efficacy of pediatric intravenous injection management, and nursing performance in pediatric intravenous injection management. A total of 150 questionnaires were distributed and returned. After excluding nine questionnaires for incomplete responses, data from 141 questionnaires were used in the final analysis.

3. Measurements

All scales used in this study were used with prior approval. The questionnaire consisted of 74 items, 10, 10, 17, and 37, regarding general characteristics, nurses' knowledge about pediatric IV injection, nurses' self-efficacy related to pediatric IV injection management, and nurses' performance related to pediatric IV injection management, respectively.

1) General characteristics

The participants' characteristics regarding age, marital status, children, religion, education, total clinical career, clinical career in the pediatric unit, position, nurse-to-patient ratio, and hospital type were collected.

2) Nurses' knowledge of pediatric intravenous injection management

Knowledge was measured using a 10-item tool created by Choi et al. [10] based on the nursing protocol for peripheral catheter management in children outlined by the children's hospital of a tertiary hospital in Seoul in 2015. Each item is scored based on an answer of "correct" (1 point), "incorrect" (0 point), or "do not know" (0 point). The total scores range between 0 and 10 points, with higher scores indicating higher knowledge levels. The tool's reliability (Cronbach's α) was not presented when this tool was developed initially. Nonetheless, each item's content validity index (CVI) ranged between 0.0 and 1.0, and the CVI of all items was 0.96.

3) Nurses' self-efficacy in pediatric intravenous injection management

Self-efficacy was measured using the General Self-Efficacy Scale, initially developed by Sherer et al. [19] and subsequently modified and updated by Jung [20]. This tool comprises 17 items, with each item rated on a 5-point Likert scale (1: "not at all" to 5: "always"). The total scores range between 17 and 85 points, with higher scores indicating higher self-efficacy. The tool's reliability (Cronbach's α) was .86 at the time of development, .94 in the study by Jung [20], and .97 in this study.

4) Nursing performance in pediatric intravenous injection management

Nursing performance was measured using a tool developed by Choi et al. [10] based on the nursing protocol for pediatric peripheral catheter management developed by the children's hospital of a tertiary hospital in Seoul in 2015. This tool comprises 37 items in five domains: "education" (2 items), "dressing and fixation" (7 items), "maintenance and management" (7 items), "observation and recording" (9 items), and "complications management" (12 items). Each item is rated on a 4-point Likert scale (1: "not at all" to 4: "always"). The total scores range between 37 and 148 points, with higher scores indicating higher nursing performance levels. The CVI value of each item in this tool ranged between 0.8 and 1.0, and the CVI value of all items was 0.97. The tool's reliability (Cronbach's α) was .92 at the time of its development. In this study, the reliability (Cronbach's) of the tool was .92, while the reliability of each domain was .81, .77, .57, .79, and .84 for education, dressing and fixation, maintenance and management, observation and recording, and complications management, respectively.

4. Data Collection

Approval was obtained from the IRB of Chungbuk National University Hospital before data collection. Nursing departments in eight hospitals with pediatric wards, including tertiary, general, and children's hospitals, were contacted in advance. The data collection period was September 1–30, 2023. The researcher visited the nursing department of each hospital to distribute the questionnaire and explain the purpose and methods of the study. Subsequently, the researchers informed the heads of department and research participants about the purpose and methods of the study; the privacy, anonymity, and confidentiality of questionnaire data; the potential risks and benefits of participating in the study; and the right to withdraw from the study at any time without any negative repercussions. Only those who voluntarily agreed to participate in the study were asked to submit a written consent form, after which the questionnaire survey was conducted. The researchers revisited each ward to collect the questionnaire and presented a token of appreciation for participating. For the protection of personal information, the re-

searchers collected the completed questionnaires from the participants (face-to-face) and placed them in a sealed envelope. Data were anonymized, and the researcher performed data synthesis solely.

For hospitals that had provided prior permission but were challenging to visit personally, an email containing information about the study's purpose and methods; the privacy, anonymity, and confidentiality of participant data; the potential risks and benefits of participating in the study; and the right to withdraw from the study at any time without any negative repercussions was sent to the head of the nursing department at each hospital, together with a URL link for the online questionnaire (Google Form). The department heads subsequently shared this with the participants through the department member messenger app. The online questionnaire contained an optional field for entering contact information to send a token of appreciation upon completion; furthermore, it was outlined that such personal information would be destroyed immediately after sending the token of appreciation. After obtaining the consent form, the survey was conducted in a self-reporting format. Completed questionnaires were collected online using a Google Form.

5. Data Analysis

The collected data were analyzed using SPSS Windows software (IBM SPSS Statistics ver. 29.0, IBM Corp.). Participant characteristics were analyzed using frequencies, percentages, means, and standard deviations. Descriptive statistics for the study variables were analyzed using means, standard deviations, minimums, and maximums. Nursing knowledge in pediatric intravenous injection management was analyzed using correct answer rates. The differences in study variables according to participant characteristics were analyzed using an independent t test and a one-way analysis of variance with the Scheffé test. Pearson correlation coefficients analyzed the correlation between study variables. Factors affecting nursing performance in pediatric intravenous injection management were analyzed using multiple regression analysis.

RESULTS

1. Participant Characteristics

The mean age of the participants was 33.8 years, with those aged 20–29 and 30–39 years accounting for 78.1% (n=110) of the participants. Moreover, 55.3% (n=78) were married, 44.7% (n=63) had children, and 72.3% (n=102) declared no religion. Regarding education level, 34 (24.1%), 94 (66.7%), and 13 (9.2%) participants responded to college, university, and masters or higher, respectively.

Regarding total clinical experience, 40 (28.4%), 34 (24.1%), 42 (29.8%), and 25 (17.7%) participants had <5, 5–9, 10–14, and ≥15 years of experience, respectively. Regarding work experience in a pediatric ward, 77 (54.6%), 39 (27.7%), 20 (14.2%), and 5 (3.5%) participants had <5, 5–9, 10–14, and ≥15 years of experience, respectively. The mean total clinical experience was 9.00±6.13 years, and the mean work experience in a pediatric ward was 5.00±4.53 years. Of the participants, 74.5% (n=105) were staff nurses. Regarding the nurse-to-patient ratio, <20 was 47.5% (n=67), and ≥20 was 52.5% (n=74). Regarding hospital type, 86 (61.0%), 27 (19.1%), and 28 (19.9%) participants worked in children's, general, and tertiary hospitals, respectively (Table 1).

2. The Differences in Study Variables According to the Participant Characteristics

The differences in nursing performance related to pediatric IV injection management according to the characteristics of the participants are shown in Table 1. The results showed statistically significant differences in nursing performance according to education ($F=3.43$, $p=.035$) and hospital type ($F=4.83$, $p=.009$). The nursing performance scores were higher among those with a masters degree or higher than those with college or university education levels and those working in a tertiary hospital than those working in a general hospital.

3. Descriptive Statistics for Study Variables

The mean scores for knowledge, self-efficacy, and nursing performance of pediatric IV injection management were 7.29±1.35 out of 10, 3.72±0.71 out of five, and 3.35±0.42 out of four, respectively. Regarding the mean scores for each domain, dressing and fixation of the IV injection site had the highest score of 3.52±0.50 points, followed in order by observation and recording with 3.48±0.44 points, complications management with 3.32±0.51 points, maintenance and management with 3.21±0.52 points, and education with 2.77±0.87 points (Table 2).

Table 1. Characteristics of Participants & the Differences in Study Variables according to Characteristics of Participants (*N*=141)

Characteristics	Categories	n (%)	M±SD	Nursing performance		
				M±SD	t/F	*p*
Age (year)	20–29	49 (34.8)	33.80±7.59	3.39±0.49	0.47	.704
	30–39	61 (43.3)		3.34±0.37		
	40–49	27 (19.1)		3.27±0.44		
	≥50	4 (2.8)		3.32±0.08		
Marital status	Married	78 (55.3)		3.40±0.39	1.74	.085
	Single	63 (44.7)		3.28±0.45		
Children	Yes	63 (44.7)		3.36±0.43	0.26	.797
	No	78 (55.3)		3.34±0.42		
Religion	Yes	39 (27.7)		3.41±0.38	1.10	.274
	No	102 (72.3)		3.32±0.44		
Education	College[a]	34 (24.1)		3.19±0.45	3.43	.035
	University[b]	94 (66.7)		3.39±0.41		(a<c)
	≥Master[c]	13 (9.2)		3.47±0.30		
Total clinical career (year)	<5	40 (28.4)	9.00±6.13	3.38±0.49	0.66	.578
	5–9	34 (24.1)		3.40±0.39		
	10–14	42 (29.8)		3.28±0.40		
	≥15	25 (17.7)		3.33±0.40		
Clinical career in pediatric unit (year)	<5	77 (54.6)	5.00±4.53	3.34±0.45	0.18	.909
	5–9	39 (27.7)		3.39±0.42		
	10–14	20 (14.2)		3.31±0.33		
	≥15	5 (3.5)		3.31±0.43		
Position	Staff	105 (74.5)		3.31±0.43	-1.71	.089
	Manager	36 (25.5)		3.45±0.39		
Nurse-to-patient ratio	<20	67 (47.5)	20.01±9.25	3.38±0.45	0.90	.370
	≥20	74 (52.5)		3.32±0.40		
Hospital type	Children's hospital[a]	86 (61.0)		3.32±0.42	4.83	.009
	General hospital[b]	27 (19.1)		3.23±0.48		(b<c)
	Tertiary hospital[c]	28 (19.9)		3.55±0.31		

M, mean; SD, standard deviation.

Table 2. Descriptive Statistics for Study Variables (*N*=141)

Variables	M±SD	Minimum	Maximum	Range
Knowledge	7.29±1.35	3.00	10.00	0–10
Self-efficacy	3.72±0.71	1.24	5.00	1–5
Nursing performance	3.35±0.42	1.92	4.00	1–4
Dressing and fixation	3.52±0.50	1.57	4.00	1–4
Observation and recording	3.48±0.44	2.00	4.00	1–4
Complications management	3.32±0.51	2.00	4.00	1–4
Maintenance and management	3.21±0.52	1.86	4.00	1–4
Education	2.77±0.87	1.00	4.00	1–4

M, mean; SD, standard deviation.

4. Correlation between Study Variables

The correlations between nursing performance and the study variables are shown in Table 3. Nursing performance showed a statistically significant positive correlation with nursing knowledge (r=.44, p<.001) and self-efficacy (r=.19, p=.022).

Table 3. Correlation Between Study Variables (*N*=141)

Variables	Knowledge	Self-efficacy	Nursing performance
	r (*p*)		
Knowledge	1		
Self-efficacy	-.05 (.594)	1	
Nursing performance	.44 (<.001)	.19 (.022)	1

5. Factors Affecting Nursing Performance in Pediatric Intravenous Injection Management

A multiple regression analysis was performed to identify the factors affecting nursing performance regarding pediatric IV injection management. Four variables were inputted as independent variables, including two (education and hospital type) that showed significant differences with nursing performance in the univariate analyses and two (knowledge and self-efficacy) with confirmed correlation in the correlation analyses. Of these, two nominal variables, education and hospital type, were inputted after being converted into dummy variables.

When the assumptions of the regression analysis were tested, the results showed that the Durbin–Watson statistic was 1.99, confirming independence without the autocorrelation of errors, while the tolerance between the independent variables was ≥0.1 (range: .84–.94) and the variance inflation factor was below the cutoff of 10 (1.07–1.19), indicating no multicollinearity problems.

The analysis results confirmed that nurse's knowledge (β = .42, p < .001) and self-efficacy (β = .22, p = .004) affect nursing performance regarding pediatric IV injection management. These factors showed an explanatory power of 21.9% (F = 10.82, p < .001) for nursing performance, and the most influential variable was identified to be nurse's knowledge (Table 4).

DISCUSSION

In this study, the mean score for knowledge regarding pediatric IV injection management among nurses was 7.29 out of 10 points, higher than the 5.81 points reported by Choi et al. [10] on pediatric ward nurses using the same tool. While direct comparison and review are difficult due to the scarcity of studies using the same tool, the results from studies using other tools to measure knowledge are as follows. Kim [21] investigated IV injection knowledge among new nurses and reported a mean score of 24.5 out of 35 points, similar to the present study. A study by the National Evidence-based Healthcare Collaborating Agency (NECA) [22] on knowledge about injection-related infection among healthcare service providers reported a mean score of 9.60 out of 13 points. In comparison, a study by Choi and Jeong [23] on nurses in small and medium hospitals reported a mean IV injection management knowledge score of 25.63 out of 29 points. Considering that there are only a few studies on the knowledge of pediatric IV injection management among nurses and the studies use different definitions and measurement tools, future research must use a standardized tool to explore the factors of pediatric nurses' knowledge of IV injection management.

The IV infusion practice guidelines from the CDC and Hospital Nurses Association recommend that children's peripheral IV catheters should not be changed regularly but rather as needed based on the clinical condition of the patient [10]. However, nurses do not receive regular education about revised or modified IV injection management guidelines in actual clinical practice, which can explain the results of previous studies. A study by Kim [21] reported that the "Educational method is not systematic" was the predominant response from an educational aspect in interviews with new nurses regarding IV injections. Therefore, it is necessary to provide nurses with regular educational opportunities to acquire the latest nursing knowledge using conferences and continuing education in nursing practice. Such efforts can help nurses enhance their knowledge related to their specialty and increase the efficiency of their nursing work, which can contribute to improving the quality of patient care. Therefore, nurses must continually develop their specialty to adapt to the rapidly changing healthcare environment. In a study by Huang et al. [24] on factors influencing pediatric nurses' knowledge and attitude concerning peripheral IV catheters, the level of knowledge was higher among nurses

Table 4. Factors Affecting Nursing Performance on Pediatric Intravenous Injection Management (N=141)

Variables	B	SE	β	t	p
(Constant)	1.86	0.24		7.65	< .001
Education[a)]	0.06	0.08	0.06	0.76	.451
Hospital type[b)]	0.03	0.07	0.04	0.48	.635
Knowledge	0.13	0.03	0.42	5.18	< .001
Self-efficacy	0.13	0.04	0.22	2.90	.004
F = 10.82 (p < .001), R^2 = .241, Adjusted R^2 = .219					

Reference group: [a)]Education≥Master, [b)]Hospital type; tertiary hospital.

in higher positions. This difference could be due to nursing knowledge accumulated based on that acquired through clinical experience and education. IV injection requires sufficient practice and expertise since it is an essential skill in patient care. However, unlike nurses in higher positions, new nurses have fewer opportunities to perform IV injections in clinical practice beyond observation and explanation-based practical training. There is a growing trend for medical institutions to establish educational plans and teach efficient IV injection management to resolve this problem.

In this study, the mean score for self-efficacy related to pediatric IV injection management among nurses was 3.72 out of 5 points. A study by Cho and Bang [25] on pediatric nurses using the same tool reported a mean score of 3.64, and a similar study by Youn and Noh [26] reported a mean score of 3.60.

In this study, the mean score for nursing performance related to IV injection management for children among nurses was 3.35 out of 4 points. In a study by Kim and Jung [27] on nurses working in children's hospitals using the same scale, the mean score was similar, with 3.42 points. Direct comparison and review of these results are difficult due to the scarcity of studies using this tool; however, a study by Choi and Jeong [23] on nurses in small and medium hospitals reports a mean score of 4.41 out of 5 points for performance of IV practice for infection prevention and Mo [28] reports a mean score of 3.27 out of 4 points for nursing performance for prevention of IVT complications. According to the NECA [22], a survey of healthcare service providers (physicians, nurses, nursing assistants, etc.) regarding the performance of IV injection practice revealed that over 15% of the respondents gave the response "average" or "not perform" on 13 items. The factor contributing to low performance was the lack of education opportunities related to IV injection practice. This suggested the need for systematic guidelines and education for IV injection management. For instance, a study by Choi et al. [10] compared performance scores before and after peripheral IV injection nursing protocol training among pediatric nurses and found a significant increase in the mean score from 3.14 before training to 3.56 after training. Therefore, increased knowledge from education has a positive influence on nursing performance.

Regarding the scores for the domains of nursing performance, "dressing and fixation of peripheral IV injection site" had the highest mean score with 3.52 out of 4 points, followed in order by "observation and recording" (3.48 point), "complications management" (3.32 point), "maintenance and management" (3.21 point), and "education" (2.77 point). In a study by Choi et al. [10] using the same tool, "Received regular education for IVT principles and practice" had the lowest score in the "education" domain, which was consistent with the findings in the present study. Moreover, a study by Jeong [29] on staff nurses reports that education related to IV injection consists mostly of education received when newly hired. IV injection-related education is rarely included in regular continuing education. Kim and Jung [27] was conducted in the same context as the present study. Therefore, plans to address these issues regarding IV injection-related education are needed.

The findings showed differences in the nursing performance related to IV injection management depending on education level and hospital type. The highest nursing performance scores were found among nurses with a masters degree or a higher education level, followed by a university and college degree in this order. Concerning hospital type, nursing performance scores were highest among nurses working in tertiary hospitals, followed by children's hospitals and general hospitals in this order. While a direct comparison was difficult owing to the lack of studies on nursing performance related to IV injection management among pediatric nurses, our findings were consistent with those of a previous study [28] reporting that high nursing performance was associated with the highest education level. Choi et al. [10] used the same tools as this study to investigate pediatric nurses in tertiary hospitals; items with high scores were the nurses were already familiar with through their participation in new training, infection management, and safety training. As demonstrated, tertiary hospitals have a relatively better system for new nurse training, work training, and conferences than children's and general hospitals. Therefore, it is necessary to establish measures for developing and regularly implementing standardized training that each hospital can use to enhance nursing performance.

Knowledge about pediatric IV injection management among nurses showed a statistically significant positive correlation with nursing performance, which means that nursing performance is higher among pediatric nurses with higher knowledge levels regarding IV injection management for children. This was consistent with Choi et al. [10], who reported a significant positive correlation between knowledge about IV injection management and nursing performance; Choi and Jeong [23], who reported a positive correlation be-

tween knowledge and IV injection practice for infection prevention; and Adejumo and Dada [30], who reported a positive correlation between performance and knowledge about safe injection practice. Therefore, nurses should regularly evaluate and supplement their level of knowledge about IV injection management.

In addition, a statistically significant positive correlation between self-efficacy and nursing performance among nurses was found, which indicates that nursing performance is higher among pediatric nurses with higher self-efficacy related to pediatric IV injection management. Similarly, Lee et al. [11] reported that nursing practice was higher among nurses with higher self-efficacy for oxygen therapy. Moreover, Chung [31] reported a positive correlation between nursing performance and self-efficacy after educational intervention. Based on these results, hospitals need to provide support with human resources management to achieve increased self-efficacy and work performance and qualitative improvement in nursing through performance-enhancing educational and motivational programs for pediatric nurses [32].

In this study, knowledge about pediatric IV injection management was the most significant influence on nursing performance. This indicates that pediatric nurses perform better with higher knowledge levels regarding IV injection management for children. A study by Shahzeydi et al. [33] on the relationship between knowledge and performance regarding the preparation and injection of IV drugs among 156 pediatric nurses in Iran reported that knowledge and performance among pediatric nurses were low, which would lead to adverse outcomes for children. These findings are consistent with those in the present study. A study by Choi et al. [10] also reported that nurses who received education on peripheral IV injection nursing protocol for children showed improved knowledge about IV injections and higher performance in related work. Therefore, opportunities to provide sufficient information and education regarding standardized IV injection protocol and on-the-job training should be expanded as measures for increasing nursing performance for IV injection management among pediatric nurses. Moreover, nurses are responsible for using critical thinking based on their own work experience and scientific research findings. As healthcare professionals, nurses should promote improved quality of care through continued evidence-based nursing practice.

Self-efficacy had the second most significant influence on nursing performance, indicating that pediatric nurses with higher self-efficacy for IV injection management perform better. Such results can be attributed to nurses with higher self-efficacy investing more effort in self-development to provide better-quality care to children. Previous studies on pediatric nurses have confirmed that nurses with higher self-efficacy showed better performance in pain nursing intervention [34,35]. High self-efficacy has a positive influence on problem-solving and decision-making abilities [36]; therefore, it is recommended that programs that enhance self-efficacy among pediatric nurses are developed and studies for testing the effects of such programs are conducted.

This study has several limitations. First, because this study included only pediatric nurses from a specific region, there are limitations in generalizing the findings to all nurses. Second, few studies used the same tool as this study; thus, comparisons could only be made with studies that used similar tools. Third, the tool used to measure knowledge about pediatric IV injection management included items that required revision. Therefore, the tool's reliability was low. Replication studies through revision and supplementation are needed in the future. Fourth, the tool used to measure self-efficacy pediatric IV injection was designed to assess general self-efficacy. Therefore, we propose future studies to develop and apply a tool specifically designed to measure self-efficacy related to IV injection management. Replication studies through revision and supplementation are needed in the future.

Nonetheless, the significance of this study is that it provided basic data for developing educational and interventional programs for enhancing nursing performance related to pediatric IV injection management by identifying knowledge and self-efficacy as variables associated with nursing performance among pediatric nurses.

CONCLUSION

This study was conducted to identify factors influencing the performance of pediatric intravenous administration nursing to provide essential data for efficiently maintaining and managing peripheral IV injections for hospitalized children. In conclusion, for pediatric nurses to efficiently perform IV injection management, they must explore programs and measures that can enhance their knowledge and self-efficacy, for which institutional policies and support are essential. The findings of this study can be used as foundational data for developing and utilizing various programs for managing nursing organizations to enhance nursing performance in IV

injection management for children among pediatric nurses.

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Authors' contribution

Conceptualization: all authors; Data collection and Formal analysis: Se-Won Kim; Writing-original draft: all authors; Writing-review and editing: all authors; Final approval of published version: all authors.

Conflict of interest

No existing or potential conflict of interest relevant to this article was reported.

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Data availability

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Family-based mobile application needs in childhood obesity management in South Korea: a qualitative study

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Purpose: It is essential to investigate the users' needs in developing user-centered, family-based applications (apps) for managing childhood obesity. **Methods:** This study conducted focus group interviews with ten parents, ten children, and four app developers to investigate the need to develop a family-based mobile app for childhood obesity. The interview period was from July 17 to August 30, 2023. The data were analyzed using thematic analysis. **Results:** The results highlighted 31 key themes critical to family-based app development, including the need for comprehensive content promoting healthy lifestyle habits, tailored expert support, and motivational factors for app engagement, which were categorized as intrinsic, extrinsic, and social motivations and technological features. Participants also highlighted potential challenges, such as app usability issues and the need for a user-friendly interface. The pivotal role of parents in guiding and supporting their children's health behaviors was emphasized, particularly in creating a supportive environment that encourages sustained engagement with the app. **Conclusion:** These findings provide a comprehensive understanding of the needs and preferences of parents, children, and app developers in managing childhood obesity. Emphasis on integrating healthy lifestyle content, providing expert support, and incorporating motivational strategies is crucial for the app's success. Additionally, addressing potential difficulties and recognizing the pivotal role of parents are essential considerations. These insights will inform the design and development of a user-centered mobile app that supports families in managing childhood obesity.

Keywords: Child; Focus groups; Mobile applications; Obesity management; Parenting

INTRODUCTION

Over the past 30 years, the prevalence of childhood obesity has nearly doubled, and it is one of the most grievous public health issues of the 21st century [1]. One in five children and adolescents in Korea is obese, and over the past 10 years, the prevalence of obesity among children and adolescents has more than doubled from 9.7% in 2012 to 19.3% in 2021 [2].

Childhood obesity is associated with cardiovascular diseases and is also closely linked to adult obesity [3,4]. Considering the significant role of family dynamics in shaping children's health behaviors [5], Exploring family-centered approaches to manage and prevent childhood obesity effectively is essential.

Family-based interventions are particularly effective at addressing childhood obesity, as parents play a pivotal role in influencing their children's dietary habits and physical activities [6]. "Parent-for-Child Health Behaviors" refers to par-

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ents' role in shaping and influencing their children's health behaviors [7]. "Parent-for-Child Health Behaviors" emphasizes parents' crucial role in influencing, guiding, and supporting their children's health behaviors. By actively engaging in positive health practices and creating a supportive environment, parents can contribute significantly to their children's health and well-being.

"Family-based intervention for child health behavior" refers to structured programs or strategies that involve the entire family in promoting and supporting healthy behaviors among children [8]. These interventions recognize the influence of family dynamics, environment, and interactions in shaping a child's health habits. Family-based approaches include teaching parents about self-monitoring, goal-setting for meals and physical activity, problem-solving, behavior contracts, and relapse prevention for their children [8]. Such approaches combine nutrition, physical activity education, and behavioral therapy techniques to address childhood obesity, and parental monitoring practices positively affect weight loss [9-12]. However, more than 90% of family interventions for improving childhood obesity are in the United States, Europe, and Australia, and the development of comprehensive and tailored interventions may be limited due to diverse population groups and a limited number of interventions [13].

Traditionally, obesity management interventions have mainly focused on face-to-face counseling. However, recently, researchers have been actively studying application (app)-based interventions. App-based interventions can be utilized without environmental constraints [14] and offer advantages such as promoting participant engagement, providing health education, self-monitoring, data collection, communication, and real-time feedback, thereby facilitating the continuous engagement of healthy behaviors [15]. Even though the number of 'weight loss apps' has rapidly increased in recent years, there is little evidence regarding the quality and effectiveness of these apps [16]. Evidence of weight loss and increased physical activity through apps remains lacking. However, users still have high demands and expectations for mobile apps that utilize cutting-edge technology [17]. Recent research indicates a lack of studies on the critical role of parents in managing children's weight and a lack of evidence related to behavioral change theories necessary to promote healthy lifestyle habits [18].

It is essential to develop user-centered apps by investigating the needs of parents and children to manage and improve childhood obesity [18]. User-centeredness can enhance the effectiveness and user-friendliness of apps and can offer solutions for improving childhood obesity [19]. Therefore, when developing a user-centered, family-based app for childhood obesity management, It would be the starting point for app development to understand the perspectives of parents, children, and developers.

Focus Group Interviews (FGIs) can gather opinions from various stakeholders to develop program strategies. FGI offers a valuable method for collecting qualitative data by facilitating interactive discussions among participants. The strengths of FGIs are their ability to generate rich and diverse insights, foster group interaction, adapt to emerging themes, and provide cost-effective and time-efficient data collection methods [20].

Therefore, this study aimed to investigate the user needs for developing a family-based app for parents and children to improve childhood obesity using FGIs.

METHODS

Ethical statements: The research methodology and procedures concerning ethical considerations were approved by the Institutional Review Board (IRB) of Daejin University (IRB No. 1040656-202306-HR-01-04). Before the interviews commenced, all participants were informed about the study and included after they had provided informed consent.

1. Study Design

This study adopted the qualitative method of FGI, including parents, children, and app developers, to investigate the requirements for developing a family-based mobile app for managing childhood obesity. The reporting of this study was based on the methodology of the "Consolidated criteria for reporting qualitative studies (COREQ)" [21].

2. Participants

We recruited parent and child participants from 12 community children's centers, one elementary school, and developer participants through an online recruitment notice. Purposive sampling was employed to select participants with shared common characteristics relevant to the research question. Ten parents, ten children, and four app developers were

recruited. The participants understood the purpose of the study and voluntarily expressed their intention to participate. The inclusion criteria were as follows: parents who are the primary caregivers of obese or overweight children in grades 3–6 of elementary school and are interested in improving their children's health behaviors, children of parent participants in grades 3–6 of elementary school and currently obese or overweight, and app developers with experience or degrees in app development and information technology fields, who are capable of designing, developing, testing, and maintaining health-related apps, and have experience in designing and developing user-centered apps. Table 1 summarizes the demographic characteristics of the participants.

The focus groups were carefully structured to include two parent groups, two child groups, and one developer group, each comprising 4–6 participants. We organized the group according to the participants' available dates.

3. Data Collection

The interview period was from July 17 to August 30, 2023. The interview participants received an explanation of the research topic and completed a consent form before the interview began. Each group participated in one interview session, each lasting 70–90 minutes. Interviews were conducted in a conference room, with only the participants and research team present. Interviews were recorded as audio files and notes and were conducted using a semi-structured questionnaire. The semi-structured questions were as follows. "When developing a family-based child obesity management app, what should be included in the app content?" "What should be considered when developing a family-based childhood obesity management app?" The participants discussed the topic in a free atmosphere in which they could share their opinions in detail. Every session had time for the participants to share their thoughts in depth. The facilitator summarized the focus group session and provided comments to aid understanding when necessary. Following the interviews, transcripts were returned to the participants for comments or corrections to ensure their statements' accuracy and verify that the transcribed data accurately reflected their perspectives.

The authors, female professors with PhDs and extensive experience in qualitative research, conducted the interview. The researcher's interest in childhood obesity management stemmed from prior work on healthy lifestyle modification interventions. Potential biases were acknowledged, and efforts were made to maintain objectivity by allowing participants to share their views freely.

4. Data Analysis

The data were analyzed using an inductive approach for thematic analysis. The research team thoroughly reviewed the transcripts and audio recordings to become familiar with the data. Two researchers independently identified meaningful units and completed the open coding. Based on the open coding, similar codes were grouped into broader categories. The coding tree was iteratively developed as categories emerged naturally from the data through several rounds of discussion among the research team. These categories were further refined using thematic analysis, which involved identifying, analyzing, and reporting themes within the data. The researchers discussed and revised the tentative categorization until they reached a consensus, ensuring that the derived themes accurately represented the data. Finally, these themes

Table 1. General Characteristics of the Participants

Parents	Gender	Age (year)	Job	Children	Gender	Age (year)	Obesity status	App developers	Gender	Age (year)	Career (year)
P1	Women	43	Sales manager	C1	Boy	11	Overweight	D1	Men	43	10
P2	Women	48	Housewife	C2	Girl	11	Overweight	D2	Women	46	20
P3	Women	51	Housewife	C3	Girl	11	Overweight	D3	Men	41	17
P4	Women	54	Housewife	C4	Boy	12	Overweight	D4	Women	30	7
P5	Women	38	Housewife	C5	Boy	11	Obese				
P6	Women	43	Production staff	C6	Boy	11	Obese				
P7	Men	66	Agriculture	C7	Boy	10	Obese				
P8	Men	49	Engineering	C8	Boy	9	Obese				
P9	Men	52	Driver	C9	Girl	11	Obese				
P10	Men	50	CEO	C10	Boy	12	Obese				

were named and integrated into the study findings. Data saturation was achieved after the final focus group session when no new themes emerged from the analysis. To accurately reflect the participants' perspectives, the research team ensured accuracy by conducting thorough internal data reviews and cross-checking the findings with the field notes and audio recordings instead of the participant feedback.

5. Methodological Rigor

This study applied a methodology based on the "COREQ" [21]. We tried to ensure the rigor of the research to increase credibility, fitness, auditability, and confirmability. To ensure reliability, we selected experienced participants who could express themselves well. We shared the analysis results with participants to ensure the accuracy of reflections on their experiences. To ensure suitability and auditability, we conducted all the research processes according to the FGI procedure reported by Krueger and Casey [22] and the analytical steps reported by Elo and Kyngäs [23]. The reliability of the study was verified through evaluation by external experts. To ensure confirmability, we tried to minimize the researcher's assumptions and subjectivity during the research process, maintaining neutrality and accurately reflecting participants' opinions.

RESULTS

Table 1 shows the demographic and background characteristics of the study participants. The parent group consisted of ten participants, with a mix of genders (six women and four men) and ages ranging from 38 to 66 years. The parent occupations varied widely, including housewives, sales managers, and CEOs. Each parent participant was associated with a child participant. There were ten children in total, comprising seven boys and three girls aged 9–12 years, classified as overweight or obese. The app developer group included four participants with extensive experience, ranging from 7 to 20 years in the app development field (Table 1).

The results highlight thirty-one key themes and insights into motivations, challenges, and strategies for fostering a healthy lifestyle among children through an app designed for childhood obesity management. These themes can be categorized into contents for healthy lifestyle formation, expert supports, motivation, difficulties in app use, and the role of parents in supporting child health behaviors. We summarized these findings as a figure (Figure 1).

1. Contents for a Healthy Lifestyle Formation

Participants emphasized the importance of including healthy habits such as nutritious eating and regular exercise.

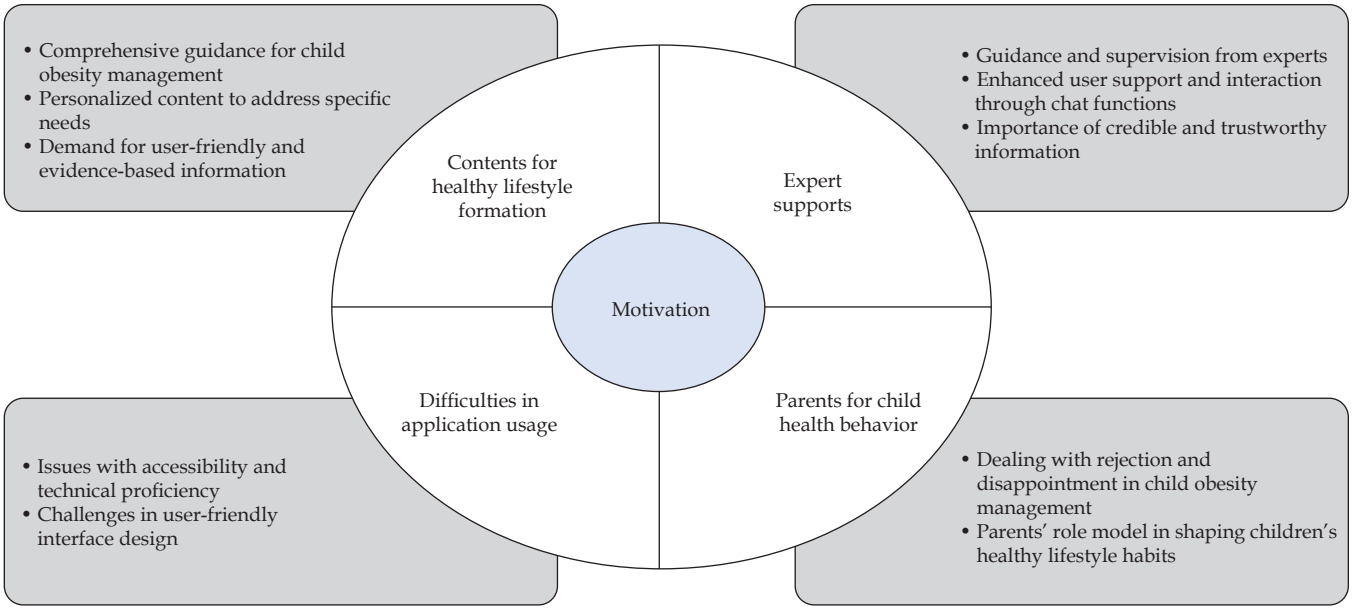

Figure 1. The motivations, challenges, and strategies for fostering a healthy lifestyle among children through an application designed for childhood obesity management.

They strongly preferred daily guidance on physical activities, exercises tailored to children's age and weight, and comprehensive dietary recommendations.

"If I enter body type…hmm, body type, weight, height, and lifestyle habits…When I enter information, it would be good if it tell me the recommended exercise, exercise time, which food, and how much food." (C5)

"Diet…The diet is hmm…adjusted to the child's age and weight accordingly. What menu would be suitable for a particular age? How can I feed a child who likes only meat? Should I give a child a mixture of vegetables, for example? I want to know such information." (P7)

"By providing personalized guidance based on the child's age, obesity level, amount of food, exercise, and comorbidities, we will be able to increase the need for and dependence on the app. I think the content that cannot be provided other than the app is the critical component that makes people find the app. Transparent sources and evidence are essential rather than technology. Also, guide documents and expert feedback that are difficult to find through web searches will be helpful." (D3)

The need for detailed monthly menus with recipes and expert-supported information highlighted the demand for accessible, evidence-based content. Visual aids, such as emoticons and images, were suggested to enhance understanding and engagement, particularly for exercises. The desire for user-friendly content that parents could easily follow was evident, focusing on making the information appealing and engaging for children.

"Then, there is something like exercising. There are also ways to exercise that can be shown using emoticons or something like that. I wish it was something that would provide a visual effect…Users can easily understand an exercise method by looking at the picture." (P6)

"Including content that parents can easily follow rather than a tricky guide document would be better—for example, 'My child eats carrots well too!' as a menu composition, cooking recipes that can attract the attention of children who are interested in instant food and fatty foods or exercise methods that children who are obsessed with cell phones, television, and game consoles can do together with their parents." (D3)

2. Expert Support

Participants underscored the need for expert advice within the app. They suggested including videos or guides in which experts directly demonstrated exercises and the availability of one-on-one inquiries through chat functions for personalized advice. This feature would enhance the credibility and usability of the app by providing accurate and trustworthy guidance and fostering a supportive environment for both parents and children.

"It would be nice if there were videos or guides provided where experts directly demonstrate and guide exercises." (P8)

"One-on-one inquiries. There are many things like consultation chats within apps these days. Since there is an open chat on KakaoTalk or something like that, there is an administrator, so wouldn't it be okay to ask questions one-on-one with the person or something like that? I think there needs to be communication. It would be better for an expert to leave a comment. I think so." (P1)

"Regarding advice, it is a good idea to conduct 1:1 matching between childhood obesity management experts and users and have the experts answer questions." (D4)

3. Motivation

Motivating children to engage with the app was a significant concern. Participants recommended incorporating various motivational elements, classified as intrinsic, extrinsic, and social motivations and technological features.

Participants emphasized the importance of intrinsic factors, such as interest or excitement from variety, engagement, self-achievement, and goal setting, in maintaining user interest and encouraging long-term app use. The participants noted that the children were more likely to remain engaged with the app if it offered a variety of programs and activities that changed regularly.

"If there are various programs, they will change frequently, so it won't get boring. If the program changes with various exercise methods and recipes, children will follow along without getting bored. A diet plan must be shared with children, and exercise methods must also be provided." (P5)

A Sense of accomplishment was identified as a crucial motivator. Children feel encouraged when they complete tasks and see tangible results, such as completing an action list or receiving positive feedback from the app.

"It's easy to use, but the kids said I'm going to do it like this, and they kept it only on the first day. When I finished the entire action list, it wasn't a game like the game app here, but it exploded like this and I achieved it...In this way, I think it would be good to give children that joy so they can feel that 'I did it' feeling." (P3)

Setting daily exercise and dietary goals and self-monitoring progress were highlighted as vital factors for sustaining motivation.

"In fact, when we go on a diet, it is about how much we eat and exercise. When we start exercise, we just set a goal for each day, set the desired amount of exercise, and then ask ourselves if we performed well that day, right? So that parents can check it themselves-...in just a few minutes. Also, if I control my eating well, I control my eating well that day, and if I do that, the statistics show that if I do that today, then a few days later, I couldn't do it in a few days this month. So, I need to work harder next month. I think that will provide more motivation." (P9)

Extrinsic motivators, including rewards and incentives, were highlighted as necessary for encouraging children to engage with the app. Participants recommended using rewards, such as praise stickers or small prizes, to positively reinforce children's health behaviors.

"When a child records their health behavior, the parents check it and give a praise sticker. An event is held where a certain number of praise stickers can be exchanged for prizes. If exchanging prizes through praise stickers is difficult, parents can check their children's records and comment on them." (D4)

"It would be best to reward your child with something he or she likes. Finding out what your child likes and rewarding him for it is a good idea. I think the same thing. That's all a concern...I think the most important thing is whether he can continue doing this. After doing this for a week, I think I can't do it because I'm bored and can't because it's hard. This is what I'm most worried about." (P5)

Social interaction and community features were identified as critical for fostering a sense of belonging and encouraging users to engage with the app actively.

Including community features, such as leaderboards, "like" buttons, and comment sections, was considered beneficial for creating a supportive environment where users could share their progress, compete with others, and receive encouragement.

"So that I can compete with other people, you can create a leaderboard to see how many calories I have burned and Which level I get to. Or I may do it with a friend. You can make a together mission or something like that." (C1)

"After doing the program, this is what changed...We shared some of these things with each other, so we did the program provided by this app, but I also did this part separately...I exercised by running 10 laps around the playground with the child...and things like this. You can now add various community features to enable sharing. You can also press the 'Like' button and use detailed functions. I'm talking about community functions, such as leaving comments. Also, you need to get a benefit for your efforts, saying, 'My child has improved so much'...That's why you need to encourage them to keep practicing good health behavior." (D2)

Highlighting the success stories of other children who had successfully improved their health using the app was suggested as a powerful motivator.

"Among them, another child became good at exercising and lost weight like this...It's a success story." (P4)

Participants emphasized the importance of specific technological features such as progress tracking and feedback, reminders, and notifications to support and enhance user engagement. Tracking progress and receiving real-time feedback were indicated as essential for maintaining motivation.

"The app shows you how many weeks and days it has been since you started it...so you can immediately see how long I've been doing it and how I've improved." (C10)

"There is a plan to calculate how many minutes you exercise, so if it continues for a week, it will be accumulated like this every week. I think the frequency of use will increase if we make it so that we can check something and press it, rather than just because we can see it." (P6)

Automated reminders and notifications were highlighted as essential tools for keeping users engaged. These features would help users remember to use the app regularly and stay on track with their health routines. The participants suggested that reminders, quizzes, or attendance points could effectively sustain daily use of the app.

"So that you can keep doing it without forgetting...It's an alarm. If an app had that function, I could keep doing it." (C7)

"I'm worried that it might fail, and if it fails, it's important to use it well at first and then increase the frequency of using the app daily. The biggest problem is the fear of lack of use. I'm afraid interest will drop...I think it would be good to provide some support so that students can continue to participate in quizzes, such as giving points for answering quizzes or giving points for attendance, etc." (P6)

4. Difficulties in the Use of an Application

Participants anticipated potential challenges in using the app, including difficulties with installation and understanding complex terms or operations. They suggested simplifying the app's interface and explaining the complex terms to mitigate these issues.

"Because I'm not good at installing apps...I'm clumsy." (P7)

"Difficult words may come out. It would be helpful if the word's meaning were written next to it in a speech bubble." (C4)

"I am worried if an error occurred due to touching the app incorrectly." (C5)

Ensuring the app is user-friendly and accessible to all users, regardless of their technical proficiency, is essential for its widespread adoption and sustained use.

5. Parents for Child Health Behavior

This study highlighted the crucial role of parents in managing obesity in their children. Parents expressed feelings of burden and concern about their children's reactions and the effectiveness of obesity management efforts.

"First of all, I got tired of constantly reacting to rejection…. Mom, do I have to do this today, too? He may also be having a hard time because of his schedule, but when he shows some resistance, I think the biggest problem is whether he should continue with it or not." (P6)

"I put it into practice, but I'm worried that it won't work out. I'm afraid the kids will be disappointed if it brings less benefit." (P10)

They emphasized the importance of setting an excellent example through healthy lifestyle habits children could follow.

Encouraging parents to engage in healthy behaviors alongside their children could foster a supportive environment and promote the formation of healthy habits in children.

"If children eat it, adults should eat it, too. If parents do a good job, children can watch and follow suit." (P10)

"Since mothers have to make their kids exercise, we have to do it together, but other than that, the kids have to make it a part of their daily routine. Now, we need to make it so that it becomes a natural part of our lives. So, I think we need to make it a habit to diet and exercise as much as possible, rather than just doing high intensity from the beginning. It's up to moms and dads...I'm not old enough to understand anymore, so I think I can think about it and follow along to some extent even if I don't understand it 100%." (P3)

DISCUSSION

This qualitative study investigating the development of a family-based mobile app for managing childhood obesity provided valuable insights into the needs and preferences of parents, children, and app developers. The FGIs revealed 31 key themes organized into five categories that should be considered in the design and functionality of the proposed app.

Health apps can provide various features to facilitate healthy lifestyles. The participant desired the app to provide comprehensive and evidence-based guidance on nutrition and physical activities suitable for children. These guidelines include healthy daily habits, detailed exercise recommendations based on age, and tailored dietary advice considering age, weight, and lifestyle factors. The emphasis on transparent sourcing and expert-backed content reflected the need for credibility and reliability in the provided information. Recent studies have emphasized the importance of nutrition and activity at home and have reported that managing these and providing information are essential in managing obesity in children [24]. Similarly, Karmali et al. [25] reported that focusing on improving physical activity and nutrition, providing benefits and guidelines for physical activity, and developing ideas for increasing physical activity in the daily lives of parents and children are essential. Additionally, educational information, including accurate height and weight measurements, can help understand a child's growth rate, help parents accurately monitor growth, and determine their child's nutritional status [26].

The need for expert support was a recurring theme, with participants requesting accurate guidance, comments, and answers to questions from professionals. Expert involvement is vital for providing credible advice and maintaining user

trust [27]. The preference for personalized guidance and expert feedback underscores the importance of tailored support to manage childhood obesity effectively.

This study highlights four main categories of motivation—intrinsic, extrinsic, social, and technological—each of which plays a significant role in user engagement.

The emphasis on interest or excitement from variety and engagement as intrinsic motivators aligns with the existing literature, suggesting that maintaining user interest through varied and dynamic content is critical to sustaining engagement in health apps [28]. The finding that self-achievement and goal-setting are critical motivators supports the notion that personal satisfaction and progress monitoring are essential for long-term adherence to health behaviors. This suggests that the app should incorporate features allowing users to set personalized goals and track their progress over time, fostering a sense of accomplishment and encouraging continued use.

The role of extrinsic rewards, such as praise stickers and incentives, is consistent with behavioral theories that highlight the effectiveness of positive reinforcement in modifying behavior [29]. However, it is vital to ensure that these rewards do not become the sole motivators for using the app, as they could diminish the impact of intrinsic motivators over time. Future research should explore the balance between intrinsic and extrinsic motivation to determine the optimal mix for sustaining long-term engagement.

The importance of social interaction and community features reflects the growing recognition of the role of social support in health behavior change. This study suggests incorporating leaderboards, community challenges, and peer success stories could enhance user engagement by fostering a sense of belonging and mutual encouragement. This aligns with previous research indicating that social features in health apps can improve adherence by providing users with a support network and a sense of accountability [30].

Technological features like progress tracking and automated reminders were highlighted as critical for keeping users engaged with their health goals. These findings suggest that the app should incorporate user-friendly interfaces and tools that provide real-time feedback and reminders to sustain user engagement. Integrating these technological features can enhance the overall user experience, making the app more effective in promoting healthy behaviors.

While this study provides valuable insights into motivational factors, several challenges remain unsolved. For instance, ensuring the app content remains fresh and engaging over time requires continuous updates and potentially significant resources. Moreover, balancing extrinsic and intrinsic motivation is crucial for avoiding over-reliance on rewards. Future research should thus explore how these motivational strategies can be optimized for different user demographics and how they impact long-term behavioral changes.

Moreover, this study confirmed that users face difficulties using the app, including a lack of ability, technical challenges, and burdens. User education and support are essential for resolving these difficulties and enabling users to utilize the app more easily. Additionally, it is crucial to design a simple and intuitive interface so that users can easily learn it. Complex functions or terminology should be minimized and structured so that users can easily access and understand them.

This study also suggests the need for support in terms of behavioral skills to relieve the burden of children's rejection reactions and manage expectations regarding the outcomes of obesity management. Therefore, parents need to learn how to appropriately deal with their children's rejection reactions and manage their expectations regarding the outcomes of obesity management. Strengthening communication with children is thus vital to increasing their understanding of healthy habits and achieving obesity management goals through cooperation with parents.

This study confirmed the importance of programs and motivations for parents to become good role models in promoting healthy behavioral habits in their children. Therefore, it is vital to encourage parents to practice healthy lifestyle habits and engage in exemplary behavior. Parents can provide good examples of healthy behavior and naturally promote it in their children [31]. These results were consistent with those of Thomas et al. [32] and Karssen et al. [33]. They argued for a deeper understanding of user behavior and decision-making processes and emphasized that parental roles are significant for managing childhood obesity. Parental roles are also essential for developing energy balance-related behavior, and their parenting practices are crucial in managing childhood obesity [33]. Karssen et al. [33] assessed the determinants of parenting-related energy balance, especially habitual behaviors, in an app-based program that could help establish practices such as a healthy diet, sufficient sleep, limited screen time, and sufficient physical activity. In this regard, parents can play a significant role in creating a healthy family environment by monitoring children's diets and moti-

vating them to engage in physical activity [34].

Parents play an essential role in practicing healthy lifestyle habits to manage obesity in children. However, little research has been conducted on developing apps for parents to manage obesity in children. Moreover, this study recruited diverse participants, including parents, children, and app developers, ensuring multiple perspectives on developing a family-based mobile app for managing childhood obesity. This study demonstrates several strengths in its comprehensive approach, rigorous methodology, and in-depth data collection and analysis. However, it also faces limitations related to generalizability, potential biases, and the inherent challenges of qualitative research. Balancing these strengths and limitations is crucial for interpreting the findings and considering their app in developing a family-based mobile app for managing childhood obesity.

CONCLUSION

The findings of this study provide a comprehensive understanding of the needs and preferences of parents, children, and app developers for managing childhood obesity through a mobile app. The emphasis on integrating healthy lifestyle content, providing expert support, and incorporating motivational strategies is crucial for an app's success. Additionally, addressing potential difficulties and recognizing the pivotal role of parents are essential considerations. These insights will inform the designing and developing of a user-centered, practical, and engaging mobile app to support families managing childhood obesity. Future research should focus on testing and refining the app based on these findings to ensure it effectively meets users' needs.

ARTICLE INFORMATION

Authors' contribution

Conceptualization: all authors; Data collection: Hwa-Mi Yang; Formal analysis: all authors; Writing-original draft: all authors; Writing-review and editing: all authors; Final approval of published version: all authors.

Conflict of interest

No existing or potential conflict of interest relevant to this article was reported.

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Data availability

Please contact the corresponding author for data availability.

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Korean nurses' knowledge, opinions and current practice of trauma-informed pediatric nursing care in South Korea: a descriptive study

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Purpose: This study aimed to investigate the knowledge, opinions, competence, and barriers of nurses providing trauma-informed care (TIC) to children in hospitals. **Methods:** Data were collected from 198 nurses nationwide using the TIC Provider Survey developed by the Center for Pediatric Traumatic Stress in July, 2024. Descriptive statistics, t tests, and one-way ANOVA were conducted using the IBM SPSS Statistics software (ver. 23.0, IBM Corp.). **Results:** Of the 13 items assessing knowledge of TIC, seven had a correct response rate of over 90%. However, the correct response rate for these three items were less than 30%. Regarding opinions on the TIC, more than 90% of participants agreed with five of the seven items. In self-rated competence in providing TIC, they were not competent in responding to a child's (or parent's) questions about whether the child is going to die or understanding how traumatic stress may present differently according to developmental stages. The major barriers to providing TIC were time constraints, lack of training, and organizational support. Items with relatively low performance rates were 'teach parents what to say to their child after a difficult/sick/scary experience, and teach child or parents the specific ways to cope with unpleasant experiences'. **Conclusion:** This study suggests that it can contribute to the development of specific guidelines for nurses to effectively apply TIC in pediatric and family nursing practice, emphasizing the need for educational programs to support this implementation.

Keywords: Child care; Family; Knowledge; Nurses; Stress disorders, post-traumatic

INTRODUCTION

Nurses frequently encounter patients who have experienced accidents or severe illnesses that can cause physical or psychological trauma. Although these patients may experience acute stress due to such incidents or illnesses, not all develop long-term post-traumatic stress disorder (PTSD). However, individuals who face adversity during childhood are more likely to develop mental health issues in adulthood [1].

Historically, childhood trauma has primarily been associated with major accidents or severe abuse. However, recent understanding acknowledges that various factors can contribute to childhood trauma, including serious illnesses experienced during childhood, chronic stressors, adverse childhood experiences (ACEs), and the COVID-19 pandemic [2,3]. Studies have indicated that these adverse experiences can have detrimental effects on a child's developmental process and lifespan [4], highlighting the importance of timely and appropriate care (nursing) for children in distressing situations.

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Trauma-informed childcare refers to the provision of care that integrates an understanding of PTSD with the aim of reducing PTSD experienced by pediatric patients in clinical settings [5]. Trauma-informed care (TIC) involves empathizing with and supporting individuals affected by trauma, recognizing its impact, and evaluating social connections and support systems to appropriately utilize family, friends, spiritual, and community resources [6]. The six principles of the TIC are safety, trustworthiness and transparency, peer support, collaboration and mutuality, empowerment, voice, and choice, and consideration of cultural, historical, and gender issues [6]. In healthcare settings where nurses, doctors, therapists, and other health support professionals are present, multidisciplinary collaboration and communication among professionals are crucial for effective TIC. Knowledge of TIC is essential for understanding children who have experienced trauma and providing individualized care that meets their physical and emotional needs. Opinions and awareness of TIC are crucial in creating a safe and therapeutic environment for traumatized children, facilitating better assessments and promoting recovery through multidisciplinary collaboration [5,6]. Therapeutic interventions used in clinical practice, such as play therapy, animal-assisted therapy, biofeedback, and art activities, can reduce children's stress and prevent re-traumatization [4].

In other countries, various research and practical applications of TIC have already been implemented, whereas in South Korea, TIC is a relatively new concept, with limited recognition and application. According to a recent scoping review, TIC studies in children have increased rapidly since 2017, and more than 95% of them have been conducted in Western countries, and in the case of Asian countries, there is no other than one study conducted in the United Arab Emirates [7]. However, as research on TIC in the field of nursing has been found to be the most active, the interest in and importance of TIC for children is also expected to increase in the future.

Nurses often work with pediatric patients experiencing severe illnesses, depending on their specific units, such as high-risk neonates, pediatric oncology patients, pediatric intensive care units, emergency rooms, and psychiatric and general wards. Nurses caring for children are responsible for recognizing and assessing trauma across the continuum of care from birth to adolescence. They provide care to pediatric patients in complex and diverse healthcare settings, focusing on the importance of promoting health and resilience [2]. Particularly, when a child experiences a serious illness, the process can be highly threatening and requires absolute support and meticulous care by nurses.

In this study, we would like to compare nurses' knowledge, opinions, and self-rated competencies related to TIC according to demographic characteristics such as sex, age, child status, work unit, type of hospital, and period of clinical career in the children's ward. This will help reveal differences in the levels of knowledge, opinions, and self-rated competencies related to TIC based on nurses' general and job-related characteristics, which will be an important consideration in the development of relevant educational programs in the future.

This study aims to assess the knowledge, opinions, competence, practices, and barriers related to TIC among nurses caring for children in diverse hospital settings and environments. By identifying these factors, this study seeks to determine the necessary level of education and provide foundational data for developing strategies to offer holistic nursing care in the future. The specific objectives are as follows: (1) to assess the knowledge, opinions, and competence levels of the participants regarding TIC; (2) to examine the differences in TIC knowledge, opinions, and competence based on general characteristics; (3) to evaluate the actual practice levels of TIC; and (4) to identify barriers to the implementation of TIC.

METHODS

Ethical statements: This study was approved by the Institutional Review Board (IRB) of Seoul National University (IRB No. 2403/002-011). Informed consent was obtained from all participants.

1. Study Design

This study is a descriptive survey that examines the knowledge, opinions, competence, barriers, and practices of pediatric ward nurses in South Korea regarding trauma-informed child care. This study was conducted in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines.

2. Samples

The inclusion criteria for participants in this study were

nurses who had been working for more than 6 months in the pediatric wards of medical institutions in South Korea. When calculating the sample size for a one-way ANOVA, since it was difficult to find similar studies, the effect size was set to .25 (medium), with a power of .8, a significance level of .05, and 4 groups. The total sample size was determined to be 180. Considering an anticipated dropout rate of 10%, a maximum of 200 participants were recruited. Two hundred respondents completed the Google Survey, of which 198 were included in the final analysis.

3. Measurement

1) Demographic variables

Data on participants' general and job-related characteristics were collected using 12 items. These items included sex, age, marital status, whether they had children, religion, current ward of employment, previous wards of employment, the region and type of medical institution where they worked, current position, total nursing work experience, and work experience in pediatric wards.

2) Trauma-informed care provider survey pediatric version

In this study, the TIC Provider Survey developed by the Center for Pediatric Traumatic Stress (CPTS) [8] was used. The pediatric version of the TIC Provider Survey comprises 48 items in five categories: 13 items on knowledge about trauma-informed child care, seven items on opinions about trauma-informed child care, 12 items on self-rated competence in trauma-informed child care, seven items on perceived barriers to performing trauma-informed child care, and nine items on recent practices in trauma-informed childcare. Each item for knowledge, opinions, competence, and barriers is rated on a 3- or 4-point Likert scale with anchors appropriate for the category (e.g., competence was rated as "not competent", "somewhat competent", or "very competent"). Items of practice are rated on a dichotomous scale of "yes" or "no". Summary scores were generated for each of the three item categories—knowledge, opinions, and competence—by combining together the survey item ratings (ranging from 1 to 3 or 1 to 4) within each category. Higher scores indicated greater knowledge, more favorable opinions, and higher self-rated competence.

The Korean version of the TIC Provider Survey was assessed for face and content validity through internal review by experts. To use this tool with Korean nurses, approval was first obtained by the research team from the CPTS that developed the original tool. The research team then translated the English items into Korean, reviewed the translation for accuracy, and made necessary modifications to reflect the characteristics of Korean nurses. The final translation was approved by the researchers. The Korean version of the survey was translated back into English by a professional translation service. The research team compared and reviewed the back-translated version with the original tool to ensure accuracy and found no changes in meaning. The final Korean version of the questionnaire was then confirmed. Cronbach's alpha of the original tool was .66 for knowledge, .60 for opinions, .90 for self-rated competence, .80 for recent practice, and .69 for barriers [6]. In this study, the Cronbach's alpha was as follows: knowledge, .64; opinion, .43; self-rated competence, .89; practice, .84; and barriers, .69.

4. Data Collection and Research Procedures

After obtaining IRB approval, data were collected from 200 participants using an online Google survey conducted from July 2 to 14, 2024. The participants were recruited using convenience sampling. After obtaining cooperation from relevant stakeholders, the researchers posted recruitment notices on online communities frequently used by nurses in Korea, including advanced general hospitals, general hospitals, and small hospitals.

The first page of the online survey explained the study's purpose and ethical considerations, and participants were required to indicate their consent by selecting "agree" to proceed with the survey. To maintain anonymity and confidentiality, the personal identification information of the study participants was assigned a separate unique number, and all collected data were stored on a computer that required a password to be accessible only to the researchers. The survey consisted of 60 questions and took approximately 20 min to complete. The participants who completed the survey received a mobile coffee coupon as a token of appreciation.

5. Data Analysis

Data were analyzed using IBM SPSS Statistics (vers. 23.0, IBM Corp.). General and work-related characteristics of the participants and their knowledge, opinions, barriers, and practice of trauma-informed pediatric care were analyzed using descriptive statistics, including means, standard devia-

tions, and percentages. Differences in variables according to participant characteristics were analyzed using independent t-tests and one-way ANOVA. Post-hoc analysis was conducted using Scheffe's test.

RESULTS

1. Characteristics of the Participants

Of the 200 nurses who participated in this study, 198 were included in the final analysis after excluding one who had response errors and one who did not meet the inclusion criteria. Of the 198 nurses included in the analysis, most were female (97.5%), with an average age of 33.86 years. Regarding job positions, 152 (76.8%) were staff nurses, 28 (14.1%) were charge nurses, and 18 (9.1%) were head nurses or higher managers. The nurses had an average of 9.73 years of clinical experience and 6.41 years of clinical experience in pediatric wards. The most common type of hospital in which they worked was a tertiary hospital (67.7%). The current working units were pediatric and neonatal intensive care units (39.9%), cancer wards (5.6%), internal and surgical wards (29.3%), and others (e.g., psychiatric ward, emergency room, operating room/anesthesiology, outpatient) (25.3%) (Table 1).

2. Comparisons According to Demographic Characteristics of Participants

Knowledge of TIC did not differ based on the participants' demographic characteristics. Opinions on TIC were more positive among those with children (t=2.00, p=.048), those working in advanced general hospitals (F=3.70, p=.027), and those with over 5 years of experience in pediatric wards (t=-2.01, p=.046). Competence in TIC showed significant differences depending on the type of hospital in which participants worked (F=5.47, p=.005). Post hoc analysis revealed that the advanced general hospital group (mean [M]=8.84) and general hospital group (M=8.86) had significantly higher competence scores than the hospital and other groups (M=5.80); however, no significant differences were found between the other groups (Table 1).

3. Knowledge and Opinions regarding Trauma-Informed Care

Of the 13 items assessing knowledge of TIC, seven items had a correct response rate of >90%. However, three items had very low correct response rates, below 30% (ranging from 9.6% to 27.3%). These items were: 'It is inevitable that most children and families who experience a life-threatening illness or injury will experience severe post-traumatic stress or PTSD' (9.6%; M±SD=1.83±0.58), 'Children who are more severely injured or ill generally have more serious traumatic stress reactions than children who are less severely injured or ill' (21.2%; M±SD=2.02±0.65), and 'Children and families with severe post-traumatic stress reactions usually show obvious signs of distress' (27.3%; M±SD=2.12±0.68). Notably, the correct answer for all three items was "disagree."

Regarding opinions on TIC, over 90% of the participants agreed with five of the seven items. The remaining two items, 'Service providers should focus on medical rather than mental health services for hospitalized children' and 'I have colleagues who can help a child or family experiencing severe traumatic stress,' were rated favorably by only 59.1% and 66.2% of participants, respectively (Table 2).

4. Self-Rated Competence in Providing Trauma-Informed Care

Among the items in the self-rated competence in providing TIC, more than 50% of participants rated themselves as "very competent" or "somewhat competent" on nine out of 12 items. The item with the highest percentage of participants reporting themselves as very or somewhat competent was 'Respond to the distress, emotional needs, and support needs of colleagues' (85.9%; M±SD=1.05±0.58). Conversely, the items with the highest percentage of participants rating themselves as "not competent" were 'Respond to a child's (or parent's) questions about whether the child is going to die' (61.6%; M±SD=0.43±0.59), 'Understand how traumatic stress may present differently in young children, school-aged children, and adolescents' (56.6%; M±SD=0.51±0.63), and 'Educate a child and family about common traumatic stress reactions and symptoms' (55.6%; M±SD=0.51±0.62) (Table 3).

5. Potential Barriers to Implementing Trauma-Informed Care

More than half of the respondents rated time constraints, lack of training, and lack of organizational support as "significant barriers" to providing TIC to children and families. All factors were rated as at least "somewhat of a barrier." The

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Table 1. Comparison of Knowledge, Opinions, and Self-Rated Competence According to Demographic Characteristics (*N*=198)

Variables	Categories	n (%)	M±SD	Knowledge		Opinions		Competence	
				M±SD	t or F (*p*)	M±SD	t or F (*p*)	M±SD	t or F (*p*)
Sex	Female	193 (97.5)		35.77±2.32	0.10 (.929)	21.23±1.93	0.49 (.624)	8.24±5.02	-1.21 (.229)
	Male	5 (2.5)		35.60±3.91		20.80±1.30		11.00±6.44	
Age (year)	23–35	132 (66.7)	33.86±6.86	35.77±2.41	0.02 (.983)	21.19±1.80	-0.29 (.774)	8.38±4.94	0.28 (.782)
	36–55	66 (33.3)		35.76±2.27		21.27±2.16		8.17±5.32	
Marital status	Unmarried	104 (52.5)		35.76±2.28	-0.02 (.985)	21.07±1.69	-1.14 (.255)	8.34±4.52	0.08 (.935)
	Married	94 (47.5)		35.77±2.45		21.38±2.15		8.28±5.62	
Child status	Yes	68 (34.3)		35.88±2.44	0.52 (.606)	21.62±2.18	2.00 (.048)	8.87±5.74	1.06 (.293)
	No	130 (65.7)		35.70±2.32		21.01±1.74		8.02±4.66	
Religion	Yes	75 (37.9)		35.80±2.38	0.17 (.862)	21.17±1.76	-0.25 (.803)	8.20±5.02	-0.23 (.815)
	No	123 (62.1)		35.74±2.35		21.24±2.02		8.37±5.10	
Current working unit	Pediatric and neonatal intensive care unit	79 (39.9)		35.86±2.40	0.77 (.191)	21.63±2.04	2.72 (.073)	8.35±5.38	0.73 (.358)
	Cancer ward	11 (5.5)		36.64±2.87		21.36±2.69		9.64±5.32	
	Internal/surgical ward	58 (29.3)		35.69±2.02		21.09±1.57		7.62±4.24	
	Others (psychiatric ward, emergency room, operating room/anesthesiology, outpatient, etc.)	50 (25.3)		35.50±2.55		20.68±1.80		8.74±5.38	
Current working area	Metropolitan	159 (80.3)		35.63±2.21	1.31 (.273)	21.16±1.84	1.92 (.128)	8.15±4.75	1.83 (.143)
	Gangwon/Chungcheong	8 (4.0)		36.75±2.76		21.00±1.51		5.75±3.24	
	Gyeongsang	20 (10.1)		36.50±3.00		21.05±2.42		10.30±6.55	
	Honam/Jeju	11 (5.6)		35.64±2.77		22.55±2.11		8.82±6.68	
Type of hospital	Advanced general hospital[a]	134 (67.7)		35.81±2.47	2.50 (.085)	21.40±1.94	3.70 (.027) (a,b>c)[b)]	8.84±4.83	5.47 (.005) (a,b>c)[b)]
	General hospital[b]	29 (14.6)		36.38±2.23		21.35±2.14		8.86±5.59	
	Hospital/Other[c]	35 (17.7)		35.09±1.85		20.43±1.42		5.80±4.84	
Position	General nurse	152 (76.8)		35.61±2.30	2.63 (.075)	21.10±1.87	0.29 (.104)	8.22±5.21	2.08 (.128)
	Charge nurse	28 (14.1)		35.82±2.14		21.29±1.78		7.43±3.71	
	Manager (≥Head nurse)	18 (9.1)		36.94±2.90		22.11±2.35		10.44±5.23	
Period of clinical career in the children's ward (year)[a)]	<5 years	97 (49.5)	6.41±5.48	35.69±2.34	-0.44 (.664)	20.96±1.76	-2.01 (.046)	8.25±4.97	-0.40 (.689)
	≥5 years	99 (50.5)		35.84±2.41		21.51±2.04		8.54±5.07	
Total clinical career (year)	<10 years	118 (59.6)	9.73±6.69	35.75±2.24	-0.12 (.903)	21.10±1.79	-1.03 (.305)	8.48±5.00	0.59 (.556)
	≥10 years	80 (40.4)		35.79±2.53		21.39±2.10		8.05±5.16	

[a)]Excluding non-responses; [b)]Scheffe's test; M, mean; SD, standard deviation.

Table 2. Nurses' Knowledge and Opinions Regarding Trauma-Informed Care (*N*=198)

Knowledge items	Nurse ratings				Correct responses	Score (M±SD)
	Strongly agree	Agree	Disagree	Strongly disagree	n (%)	
	n (%)	n (%)	n (%)	n (%)		
1. Almost all people who are seriously injured or ill experience a traumatic stress response at least once in the immediate aftermath of the event.	50 (25.3)	138 (69.7)	9 (4.5)	1 (0.5)	188 (95.0)	3.20±0.53
2. It is inevitable that most children and families who experience a life-threatening illness or injury will experience severe post-traumatic stress or PTSD. (Disagree)	52 (26.3)	127 (64.1)	19 (9.6)	0 (0.0)	19 (9.6)	1.83±0.58
3. Children who are more severely injured or ill generally have more serious traumatic stress reactions than children who are less severely injured or ill. (Disagree)	39 (19.7)	117 (59.1)	41 (20.7)	1 (0.5)	42 (21.2)	2.02±0.65
4. Children who believe they might die at some point during a traumatic event are at greater risk of post-traumatic stress reaction.	71 (35.9)	123 (62.1)	4 (2.0)	0 (0.0)	194 (98.0)	3.34±0.52
5. Many children and families cope well on their own after a severe illness or injury.	6 (3.0)	63 (31.8)	113 (57.1)	16 (8.1)	69 (34.8)	2.30±0.66
6. The psychological effects of an injury or illness often last longer than the physical symptoms.	62 (31.3)	129 (65.2)	7 (3.5)	0 (0.0)	191 (96.5)	3.28±0.52
7. Children and families with severe post-traumatic stress reactions usually show obvious signs of distress. (Disagree)	33 (16.6)	111 (56.1)	52 (26.3)	2 (1.0)	54 (27.3)	2.12±0.68
8. I am aware of the common signs and symptoms of traumatic stress in children and families.	6 (3.0)	126 (63.7)	61 (30.8)	5 (2.5)	132 (66.6)	2.67±0.58
9. Some initial traumatic stress reactions in children and families may be part of a healthy emotional recovery process.	19 (9.6)	162 (81.8)	17 (8.6)	0 (0.0)	181 (91.4)	3.01±0.43
10. There are measures service providers can take to prevent long-term post-traumatic stress in sick and injured children and families.	45 (22.7)	139 (70.2)	13 (6.6)	1 (0.5)	184 (92.9)	3.15±0.54
11. There are effective screening tools for providers to use in practice to assess traumatic stress.	14 (7.1)	80 (40.4)	89 (44.9)	15 (7.6)	94 (47.5)	2.47±0.74
12. Healthcare workers themselves may experience signs of physical and/or emotional distress related to their work.	39 (19.7)	140 (70.7)	17 (8.6)	2 (1.0)	179 (90.4)	3.09±0.56
13. The risk of distress in employees is strongly influenced by both personal and workplace factors.	60 (30.3)	135 (68.2)	3 (1.5)	0 (0.0)	195 (98.5)	3.29±0.49
Opinions items						
14. Service providers should focus on medical rather than mental health services for hospitalized children.	6 (3.0)	75 (37.9)	109 (55.1)	8 (4.0)	N/A	2.60±0.62
15. Healthcare delivery can be modified to reduce stress for a child and family.	40 (20.2)	153 (77.3)	5 (2.5)	0 (0.0)	N/A	3.18±0.44
16. Providers can teach families how to cope with trauma.	28 (14.1)	152 (76.8)	15 (7.6)	3 (1.5)	N/A	3.04±0.53
17. Healthcare professionals should regularly assess for symptoms of traumatic stress.	41 (20.7)	145 (73.2)	11 (5.6)	1 (0.5)	N/A	3.14±0.51
18. It is necessary for healthcare providers to have information about the mental health of pediatric patients to provide appropriate services.	60 (30.3)	135 (68.2)	3 (1.5)	0 (0.0)	N/A	3.29±0.49
19. I have colleagues who can help a child or family experiencing severe traumatic stress.	14 (7.1)	117 (59.1)	63 (31.8)	4 (2.0)	N/A	2.71±0.62
20. Healthcare organizations should address how working with patients and families affects staff.	54 (27.3)	142 (71.7)	2 (1.0)	0 (0.0)	N/A	3.26±0.46

For knowledge items 2, 3, and 7, 'disagree/strongly disagree' represented a correct response; For opinion item 14, 'disagree/strongly disagree' represented an opinion favorable to trauma-informed care; M, mean; SD, standard deviation; N/A, not applicable.

Table 3. Nurses' Self-Rated Competence in Specific Aspects of Trauma-Informed Care (*N*=198)

Specific aspects of trauma-informed care	Nurse ratings			Score (M±SD)
	Very competent	Somewhat competent	Not competent	
	n (%)	n (%)	n (%)	
1. Interact with the traumatized child and family members so that they feel comfortable talking to you or are comforted by you.	27 (13.7)	107 (54.0)	64 (32.3)	0.81±0.65
2. Respond calmly and non-judgmentally to a child or family's intense emotional distress.	28 (14.2)	127 (64.1)	43 (21.7)	0.92±0.60
3. Elicit details of the traumatic event from a child or family, but in a way that does not re-traumatize them.	21 (10.6)	94 (47.5)	83 (41.9)	0.69±0.66
4. Educate a child and family about common traumatic stress reactions and symptoms.	13 (6.5)	75 (37.9)	110 (55.6)	0.51±0.62
5. Change or modify situations in the hospital that a child or family may experience as traumatic.	16 (8.1)	84 (42.4)	98 (49.5)	0.59±0.64
6. Respond to a child's (or parent's) questions about whether the child is going to die.	10 (5.1)	66 (33.3)	122 (61.6)	0.43±0.59
7. Assess a child's or family's distress, emotional needs, and support system immediately following a traumatic event.	14 (7.1)	88 (44.4)	96 (48.5)	0.59±0.62
8. Provide basic trauma-focused interventions (assess symptoms, normalize, provide guidance on expectations, and support coping).	18 (9.1)	84 (42.4)	96 (48.5)	0.61±0.65
9. Understand how traumatic stress may present differently in young children, school-aged children, and adolescents.	14 (7.1)	72 (36.3)	112 (56.6)	0.51±0.63
10. Understand the scientific or empirical basis of assessments and interventions for traumatic stress.	14 (7.1)	93 (46.9)	91 (46.0)	0.61±0.62
11. Respond to the distress, emotional needs, and support needs of colleagues.	38 (19.2)	132 (66.7)	28 (14.1)	1.05±0.58
12. Managing your work-related stress or distress.	41 (20.7)	115 (58.1)	42 (21.2)	1.00±0.65

M, mean; SD, standard deviation.

item most frequently rated as 'not a barrier' was personal stress and distress levels (9.6%; M±SD=1.23±0.61), which was the highest among the seven factors (Table 4).

6. Implementation of Trauma-Informed Practices

In a report on trauma-informed practices performed for children and their parents over the past 6 months, the item with the highest performance rate among the nine items was 'Assess and manage personal emotional and physical health' (67.7%; M±SD=0.68±0.47), followed by 'Utilize organizational support for yourself and your team' (62.6%; M±SD=0.63±0.49). Items with relatively low performance rates (<40%) were 'teach parents what to say to their child after a difficult/sick/scary experience' (35.9%; M±SD=0.36±0.48) and 'teach a child or parents the specific ways to cope with unpleasant experiences' (37.9%; M±SD=0.38±0.49) (Table 5).

DISCUSSION

This study investigated the knowledge, opinions, and competencies of nurses caring for children at hospitals regarding TIC, their actual practices, and the barriers they face. Based on these results, the discussion, along with a review of previous studies, is as follows:

Providing care to support the adaptation and psychological stability of children and their families facing medically challenging situations or traumatic events is not new for nurses caring for children. This is especially true in pediatric nursing, where family centered care has long been emphasized [9]. Marsac et al. [10] described the commonalities between family-centered care and TIC as well as their differences. Apart from these situations, numerous findings showed that nurses generally do not have accurate knowledge or information about PTSD [11,12]. In addition, various types of trauma may not be apparent without appropriate assessment.

In this study, we compared the differences in the scores of knowledge, opinions, and self-rated competencies related to

Table 4. Nurses-Reported Barriers to Trauma-Informed Care Implementation (*N*=198)

Barriers to providing trauma-informed assessment and intervention	Nurse ratings			Score (M±SD)
	Significant barrier	Somewhat of a barrier	Not a barrier	
	n (%)	n (%)	n (%)	
1. Time constraints	104 (52.5)	92 (46.5)	2 (1.0)	1.52±0.52
2. Scope of practice constraints	92 (46.5)	101 (51.0)	5 (2.5)	1.44±0.55
3. Lack of training	124 (62.6)	73 (36.9)	1 (0.5)	1.62±0.50
4. Confusing or unclear information about trauma-informed care	98 (49.5)	97 (49.0)	3 (1.5)	1.48±0.53
5. Concern about upsetting or traumatizing patients further	70 (35.4)	121 (61.1)	7 (3.5)	1.32±0.54
6. Lack of organizational support	111 (56.1)	86 (43.4)	1 (0.5)	1.56±0.51
7. Personal stress/distress levels	64 (32.3)	115 (58.1)	19 (9.6)	1.23±0.61

M, mean; SD, standard deviation.

Table 5. Nurses' Report of Specific Trauma-Informed Practices Performed in the Past 6 Months (*N*=198)

Specific trauma-informed practice	Have done this in past 6 months	Score (M±SD)
	n (%)	
1. Ask a child questions to assess symptoms of distress.	97 (49.0)	0.49±0.50
2. Ask parents to assess symptoms of pain.	93 (47.0)	0.47±0.50
3. Teach a child or parents the specific ways to manage pain and anxiety during the procedure.	98 (49.5)	0.50±0.50
4. Teach a child or parents the specific ways to cope with unpleasant experiences.	75 (37.9)	0.38±0.49
5. Encourage parents to utilize their social support system (family, friends, etc.).	101 (51.0)	0.51±0.50
6. Teach parents what to say to their child after a difficult/sick/scary experience.	71 (35.9)	0.36±0.48
7. Provide parents with information about emotional or behavioral responses that may indicate their child may need help.	99 (50.0)	0.50±0.50
8. Assess and manage personal emotional and physical health.	134 (67.7)	0.68±0.47
9. Utilize organizational support for yourself and your team.	124 (62.6)	0.63±0.49

M, mean; SD, standard deviation.

TIC according to the demographic variables of the participants. There were no differences in the TIC-related knowledge scores across demographic variables. This indicates that the level of knowledge regarding TIC does not vary according to factors such as nurses' age, religion, current work unit, type of hospital, or clinical experience in children's wards. The opinion scores regarding TIC were significantly higher among nurses with more than 5 years of clinical experience in children's wards compared to those with less than 5 years of experience and among nurses with children compared to those without children. This suggests that nurses with extensive clinical experience in children's wards or those with children have more positive opinions about TIC.

Additionally, there were significant differences in opinion and self-rated competency scores according to the type of hospital (advanced general hospitals, general hospitals, and hospitals). The advanced general hospital group had significantly higher opinion and self-rated competency scores than the hospital and the other groups. However, there were no significant differences in opinions or self-rated competency scores between the advanced and general hospital groups. These findings reflect the influence of the hospital type on nurses' opinions and self-rated competency levels regarding TIC in Korean hospitals. In a study examining the knowledge, confidence, and intention to perform basic life support (BLS) guidelines for nurses in small and medium sized hospitals in Korea, nurses' knowledge and confidence were lower than their intention to perform BLS [13]. This is consistent with the results of this study, which showed that the TIC self-rated competence of hospital/other group nurses was lower than that of nurses in advanced general hospitals. Therefore, it is necessary to strengthen various nursing education programs for nurses in small and medium sized hospitals and increase their confidence in nursing practice by conducting continuous re-education.

In this study, pediatric nurses' knowledge of TIC was assessed. While approximately seven out of 12 items had a high correct response rate of >90%, three items exhibited very low correct response rates (below 30%), indicating persistent misunderstandings about PTSD. Specifically, these items revealed that many nurses believed that severe injury or serious illness inevitably leads to more PTSD and that

PTSD symptoms are always very distinct and obvious. This finding shows even lower correct response rates compared with a similar study conducted with American nurses using the same measurement tool [6]. The TIC emphasizes the importance of carefully assessing the condition of children and families who have experienced difficult situations and preventing further trauma [14]. The misconception that clear PTSD symptoms will appear based on the intensity of the experience overlooks the fact that it might be unveiled and that nurses can play a proactive role in assessing and preventing these symptoms.

Furthermore, when looking at opinions on TIC in this study, disagreement with the statement that 'Service providers should focus on medical services rather than mental health services for hospitalized children' indicates a positive stance on TIC. However, approximately 40% of the participants believed that focusing on medical treatment was more important than mental health services. From the perspective of nurses who frequently care for critically ill patients, it is challenging to completely dismiss this view. This aligns with the observed incorrect knowledge, wherein severe illness is often associated with inevitable PTSD. Furthermore, only 66.2% of the participants in this study viewed the statement 'I have colleagues who can help a child or family experiencing severe traumatic stress' favorably, indicating a perceived shortage of nurses capable of addressing severe traumatic stress. This result is consistent with the recognition of lack of training and organizational support as major barriers to TIC.

The results of this study showed that although some items showed confidence in self-rated competence in providing TIC, questions regarding talking about patient death and understanding how trauma responses appear at different developmental stages in children were considered very difficult. This may be because, although they feel that TIC are necessary and should be performed, they are not well versed in how to support and care for children and families in various situations and according to the child's age, where understanding and responses differ. As explained in a previous study, if appropriate nursing education is provided on how pediatric nurses should respond to the sleep, diet, and bowel movements of children with trauma, and the behavioral symptoms at different developmental stages of children with trauma [4], nurses caring for children could perform with greater confidence.

Such education on TIC must to be implemented starting with undergraduate programs. According to a study conducted on nursing students in Turkey regarding their awareness of trauma-informed pediatric nursing care and family-centered care, except for one question about TIC, which had a correct response rate of 25.7%, the remaining questions showed a relatively high correct response rate of 77.4%-93.9% [15]. This rate was higher than that reported in the present study. However, in terms of competence, most respondents indicated only a moderate level of confidence in most items, and similar to this study, they showed the least confidence in talking about the death of a patient [15]. Additionally, students who had been hospitalized during childhood had a positive view of these research findings. However, even among these students, the overall rate of trauma-informed practice is very low, leading researchers to emphasize the need for practical experience and educational opportunities focused on pediatric care [15].

A scoping review examining education for TIC providers found that despite being a relatively recent study, the content of education varied greatly depending on the academic field, such as nursing, medicine, and social work [16]. For nurses and doctors, education is particularly lacking owing to time constraints [16]. It seems difficult to present standardized TIC education guidelines in the nursing field at present, and educational programs need to be developed to suit the specific circumstances of each country and hospital.

In this study, the participants identified three major factors that could hinder the provision of TIC to children and their families: time constraints, lack of training, and lack of organizational support. Time and lack of support are commonly mentioned barriers in various clinical nursing practices [17-22]. Moreover, nurses recognized the lack of opportunities for education and training in TIC. The TIC emphasizes the creation of an organizational culture that prioritizes it. To measure this, the University of Buffalo in the United States introduced the Trauma-Informed Climate Scale and the Trauma-Informed Organizational Change Manual, emphasizing TIC on a larger scale [23]. Establishing it requires not only education for healthcare professionals in one field but also efforts from all members of the organization to share these values and improve organizational culture [24]. When applying this to the culture of Korean nursing organizations, it is important to create a work environment that prioritizes the safety of nurses, fosters a collaborative organizational environment based on trust among colleagues, grants nurses choice and empowerment, and enables their participation in decision-making processes based on the five core principles

and values proposed by Harris and Fallot [25] to prevent retraumatization: safety, trustworthiness, choice, collaboration, and empowerment. Establishing a nursing organizational culture and work environment based on TIC could also positively impact nursing performance and productivity.

In this study, reporting on trauma-informed practices with pediatric patients and their parents over the past 6 months and assessing and managing an individual's physical and emotional state had the highest performance rate. However, this rate did not exceed 70% despite the essential role of nurses. In particular, items with a relatively low performance rate of <40% included educating children and parents on how to cope with adversity and teaching parents how to talk to their children. This indicates a lack of confidence in actively engaging with children and families experiencing trauma as well as a tendency to avoid necessary nursing tasks due to other priorities.

Therefore, to more actively apply TIC in pediatric nursing practice, it is necessary to provide specific and appropriate education on TIC to nurses, healthcare professionals, and hospital staff. Additionally, it is essential to create an organizational culture that recognizes the importance of TIC and willingly implements it. South Korea is currently facing a significant challenge, with low birth rates and a severe shortage of hospital care for children. Nurses need to keep this in mind in their practice to ensure that children, who are the future of the country, and their families can enjoy a higher quality of life. Efforts should also be made to change organizational culture.

The limitations of this study include the fact that it involved nurses not only from wards exclusively for children but also from wards with both adult and pediatric patients, emergency rooms, and psychiatric wards. Consequently, the study targeted nurses who had experience in caring for children rather than exclusively pediatric nurses. Therefore, it is important to note that there may be differences between studies that target only pediatric ward nurses. Additionally, approximately 70% of the participants worked in advanced general hospitals; therefore, it is not appropriate to generalize the findings to all nurses caring for children. However, this limitation was mitigated by comparing the differences in knowledge, opinions, and self-rated competencies according to hospital type. Furthermore, some reliability coefficients of the tool were confirmed as low. In particular, opinions on TIC showed low reliability. It can be inferred that the concept measured by this tool was a new concept unfamiliar to Korean nurses, and this background influenced the response consistency. In future studies, it will be necessary to consider ways to improve reliability by verifying the validity of the measurement tool in various ways for Korean nurses and correcting it to a more appropriate question or by adjusting the number of items on the tool.

This study is significant because it identified the current TIC status that nurses should consider in pediatric and family nursing by targeting nurses who provide nursing care to children in various hospitals and wards. This is especially important, given the scarcity of TIC studies focusing on these nurses in Korea. It is expected that future studies related to the development of TIC education programs for nurses caring for children will be conducted by applying factors such as symptoms and risk factors of trauma seen by hospitalized children and their families and methods of clinically implementing the principles of TIC such as safety, trust, choice, and collaboration.

CONCLUSION

This study aimed to investigate the knowledge, opinions, competence, actual practices, and barriers faced by nurses working in pediatric hospital settings regarding TIC to identify directions for enhancing TIC. While nurses demonstrated high accuracy in many knowledge measures, there were areas where correct responses fell below 30%, indicating that their knowledge of TIC was somewhat lacking. However, most nurses recognized the importance of TIC. However, their competence and actual practice of TIC were generally insufficient, highlighting the need for systematic education and support from the staff. The significance of this study lies in its exploration of the overall knowledge, views, practices, and barriers related to TIC among nurses who care for children, particularly in the field of pediatric nursing, where TIC are critically important. These findings provide foundational data for developing strategies to enhance TIC in the future.

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Authors' contribution

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Factors influencing nursing professionalism among nursing students in South Korea: a descriptive study

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Purpose: This study aims to explore the factors influencing nursing professionalism among nursing students, focusing on the image of nurses, satisfaction with their major, and career metacognition. **Methods:** We conducted a descriptive survey with 185 nursing students from D city and K region on June 10–30, 2024. Data were analyzed using IBM SPSS ver. 27.0 (IBM Corp.), employing descriptive statistics, t tests, one-way ANOVA, Scheffé tests, Pearson's correlation coefficients, and regression analysis. Multiple linear regression analysis was used to identify factors affecting nursing professionalism among nursing students. **Results:** The regression analysis revealed that the image of nurses (β=.69, p<.001) and monitoring aspect of career metacognition (β=.13, p=.025) were significant predictors of nursing professionalism, accounting for 64.5% of the variance. **Conclusion:** The findings indicate that the image of nurses and monitoring component of career metacognition are critical in shaping nursing professionalism among nursing students. Therefore, nursing education programs should aim to improve the image of nurses and promote self-reflective career practices as strategies to foster professionalism among nursing students.

Keywords: Career; Image; Nursing; Personal satisfaction; Professionalism

INTRODUCTION

Nursing professionalism encompasses the beliefs, concepts, and impressions central to the role of a nurse, forming the foundation of holistic nursing practice and closely aligning with values in nursing [1]. Recent studies show significant expansion in nurses' roles and responsibilities, with an increasing need for nursing professionalism within the healthcare sector [2]. As the field evolves, strong and positive nursing professionalism is vital for delivering high-quality care [3]. A well-established sense of nursing professionalism promotes quality care and improves performance, leading to higher organizational commitment and lower turnover intention, particularly among new nurses adapting to clinical settings [4,5]. Nursing professionalism shapes individual motivation and aspirations, influences human perception and interpretation, and forms a perspective for seeing, feeling, and interpreting objects, scenes, and situations, thereby essentially acting as a lens through which the nursing world is viewed [1]. Education is crucial in shaping nursing professionalism, which is developed through theoretical learning and practical experience [6]. Given its importance in influencing future attitudes and behaviors, fostering strong professionalism in nursing students is essential [1,3,6,7].

The image of nurses refers to the belief that nurses hold about nursing and the profession and perceptions held by doctors, staff, patients, and guardians within the workplace, shaped by their cumulative experiences [8]. A positive image

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of nurses promotes the development of strong nursing professionalism and facilitates changes in values and attitudes toward the profession [9]. It fosters nurses' sense of pride, self-esteem, and professionalism, reinforcing their commitment to their roles [6]. Therefore, forming and maintaining a positive image is essential for strengthening nursing professionalism.

Satisfaction with one's major refers to how individuals evaluate and judge their current field of study relative to their career or professional standards [10]. Studies consistently show that nursing students who are more satisfied with their major often have higher clinical satisfaction and a stronger professional identity [11]. Given that nursing education integrates theory and practice, satisfaction with one's major directly influences learning persistence, which is crucial for developing nursing professionalism [12].

Career metacognition is a relatively new concept that deepens the understanding of how individuals navigate their career paths. It examines how metacognitive processes function in career performance and problem-solving, particularly among college students [13]. Career metacognition includes cognitive behavioral strategies used to achieve goals effectively and comprises four main components: planning, evaluation, monitoring, and regulation. Planning involves setting career goals and devising effective strategies [13]. Evaluation focuses on assessing the effectiveness of career plan implementation [13]. Monitoring involves consciously recognizing one's career-related thoughts, attitudes, and emotions and examining their influence on career development [13]. Regulation refers to strategically managing performance, including correcting errors and addressing challenges during the execution of career plans [13]. The role of metacognitive strategies in career development remains unexplored, particularly among nursing students with relatively well-defined career paths. However, the evolving job market may present diverse career opportunities and challenges beyond traditional clinical roles, suggesting that career metacognition could become increasingly significant in nursing students' professional growth.

Previous studies have identified factors that influence nursing students' professionalism, such as the image of nurses and satisfaction with their major [2,6,7,12,14]. However, these studies primarily focused on external factors, limiting their ability to fully reflect the active career development process of nursing students. Career metacognition is pivotal in shaping nursing students' professional identity and roles, with research showing that career identity and preparation behavior influence nursing professionalism [15]. Although studies have explored nursing professionalism through career identity and preparation behavior, they have not addressed the deeper cognitive strategies that individuals use to navigate their career paths. Career metacognition, which involves cognitive strategies for planning, evaluating, and regulating career-related decisions and actions [13], offers a more comprehensive perspective. It provides insights into how nursing students actively shape and refine their career goals and strategies, potentially influencing the development of professionalism on a deeper level. Through enhanced self-reflection and cognitive approaches, career metacognition can support nursing students in setting and achieving their professional goals more effectively.

In this context, the study provides an in-depth exploration of how nursing students' image of nurses and satisfaction with their major, as well as the newly introduced concept of career metacognition, contribute to the development of nursing professionalism. Career metacognition involves cognitive strategies for setting and achieving career goals, offering a new perspective on how to cultivate professionalism among nursing students. Therefore, by examining this new variable, this study aims to provide insights that can inform the design of educational programs to enhance professionalism among nursing students. Accordingly, the objectives of this study are as follows: (1) to assess the levels of the image of nurses, satisfaction with their major, career metacognition, and nursing professionalism among participants; (2) to determine differences in nursing professionalism based on participants' general characteristics; (3) to examine correlations between the image of nurses, satisfaction with their major, career metacognition, and nursing professionalism; and (4) to identify factors influencing nursing professionalism among nursing students.

METHODS

Ethical statements: This study was approved by the Institutional Review Board (IRB) of Kyungpook National University (No. 2024-0211). Informed consent was obtained from all participants.

1. Study Design

This study used a descriptive survey to identify factors that

influence professionalism among nursing students.

2. Participants

The participants were nursing students enrolled in universities in Daegu and North Gyeongsang Province. The sample size was determined using G*Power 3.1.9.7, with a significance level, effect size, power, and predictor variable of .05, .15, .95, and 10 (7 general characteristics and 3 independent variables), respectively. The calculated sample size was 172, and to account for a potential 15% dropout rate, responses were collected from 198 students. After excluding 13 participants with incomplete responses, data from 185 participants were included in the final analysis.

3. Measurements

1) Nursing professionalism

Nursing professionalism was measured using 27 items from the nursing professionalism scale developed by Yeun et al. [1]. Two items that were difficult for nursing students to comprehend or could be misinterpreted owing to limited experience were excluded [16] from the original 29-item scale. The tool includes the following subdomains: professional self-concept, social awareness, nursing expertise, nursing practice roles, and nursing independence. Each item was rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicated higher levels of professionalism. The reliability (Cronbach's α) was .92 in both Yeun et al. [1] and the current study.

2) Image of nurses

Participants' image of nurses was assessed using an instrument developed by Song [8] and later modified by Kim and Kim [17]. This tool comprises 40 items rated on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicate a more favorable image of nurses. The reliability (Cronbach's α) was .95 in Kim and Kim [17] and the current study.

3) Satisfaction with major

Participants' satisfaction with the nursing major was evaluated using 18 items related to satisfaction with one's major, selected from the 27-item department satisfaction tool developed by Kim and Ha [10]. Each item was rated on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicated greater satisfaction with the nursing major. The reliability (Cronbach's α) was .92 at the time of development [10] and .88 in the current study.

4) Career metacognition

Career metacognition was assessed using a tool developed by Kim and Lee [13]. This scale includes 20 items categorized into four subfactors: planning, evaluation, monitoring, and regulation. Items were rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicated greater use of career metacognition in effectively achieving career goals. The reliability (Cronbach's α) was .91 in Kim and Lee [13] and .93 in the current study.

4. Data Collection

Data were collected between June 10–30, 2024, via an online survey targeting nursing students in Daegu and North Gyeongsang Province. Permission was obtained to use all measurement tools in this study from their respective developers. Data were collected by posting recruitment notices containing links to online consent forms and questionnaires on social media platforms. The first page of the questionnaire required participants to confirm their voluntary consent, and only those who agreed could proceed to the survey. Participants were informed of their right to withdraw at any time without penalty and assured that the collected data would be used exclusively for research purposes and destroyed upon completion of the study. The online survey took approximately 10 minutes to complete, and participants received a mobile food coupon as a token of appreciation. All personal information was destroyed immediately after the coupons were distributed.

5. Data Analysis

Data were analyzed using IBM SPSS ver. 27.0 (IBM Corp.). Descriptive statistics were used to analyze the participants' general characteristics and image of nurses, satisfaction with their major, career metacognition, and nursing professionalism. Differences in nursing professionalism based on the general characteristics of the participants were analyzed using t tests and one-way ANOVA, with Scheffé tests used for post-hoc analysis. Statistical significance was defined as p-values $<.05$. Relationships between key variables were examined using Pearson's correlation coefficients. Multiple lin-

ear regression analysis was conducted using variables that showed statistical significance in relation to nursing professionalism.

RESULTS

1. Image of Nurses, Satisfaction with Major, Career Metacognition, and Nursing Professionalism among Participants

The mean scores for participants' image of nurses and satisfaction with the nursing major were 3.83±0.38 and 3.89±0.47, respectively. Career metacognition showed an overall mean score of 3.63±0.61, with subfactor scores as follows: planning (3.99±0.65), evaluation (3.17±0.94), monitoring (3.57±0.84), and regulation (3.80±0.66). The mean score for nursing professionalism was 3.72±0.47. All scores were based on a 5-point scale (Table 1).

2. Differences in Nursing Professionalism According to Participants' General Characteristics

Statistically significant differences in nursing professionalism were observed based on age, academic year, clinical practice experience, and acquaintance with nurses. Students aged 20–21 years showed higher levels of professionalism (3.85±0.39) than those aged ≥22 years (t=2.88, p=.005). First- and second-year students had higher professionalism levels (3.84±0.42) than third- and fourth-year students (t=3.53, p<.001). Those without clinical practice experience scored higher (3.85±0.43) than those with experience (t=3.81, p<.001). Students with nurse acquaintances exhibited higher levels of professionalism (3.78±0.47) than those without them (t=2.28, p=.024). No significant differences in nursing professionalism were observed based on sex, motivation for choosing nursing, or final career path (Table 2).

3. Correlations between the Image of Nurses, Satisfaction with Major, Career Metacognition, and Nursing Professionalism

Participants' image of nurses (r=.78, p<.001) and satisfaction with their major (r=.51, p<.001) were positively correlated with nursing professionalism. All four subfactors of

Table 1. Levels of the Image of Nurses, Satisfaction with Major, Career Metacognition, and Nursing Professionalism among the Participants (*N*=185)

Variables	M±SD	Min	Max
Image of nurses	3.83±0.38	2.95	4.78
Satisfaction with major	3.89±0.47	2.50	4.83
Career metacognition	3.63±0.61	1.90	5.00
Planning	3.99±0.65	2.00	5.00
Evaluation	3.17±0.94	1.00	5.00
Monitoring	3.57±0.84	1.00	5.00
Regulation	3.80±0.66	1.00	5.00
Nursing professionalism	3.72±0.47	2.15	4.89

M, mean; SD, standard deviation.

Table 2. Differences in Nursing Professionalism According to General Characteristics of the Participants (*N*=185)

Variables	Categories	n (%)	M±SD	t or F (*p*)
Sex	Female	159 (85.9)	3.71±0.46	1.01 (.314)
	Male	26 (14.1)	3.81±0.54	
Age (year)	20–21	72 (38.9)	3.85±0.39	2.88 (.005)
	≥22	113 (61.1)	3.64±0.50	
Academic year	Freshman, sophomore	91 (49.2)	3.84±0.42	3.53 (<.001)
	Junior, senior	94 (50.8)	3.61±0.49	
Application motivation of nursing	Aptitude and interesting	59 (31.9)	3.79±0.48	0.06 (.577)
	Well-employed	69 (37.3)	3.67±0.47	
	Fitting to score	31 (16.7)	3.70±0.40	
	Recommendation of other	26 (14.1)	3.72±0.53	
Clinical practice experience	Yes	89 (48.1)	3.59±0.48	3.81 (<.001)
	No	96 (51.9)	3.85±0.43	
Final career destination	Domestic clinical nurse	82 (44.3)	3.73±0.44	1.66 (.193)
	International clinical nurse	44 (23.8)	3.81±0.43	
	Other	59 (31.9)	3.64±0.53	
Nurse acquaintance	Yes	121 (65.4)	3.78±0.47	2.28 (.024)
	No	64 (34.6)	3.62±0.46	

M, mean; SD, standard deviation.

career metacognition also showed significant positive correlations with nursing professionalism: planning (r=.33, p<.001), evaluation (r=.24, p=.001), monitoring (r=.27, p<.001), and regulation (r=. 16, p=.029) (Table 3).

4. Factors Influencing Nursing Professionalism among Participants

To identify factors that influence nursing professionalism, variables with significant differences (academic year, clinical practice experience, and having nurse acquaintances) and those with significant correlations (image of nurses, satisfaction with major, and career metacognition) were set as independent variables. Multiple regression analysis was performed with nursing professionalism as the dependent variable to evaluate the explanatory power and predictive strength of each factor (Table 4). Although nursing professionalism showed differences across age groups, age was excluded as a variable in the final regression analysis because of its nonsignificant correlation with nursing professionalism (r=-.07, p=.368). Nominal variables (academic year, clinical practice experience, and having nurse acquaintances) were converted into dummy variables for analysis.

Multicollinearity was assessed using tolerance and variance inflation factor (VIF) values. Tolerance values ranged from 0.178 to 0.948 (within 0.1 to 1.0), while VIF values ranged from 1.06 to 5.63 (<10), indicating no multicollinearity issues. The Durbin–Watson test showed a value of 2.13, confirming no autocorrelation in errors. The regression model analyzing the effects of the independent variables on nursing professionalism was statistically significant (F=35.31, p<.001). The final influential factors identified were the image of nurses (β=.69, p<.001) and monitoring of career metacognition (β=.13, p=. 025). Overall, the regression analysis revealed that the independent variables accounted for 64.5% of the variance in nursing professionalism (Table 4).

Table 3. Correlations Between the Image of Nurses, Satisfaction with Major, Career Metacognition, and Nursing Professionalism (N=185)

Variables	Image of nurses	Satisfaction with major	Career metacognition				Nursing professionalism
			Planning	Evaluation	Monitoring	Regulation	
	r (p)						
Image of nurses	1						
Satisfaction with major	.51 (<.001)	1					
Career metacognition							
Planning	.33 (<.001)	.48 (<.001)	1				
Evaluation	.34 (<.001)	.29 (<.001)	.44 (<.001)	1			
Monitoring	.24 (.001)	.31 (<.001)	.37 (<.001)	.53 (<.001)	1		
Regulation	.20 (.006)	.25 (.001)	.50 (<.001)	.59 (<.001)	.56 (<.001)	1	
Nursing professionalism	.78 (<.001)	.51 (<.001)	.33 (<.001)	.24 (.001)	.27 (<.001)	.16 (.029)	1

Table 4. Factors Influencing Nursing Professionalism among the Participants (N=185)

Variables	B	SE	β	t	p	Tolerance	VIF
(Constant)	-0.06	0.27		-0.23	.816		
Academic year (freshman, sophomore)[a]	-0.07	0.10	-.08	-0.74	.459	.18	5.54
Clinical practice experience (no)[b]	-0.13	0.10	-.14	-1.33	.185	.18	5.63
Nurse acquaintance (no)[c]	0.05	0.05	.05	1.16	.250	.95	1.06
Image of nurses	0.85	0.07	.69	11.95	<.001	.61	1.64
Satisfaction with major	0.10	0.06	.10	1.68	.094	.60	1.67
Career metacognition							
Planning	0.05	0.04	.07	1.25	.215	.59	1.69
Evaluation	-0.05	0.03	-.10	-1.56	.121	.54	1.86
Monitoring	0.07	0.03	.13	2.27	.025	.60	1.65
Regulation	-0.03	0.05	-.05	-0.76	.447	.51	1.94
R^2=.645, AdjR^2=.627, F (p)=35.31 (<.001)							

[a]Dummy variables (ref. junior, senior); [b]Dummy variables (ref. yes); [c]Dummy variables (ref. yes); SE, standard error; VIF, variance inflation factor.

DISCUSSION

This study explored strategies to enhance nursing professionalism among nursing students by analyzing the relationships between participants' image of nurses, satisfaction with their major, and career metacognition, as well as their combined effect on professionalism. The lack of prior studies focusing on career metacognition in nursing students creates challenges for developing a comprehensive discussion on the topic. To address this, comparisons were drawn from studies that examined related variables to guide the discussion. Although this may be considered a limitation of the study, understanding the potential role of career metacognition in shaping nursing professionalism provides valuable insights into preparing future nurses to meet the dynamic needs of the healthcare field.

In this study, nursing students' image of nurses received an average rating of 3.83±0.38 out of 5 points, aligning with the 3.83 points reported by Gu and Lee [14]. Recent shifts in the healthcare environment, increased demand for nurses, and evolving social perceptions of their dedication have generally improved the image of nurses [9]. Considering previous research [7] indicating that a positive image of nurses significantly influences the development of nursing professionalism, a systematic approach to fostering such an image is crucial in nursing education [12]. Despite progress, nurses are still often perceived as lacking autonomy in patient care. Therefore, highlighting their professional responsibility and dedication is vital for improving the public's view of nursing as a respected profession [2]. Effective strategies could include maintaining and reinforcing positive images, improving media portrayals, implementing various campaigns to enhance the recognition that nurses receive, and integrating relevant programs into nursing curricula. Examples of such initiatives are the Korean Nursing Association's badge-wearing campaign [18] and problem-based learning programs that combine nursing and media studies to enhance the public image of nurses [19]. These multifaceted approaches can improve the social perceptions of nursing students and foster their professional identity.

In this study, nursing students' satisfaction with their major was, on average, 3.89±0.47 out of 5 points. This is lower than the 3.92 points reported by Lee and Seo [6] but higher than the 3.66 points reported by Lee and Kim [11]. These differences may be attributable to variations in participant characteristics and sample sizes across studies. Overall, the findings suggest that the nursing students in this study showed a relatively high level of satisfaction with their major compared to those in previous studies. Satisfaction with their major is crucial for nursing students, as it positively influences values and attitudes toward the profession [6] and enhances job satisfaction among newly graduated nurses [11]. Conversely, a student's dissatisfaction with their major may contribute to a negative view of the nursing profession, potentially hindering the formation of positive nursing professionalism [20]. Therefore, nursing education institutions should adopt multifaceted strategies to improve students' satisfaction with their major. Enhancing academic achievement and fostering a deep understanding of and attachment to nursing can be achieved through mentoring programs, career exploration opportunities, and stronger connections to clinical settings. Additionally, refining curricula, improving learning environments, and enhancing student support services could further promote satisfaction. These approaches can help students develop a comprehensive understanding of their field, potentially leading to greater satisfaction and a significant commitment to nursing.

Nursing students' average level of career metacognition was 3.63±0.61 out of 5 points. Career preparation behavior, defined as the practical actions taken to identify the aptitude of an individual and achieve career goals for informed and appropriate career decision-making [21], was rated 3.1 out of 4 points in a study by Sim and Joung [20]. Although direct comparison is challenging owing to different concepts and measurement tools, these results are broadly comparable to the career metacognition scores in this study. Career metacognition is a critical competency for nursing students as they navigate their development path as healthcare professionals, highlighting the need for further research on this topic. This study serves as a foundational investigation into career metacognition among nursing students; however, additional research is necessary. In particular, studies are needed to develop and verify the effectiveness of programs that aim to enhance career metacognition among nursing students.

Nursing students' professionalism reached an average of 3.72±0.47 out of 5 points, which is slightly higher than that found by Nam and Kim [22]. However, scores varied significantly by academic year, with first- and second-year students scoring higher than third- and fourth-year students. This decline among upper-year students may be due to increased educational and employment pressure and challenges during

clinical practice, which can negatively affect nursing students' self-esteem and professional identity [23,24]. Therefore, developing targeted curricular and extracurricular activities is critical for reinforcing professionalism throughout students' academic journeys. These activities include pre-clinical education, psychological preparation for clinical environments, and mentoring programs with experienced nurses to bridge the gap between ideals and clinical realities [25]. Strengthening these initiatives will provide support to students in maintaining and enhancing their professionalism as they progress through their nursing program, ultimately fostering a stronger professional identity and preparedness for future practice.

Two primary factors were found to influence nursing professionalism among nursing students in this study: the image of nurses ($\beta = .69$, $p < .001$) and monitoring of career metacognition ($\beta = .13$, $p = .025$). Combined, these two factors accounted for 64.5% of the variance in nursing professionalism in this study. Consistent with previous findings, the image of nurses is a strong predictor of nursing professionalism [2] and career preparation behavior similarly influences nursing professionalism [15].

The image of nurses emerged as the most significant factor shaping nursing professionalism, underscoring its crucial role in the formation of professional identity among nursing students. Therefore, initiatives to enhance nursing professionalism should prioritize the cultivation of a positive image of nurses. For instance, in child health nursing, a positive image may not only encourage students to feel prouder of their role as nurses but also increase their interest in specializing in the field. Image-making classes designed to instill pride and core nursing values can effectively increase professionalism [26]. Educational strategies should incorporate media literacy programs to help students critically evaluate how nurses are portrayed, thus fostering more realistic and positive perceptions of the profession. Additionally, "Nursing Ambassador" initiatives, which include mentorship by role models and shadowing opportunities in diverse healthcare settings, can further reinforce the professional image of nurses, aiding students in developing aspirational and realistic career goals.

The significant effect of monitoring suggests that students' ability to reflect on their career-related thoughts and emotions is vital for developing nursing professionalism. Clinical practicums in nursing education offer an ideal environment for students to actively monitor their career aspirations and receive valuable feedback on their professional growth [27]. For instance, exposure to specialized fields such as pediatric nursing allows students to assess their suitability and interest in specific nursing areas [28]. However, limited practicum opportunities, primarily in regions affected by societal changes such as declining birth rates [27], may restrict students from exploring various specialties and gaining the necessary hands-on experience. Integrating structured reflective practices and career-monitoring activities into the nursing curriculum is crucial for addressing this limitation. For instance, reflective journaling exercises [29] can encourage students to consciously evaluate their career-related thoughts, attitudes, and emotions. Peer coaching sessions [30] in which students share reflections and receive feedback from peers could further enhance these skills. By providing such structured opportunities, nursing programs can support students in actively monitoring their career progress despite limited practicum opportunities. This approach helps maintain a positive outlook on diverse nursing fields while fostering professional growth. Combining efforts to promote a positive image of nurses and encourage active career monitoring could enable educational institutions to better support students in developing nursing professionalism, thereby preparing them for the demands of the healthcare environment.

Based on the results of this study, although monitoring career metacognition was found to significantly influence nursing professionalism, other components, including planning, evaluation, and regulation, did not show significant effects. This finding may be attributable to several factors. First, as a relatively new concept, career metacognition may not yet be fully integrated into nursing education, thus limiting students' opportunities to develop and apply these skills. Second, given that nursing students often have a defined career path, the planning and regulation aspect of career metacognition may be less critical compared to fields with more diverse or uncertain career trajectories. Finally, these subfactors may influence nursing professionalism indirectly through other variables rather than having a direct effect. Future research should explore the roles of different career metacognition components and their relationships with the development of nursing professionalism.

This study has some limitations that can provide suggestions for future research. The study involved nursing students from specific regions, limiting the generalizability of the findings to nursing students nationwide. The limited research on career metacognition among nursing students provides insufficient data for direct comparison. Therefore, fu-

ture research should include nursing students from diverse regions to improve generalizability, further examine the relationship between career metacognition and nursing professionalism, and develop and verify the effectiveness of programs designed to improve nursing students' image of nurses and monitoring of career metacognition. These studies would contribute to a deeper understanding of the factors affecting nursing professionalism and help develop effective strategies to enhance it among nursing students.

CONCLUSION

This study identified the image of nurses and monitoring of career metacognition as key factors influencing nursing professionalism among nursing students, accounting for 64.5% of the variance. Improving nursing students' image of nurses and fostering their monitoring of career metacognition are crucial for strengthening nursing professionalism.

The findings of this study indicate the need for educational institutions to implement strategies that promote positive perceptions of the nursing profession and support students' development of career-related metacognitive skills, ultimately resulting in stronger professional values. Effective strategies may include media literacy programs, positive role modeling, reflective journaling, and peer coaching. Incorporating these approaches into nursing education can foster professional values and identity and prepare students for future challenges in healthcare. Future research should evaluate the effectiveness of these interventions and examine the link between career metacognition and nursing professionalism.

ARTICLE INFORMATION

Authors' contribution

Conceptualization: all authors; Methodology: Bokyoung Kim; Software: Jiyeon Park, Gain Seo; Validation: Bokyoung Kim; Data collection: Jiyeon Park, Gain Seo, Bokyoung Kim; Formal analysis: Jiyeon Park, Gain Seo, Bokyoung Kim; Investigation: Jiyoon Park, Seon Woo Ko, Na Yeon Kim, Jiyeon Park, Gain Seo; Resources: Bokyoung Kim; Writing-original draft: all authors; Writing-review & editing: all authors; Supervision: Bokyoung Kim; Project administration: Bokyoung Kim.

Conflict of interest

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Data availability

Please contact the corresponding author for data availability.

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Author Guidelines

CHNR
Child Health Nursing Research

Child Health Nursing Research
Enacted in April 2006 and most recently revised in February 2023 and applied from Vol 29, No 2 (April 2023)

I. General Information

1. About the Journal

Child Health Nursing Research (CHNR) is the official peer-reviewed research journal of the Korean Academy of Child Health Nursing. CHNR is a multidisciplinary, double-blind peer-reviewed, open-access journal that publishes original research, theory, and review papers on health care and nursing from the beginning of life to young adulthood, including both children and their families. It is devoted to all fields of child health, including global and cultural issues, aimed at both domestic and international healthcare professionals. The journal is published quarterly (Jan 31, Apr 30, July 31, and Oct 31) in English. The journal welcomes submissions from healthcare professionals around the world, and encourages the submission of papers dealing with cultural issues and those studied by international research teams.

- Indexed in major databases: PubMed Central, PubMed, Scopus, CINAHL, DOAJ, Crossref Metadata, Google Scholar, ScienceCentral, KCI (Korea Citation Index), RISS, KoreaMed, and KoMCI.
- Its abbreviated title is *Child Health Nurs Res*.
- Open access: All articles published in the journal are freely available with an open access license for everyone to read and download from the CHNR website (http://www.e-chnr.org/) immediately and permanently after publication.

2. Aims and Scope

Child Health Nursing Research aims to promote the health, development, and well-being of children and their families in Korea and all over the world by providing research on evidence-based practices.

Its scope includes the most recent clinically and academically relevant topics in health care and nursing from the beginning of life to young adulthood, including both children and their families. The journal deals with articles that address research, theory, and practice in a wide range of child health nursing areas and relevant cultural issues. Its regional scope is mainly Korea, but it welcomes submissions from researchers and nurses worldwide.

The primary readers of this journal are healthcare professionals, administrators and scientists serving newborns, infants, children, adolescents, young adults, and their families, including nurses, midwives, physicians, developmental specialists, public health workers, scientists, educators, epidemiologists, and other health caregivers.

The ultimate goal of *Child Health Nursing Research* is to develop a body of knowledge on the health of newborns, infants, children, adolescents, young adults, and their families while improving the clinical field and community with evidence-based practices to promote the health of children and families all over the world.

3. Readership

This journal is published for health care professionals and administrators serving infants, children, adolescents, and families, working to promote child care and welfare. Through CHNR, readers obtain information on the most recent clinically and academically relevant topics in health care and nursing for the life span from the beginning of life to young adulthood, including both children and their family members. Specifically, nurses, midwives, physicians, developmental specialists, and public health workers in the field can obtain the most recent information about health problems and nursing strategies for children and families. Administrators of healthcare facilities and public health centers can access various data regarding health problems and obtain insights into healthcare planning for children and families. Social scientists and epidemiologists can access and utilize data on recent health problems of infants, children, adolescents, and families. Child health educators can obtain the

most up-to-date information on child health to convey that knowledge to students in the field of child health care and nursing. Researchers can learn about state-of-the-art research methodology for child health care.

II. Research and Publication Ethics

1. Research Ethics

1) Statements of Human and Animal Rights and Protection: CHNR endorses and follows international standards of ethical practice in human rights and protection and the principles addressed in the Declaration of Helsinki (Ethical Principles for Medical Research Involving Human Subjects, https://www.wma.net/wp-content/uploads/2016/11/DoH-Oct2013-JAMA.pdf). According to the Bioethics and Biosafety Act of Korea and in order to meet international standards for ethical practice in human rights and protection, any research involving human subjects must be approved by an Institutional Review Board (IRB). When animals are used as research subjects, the study must be conducted in correspondence with related regulations, such as those of the Institutional Animal Care and Use Committees (IACUCs, https://ori.hhs.gov/education/products/ncstate/iacuc.htm), or National Institutes of Health (NIH) Guide for the Care and Use of Laboratory Animals (https://grants.nih.gov/grants/olaw/guide-for-the-care-and-use-of-laboratory-animals.pdf). Any treatment methods in conflict with the regulations must be described and may be grounds for rejection of the paper.

2) Statements of Informed Consent: The researcher(s) must also obtain written voluntary informed consent from the participants or their parents or legal guardian. If the research involves a child or any vulnerable subject in any way, special and sensitive protection is needed to ensure the safety and human rights of the subject. When necessary, the editor of CHNR may ask the author(s) to present the relevant document(s) on the human rights and protection issues related to the manuscript, such as the informed consent form or the evidence for the IRB approval of the study.

2. Submission declaration and verification

Duplicate publication or duplicate submission is prohibited in accordance with the ICMJE recommendations (https://publicationethics.org/resources/flowcharts/redundant-duplicate-publication-published-article). Manuscripts that have been published or are being submitted to other journal(s) should not be submitted to CHNR. Manuscripts that have been published or are currently under consideration for publication in CHNR must not be submitted to another journal. Upon notice of a duplicate submission, submission privileges to CHNR will be suspended for 2 years.

1) Decision criteria for duplicate publication
   The manuscript has never been published in another language or any medium—print, electronic media, or an academic journal.
2) The corresponding author must obtain approval from the editor-in-chief of each related journal if she or he wishes to reprint the published manuscript in another language.
3) The editorial board will determine the nature and degree of the manuscript's duplicate publication or duplicate submission.

3. Publication Ethics and Malpractice Statements

The publication and research ethics of CHNR strictly follow the ICMJE guidelines (http://www.icmje.org/).

1) Reporting standards: Authors should report on their work accurately and objectively without inappropriate manipulation. Authors should describe their methods and procedures in enough detail and present sufficient references so that others can replicate the work. Authors should not produce, record, or report non-existent data and results and should not change or omit data. Authors should also avoid producing multiple publications ("salami slicing") from content that should be only one substantial manuscript. Manuscripts that do not follow the international ethical standards of research and publication (i.e., those that involve fabrication, falsification, salami slicing, plagiarism, or simultaneous/duplicate submission) will not be considered for publication in CHNR. The editorial board will adjudicate the specific reasons for rejection.

2) Authorship of the manuscript: Authorship is be limited to those who have made a substantial contribution to the manuscript in terms of conception and design, as well as the collection, analysis, and interpretation of the data. All authors should be involved in drafting and reviewing the

manuscript and must approve the final version of the manuscript. The corresponding author is required to confirm that all appropriate persons are listed as authors in the manuscript. All authors must agree to be accountable for all aspects of their work and to ensure that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

3) **Originality and plagiarism:** Authors are required to submit original manuscripts and confirm that they have cited or quoted others' ideas and texts appropriately and accurately. Plagiarism means the appropriation of another person's ideas, research processes, results, or text as one's This includes using previously published material of oneself or any other author without citing the references. The editorial board of CHNR uses the Crossref Similarity Check tool to check for plagiarism. If plagiarism is discovered in the manuscript, the manuscript will not be published.

4) **Multiple, simultaneous, or duplicate submission:** Authors should not submit the same research to more than one journal and should not publish the manuscript in different languages. If authors wish to pursue a secondary publication of the manuscript in another language, they should obtain approval from the editor-in-chief of both related journals. The editorial board will determine the nature and degree of duplicate publication or duplicate submission for the manuscript.

5) **Data access and retention:** Authors should retain research data and be prepared to allow access to the data in case the editorial board asks them to provide the raw data in connection with the editorial review.

6) **Disclosure and conflict of interest:** Authors are required to disclose commercial or similar relationships to products or companies mentioned in the article being submitted or related to its subject matter.

7) **Acknowledgment of sources:** Sources of funding for the manuscript should be acknowledged. Authors should use or report the information obtained privately with explicit, written permission from sources.

8) **Fundamental errors in a manuscript:** When authors find a fundamental error in a published manuscript, they should immediately inform the editor and cooperate with the editor to correct or withdraw the manuscript.

9) **Process for managing publication malpractice:** When reviewers or readers suspect publication malpractice such as fabrication, falsification, salami slicing, plagiarism, or simultaneous/duplicate publication; inappropriate changes in authorship, an undisclosed conflict of interest, ethical problems with a submitted manuscript, a reviewer who has appropriated an author's idea or data, complaints against editors, and so on, the process of resolution will be initiated following the flowchart provided by the Committee on Publication Ethics (COPE) (http://publicationethics.org/resources/flowcharts). The ethics committee will discuss and adjudicate cases of suspected publication malpractice, as well as complaints and appeals against editors. CHNR will not hesitate to publish errata, corrigenda, clarifications, retractions, apologies, and expressions of concern when needed.

4. Conflict of Interest

An article's corresponding author is required to notify the editor of any potential conflicts of interest that might have affected the study's findings or the way the data were interpreted. Even when the authors are certain that their respective judgments were unaffected when producing the article, a potential conflict of interest should be stated on the title page and at the conclusion of the main text. Conflicts of interest can include ties to pharmaceutical corporations on a personal or financial level, political pressure from special interest organizations, or issues in the classroom. The ICMJE Uniform Disclosure Form for Potential Conflicts of Interest (https://www.icmje.org/disclosure-of-interest/) should be used as the model for the disclosure form. The editor will determine whether the conflict of interest disclosure should be made in the final version of the work. All funding sources for a study should be specifically identified. Before assessing a particular paper, CHNR requests that referees notify the editor if they have any conflicts of interest. All article submissions from editors, staff members, or editorial board members are handled in the same manner as unsolicited submissions. They will not participate in the decision-making or reviewer selection process. Even for commissioned manuscripts, editors will not handle their own work.

5. Authorship

The practices of CHNR regarding research and publication ethics strictly follow the International Committee of Medical Journal Editors (ICMJE) guidelines (http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html), and the Good Publication Practice Guidelines for Medical Journals 4th Edition (ISMPP, 2022, https://www.ismpp.org/gpp-2022).

1) Authorship credit

All other contributors should be credited in the acknowledgments. After the initial submission of a manuscript, any changes whatsoever in authorship (adding author[s], deleting author[s], or re-arranging the order of authors) must be explained in a letter to the editor from the authors concerned. All authors of the paper must sign this letter. Every author must also complete a copyright assignment.

2) Authorship Taxonomy

The corresponding author is responsible for ensuring that the descriptions are accurate and agreed upon by all authors. The role(s) of all authors should be listed, using the above relevant categories. Authors may have contributed in multiple roles. CRediT in no way changes the journal's criteria to qualify for authorship. Please select the CRediT (https://credit.niso.org/) statements provided below during the submission process. This information will appear above references section of the published paper, as shown below as an example.

3) Corresponding author and first author: CHNR does not allow multiple corresponding authors for a single article. Only one author for each article should correspond with the editorial office and reviewers. CHNR does not allow multiple first authors for a single article.

4) Correction of authorship after publication: CHNR does not correct authorship after publication unless the editorial staff has made a mistake. Authorship may be corrected after submission and before publication if all authors involved with the manuscript request an authorship correction.

III. Guidelines for Manuscript Preparation

1. Types of Manuscripts

This journal publishes original articles, review articles, and

Table 1. Authorship Taxonomy(https://credit.niso.org/)

Term	Definition
Conceptualization	Ideas; formulation or evolution of overarching research goals and aims
Methodology	Development or design of methodology; creation of models
Software	Programming, software development; designing computer programs; implementation of the computer code and supporting algorithms; testing of existing code components
Validation	Verification, whether as a part of the activity or separate, of the overall replication/ reproducibility of results/experiments and other research outputs
Formal analysis	Application of statistical, mathematical, computational, or other formal techniques to analyze or synthesize study data
Investigation	Conducting a research and investigation process, specifically performing the experiments, or data/evidence collection
Resources	Provision of study materials, reagents, materials, patients, laboratory samples, animals, instrumentation, computing resources, or other analysis tools
Data Curation	Management activities to annotate (produce metadata), scrub data and maintain research data (including software code, where it is necessary for interpreting the data itself) for initial use and later reuse
Writing – Original Draft	Preparation, creation and/or presentation of the published work, specifically writing the initial draft (including substantive translation)
Writing – Review & Editing	Preparation, creation and/or presentation of the published work by those from the original research group, specifically critical review, commentary, or revision – including pre-or post-publication stages
Visualization	Preparation, creation and/or presentation of the published work, specifically visualization/ data presentation
Supervision	Oversight and leadership responsibility for the research activity planning and execution, including mentorship external to the core team
Project administration	Management and coordination responsibility for the research activity planning and execution
Funding acquisition	Acquisition of the financial support for the project leading to this publication

editorials on health care and nursing for birth to young people and their families.

- ***Original articles:*** CHNR publishes original articles that fit the journal's aims and scope. These comprise comprehensive papers outlining novel research. These are reports of empirical data from top-notch scientific and clinical research studies that have relevance to nursing and health care for people from the beginning of life to young adulthood and their families. Original articles cover children's health issues, with topics encompassing nursing theory, practice, and education, among others. The articles published in CHNR present significant research results obtained using a variety of methodologies, including mixed-method designs, observational, quasi-experimental, and experimental investigations, as well as qualitative methods and measurements, including the development and evaluation of instruments. The appropriate standards should be followed when writing research papers.
- ***Review articles:*** Critical presentations on themes of interest and importance to child health nursing theory, practice, and education are included. A review article's body should consist of a thorough evaluation of the literature that is supported by academic research, critical analysis, and reasoned conclusions. We publish comprehensive literature reviews, as well as systematic reviews which target specific research problems, such as scoping reviews. We also release discussion papers, which are academic works with a discursive or argumentative tone. There must always be a discussion and critical evaluation of a significant body of research or other scholarship.
- ***Editorials:*** These are by invitation only and feature remarks made by institutional representatives or individual authors on topics of current interest. Authors should get in touch with the manager in the editorial office if they have any suggestions for editorials that deal with topics that are critically important to the discipline, especially those that are contentious or closely related to recent or upcoming journal articles.

2. Authors of Manuscripts

1) Anyone may submit a manuscript for publication in CHNR.
2) If the manuscript is the product of a dissertation, the author must disclose that the manuscript is the product of a dissertation for an academic degree program. The first author must be the author of the dissertation.

3. General Information

1) Submission system

The manuscript must be submitted online through http://www.e-chnr.org/ (website of CHNR) or http://www.chnr-submission.org/ (peer review system of CHNR). There, authors may review the submission instructions and access all submission forms, including the author checklist.

2) Language and style

Every manuscript should be written in English. The author can submit the manuscript as a Microsoft Word file or HWP file with an A4 paper size layout. The margins of the paper should be set as follows: top 30 mm, bottom 25 mm, left 25 mm, and right 25 mm. A 10-point font size should be used, and the text should be double-spaced.

3) Manuscript length

Abstracts, texts, references, tables, and figures included in the manuscript have different limits depending on the type of manuscript submitted, but all submissions must comply with the contents of Table 1. The number of references is recommended to be 30 or fewer for an article. However, the authors can include more references depending on the various article types, which have no limit on references.

Table 2. Recommended maximums for articles submitted to *Child Health Nursing Research*

	Abstract	Text	Tables & Figures
Original article	250	6,000	5
Review article	250	8,000	5
Editorial	None	2,500	5

4) Abbreviations used

If authors choose to use an English abbreviation, the complete spelling must be used upon first mention, and the abbreviation may be used after that. The title should not include any abbreviations.

5) Samples and participants

Authors should confirm the correct use of the words "sex" (when reporting biological factors) and "gender" (identity, psychosocial, or cultural factors), and report the sex or gender of study participants. Authors should define how they determined race or ethnicity and justify its relevance. If the

study was done involving an entire population, the authors should explain the reason.

6) Prior approval for the use of psychosocial questionnaires (survey tools)

Authors must acquire permission for the utilization of any psychosocial questionnaire from the tool's copyright holder.

7) Describing machinery or technical equipment

When identifying machinery and equipment, the following should be included in parentheses: the model, manufacturer. Brand names are identified by ™, ®, etc. Brand names should be used only when necessary.

8) When the manuscript is submitted, references and citations may follow any accepted style:

Examples include National Library of Medicine (NLM) and American Psychological Association (APA) style. However, after the manuscript is accepted, all references and citations must be converted to follow Citing Medicine: The NLM Style Guide for Authors, Editors, and Publishers, 2nd Edition (2007). It is the responsibility of the submitting author(s) to confirm that NLM style guidelines are adhered to prior to final publication.

4. Reporting Guidelines for Specific Study Designs

Research reports frequently omit important information. As such, reporting guidelines have been developed for a number of study designs. Authors are encouraged to adhere to relevant reporting guidelines when describing their study. A good source of reporting guidelines is the EQUATOR Network (http://www.equator-network.org/home/) and the United States National Institutes of Health/ National Library of Medicine (http://www.nlm.nih.gov/services/research_report_guide.html).

- *Observational cohort, case-control, and cross-sectional studies*

  Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)

  Meta-analysis of Observational Studies in Epidemiology (MOOSE)
- *Qualitative studies*

  Consolidated Criteria for Reporting Qualitative Research (COREQ)

  Standards for Reporting Qualitative Research (SRQR)
- *Quasi-experimental/ non-randomized trials*

  Transparent Reporting of Evaluations with Non-randomized Designs (TREND)
- *Randomized (and quasi-randomized) controlled trials*

  Consolidated Standards of Reporting Trials (CONSORT)
- *Study of Diagnostic accuracy/assessment scale*

  Standards for the Reporting of Diagnostic Accuracy Studies (STARD)
- *Systematic Review and meta-analysis*

  Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA)

  Meta-analysis of Observational Studies in Epidemiology (MOOSE)
- *Quality improvement studies*

  Standards for Quality Improvement Reporting Excellence (SQUIRE)

5. Sequence of Headings in an Original Article

The manuscript should be organized as follows. Each section should be clearly delineated. Instructions for each appear below the list.

Beginning section	- Cover letter - Title page - Abstract and keywords
Middle section (Main text)	- Introduction - Materials and Methods - Results - Discussion - Conclusion
Ending section	- ORCID and ResearcherID - Authors' contribution - Conflict of interest - Funding resource - Data availability - Acknowledgements - Supplementary materials - References
Other elements	- Tables and Figures

1) Beginning section

(1) Cover letter

The authors should address a cover letter to the editor in which they summarize the main components of the manuscript and what makes its contribution original and relevant to the Aims and Scope of CHNR. The author(s) should also address any other matters associated with authorship and publication they wish the editors to consider.

(2) Title page

① The content of the title page should appear as follows in this order: Title, running title, type of manuscript, author(s), corresponding author, conflict of interest, IRB approval, MeSH (Medical Subject Headings, https://www.ncbi.nlm.nih.gov/mesh/) keywords, number of references, and number of words of the English abstract. More specific requirements for these components are detailed below.

② Type of manuscript: One of the following should be noted: original article, review article, editorial, or invited paper.

③ Author(s): This section should list the names of all authors, each with their position and affiliation including title, department, and location of institutions to which the work should be attributed. It should also present each author's ORCID number and describe the author's role in this study.

④ Corresponding author: The corresponding author should be identified with the address (zip code), email, telephone, fax, and ORCID number.

⑤ Conflict of interest: Any matter pertaining to the research should be noted here, such as the source of research funds, conflicts of interest, or indication that the manuscript is derived from a dissertation or thesis for an academic degree program.

⑥ IRB approval: The author should fill in information about the institution that provided IRB approval, including the approval number, and informed consent. However, if it is not a study of humans or animals, a statement should be made about IRB exemption.

⑦ MeSH Keywords: The keywords are drawn from the MeSH list (not more than five).

⑧ Number of references: It is recommended that an article include no more than 30 references. However, for articles that have no reference restriction, such as meta-analyses, systematic reviews, or structural equation models, authors are free to provide more references.

⑨ Number of words of the English abstract: The number of words in the English abstract should be noted. The total should be no more than 250 words.

(3) Abstract and keywords

An abstract of up to 250 words for articles (including reviews) should be typed double-spaced on a separate page. It should cover the main factual points, including statements of the purpose, methods, results, and conclusions. The abstract should be accompanied by a list of three to five keywords for indexing purposes. The keywords should be as specific as possible and drawn from the list of MeSH keywords.

2) Middle section

The text should be composed in the following order: introduction, methods, results, discussion, conclusion.

(1) Introduction

The introduction should clearly state the need for this study and the main question or hypothesis of the study. A literature review or summary of background information related to the study should be presented.

(2) Methods

This section should describe the study design, setting and samples, ethical considerations, measurements/instruments, data collection/procedure, and data analysis used. If the study is qualitative, the research instrument can be omitted. An “Ethics statement” should be provided after the "Methods" heading in a text-box format.

> Example)
> Ethics statement: This study was approved by the Human Ethics Committee of the University of XXX (IRB No. 202104-0002-03). Informed consent was obtained from all participants.

(3) Results

The main results should be summarized in concise paragraphs. Levels of statistical significance and confidence intervals should be noted where appropriate.

(4) Discussion

The discussion should be based only on the reported results. The discussion is recommended to reflect advances in nursing practice and nursing knowledge development.

(5) Conclusion

Conclusions and recommendations for further study should be presented here, but the study results should not be summarized again.

3) Ending section

(1) ORCID and ResearcherID

The authors should provide the ORCID number and ResearcherID.

(2) Authors' contribution

Authors' contribution should be based on the authorship taxonomy.

(3) Conflict of interest

Authors are required to disclose commercial or similar relationships to products or companies mentioned in or related to the subject matter of the article being submitted. If there are no conflicts of interest, the following is an example of a sentence that can be used: "No existing or potential conflict of interest relevant to this article was reported."

(4) Funding resource

Funding institutions' policies should acknowledge sources of funding for the manuscript. If there is no funding resource, the following is an example of a sentence that can be used: "None".

(5) Data availability

Based on the degree of sharing plan, authors should deposit their data after deidentification and report the DOI of the data and the registered site. Please contact the corresponding author for data availability.

(6) Acknowledgments

Any persons who contributed to the study or the manuscript but did not meet the authorship requirements can be listed here. Written permission should be obtained from any person or organization mentioned in this section.

(7) Supplementary materials

If there are supplementary materials to help the understanding of readers or too much data to be included in the main text, it may be presented as supplementary data.

(8) References

When the manuscript is submitted, references and citations may follow any accepted style. Examples include National Library of Medicine (NLM) and American Psychological Association (APA) style. However, after the manuscript is accepted, all references and citations must be converted to follow Citing Medicine: The NLM Style Guide for Authors, Editors, and Publishers, 2nd Edition (2007). It is the responsibility of the submitting author(s) to confirm that NLM style guidelines are adhered to prior to final publication. Authors are responsible for the accuracy of the references. Use of DOIs is highly encouraged.

4) Other Elements

(1) Tables and Figures

Tables and figures, including illustrations and photos, should be presented or described in English. The figures should be on separate pages. The total number of tables and figures in a manuscript is no more than 5.

All tables and figures should be easy to understand, even when presented separately from the rest of the manuscript, and should present information relevant to the study.

6. References format

1) Style

A description of the References section is provided below. The References follow the NLM Style Guide for Authors, Editors, and Publishers, 2nd Edition (2007) (http://www.nlm.nih.gov/citingmedicine) if not mentioned below. References should be numbered serially in the order of appearance in the text, with numbers in brackets [ ]. The original reference number should be used if a reference is cited more than once.

2) Citation format

If authors wish to cite references, please use the following format.

(1) Cited work's author

If there are 7 or more authors of a cited work, the first 6 should be listed, followed by "et al."

Example: Wolchik SA, West SG, Sandler IN, Tein J, Coatsworth D, Lengua L, et al.

(2) Journals

The name of the journal should be written in full.

① Journal articles

- For 6 or fewer authors, all authors should be listed

Example:
Diego MA, Field T, Hernandez-Reif M. Preterm infant weight gain is increased by massage therapy and exercise via different underlying mechanisms. Early Human Development. 2014;90(3):137-140. https://doi.org/10.1016/j.earlhumdev.2014.01.009

- For more than 6 authors, the first 6 should be listed, followed by et al.
  Example:
  Kang HK, Kim TB, Kim KH, Kim MJ, Kim JH, Kim HY, et al. Development and effect of a metabolic syndrome prevention program for university students using mobile application. Child Health Nursing Research. 2014;20(3):205-214. https://doi.org/10.4094/chnr.2014.20.3.205
- Journals on the internet
  Example:
  Yoon SH, Kim SJ. A study on the relativeness between safety knowledge and safety behavior of elementary school children. Journal of the Korean Society of School Health. [Internet]. 2012 June [cited 2017 November 7];25(1):39-50. Available from: http://www.jkssh.or.kr/journal/view.html?uid=81&page=&sort=&scale=10&all_k=&s_t=&s_a=&s_k=&s_v=25&s_n=1&spage=&pn=search&year=&vmd=Full
- Newspaper articles
  Example:
  Cho CU. Stem cell windpipe gives Korean toddler new life. The Korea Herald. 2013 May 2;Sect. 01.

(3) Books

① Reference to an entire book
Example:
Brown B. Braving the wilderness: The quest for true belonging and the courage to stand alone. 1st ed. Random House: 2017. p. 132.
Example:
Peate I. The student's guide to becoming a nurse. 2nd ed. John Wiley & Sons; 2012. p. 59-90.
Example:
Min KA, Kim CG. Nursing management. Knowledge & Future; 2012. p. 45-62.

② Chapter in an edited book
Example:
Bochner BH. Identification of nodal metastases: The role of iron oxide enhanced MRI. In: Lee CT, Wood DP, Editors. Bladder cancer. 1st ed. Humana Press; 2010. p. 67-77.

③ Entire books on the internet
Example:
Radley DC, How SKH, Fryer AK, McCarthy D, Schoen C. Rising to the challenge: Results from a scorecard on local health system performance, 2012 [Internet]. Commonwealth Fund; 2012 March [cited 2017 February 8]. 14 p. Available from: http://www.commonwealthfund.org/~/media/files/publications/fund-report/2012/mar/local-scorecard/1578_commission_rising_to_challenge_local_scorecard_2012_finalv2.pdf

(4) Scientific and technical reports

Example:
Korean Women's Development Institute. 2015 National multicultural family survey report. Survey Report. Seoul: Ministry of Gender Equality & Family; 2016. Report No.: MOGEF2016-3.
Example:
Won YJ, Shin HR, Jeong GW, Shin AS, Gong HJ, Oh CM, et al. Cancer registration & statistics branch, division of cancer registration & surveillance. National Cancer Control Institute Annual Report. Seoul: National Cancer Center; 2012 November. Report No.: 2012.11-13520000010145-10.

(5) Unpublished theses or dissertations

Example:
Lee YH. Development and effects of nocturnal emission and menstruation education program using CAI for Korean elementary school children [dissertation]. Seoul: Ewha Womans University; 2010. p. 1-118.
Example:
Choi JW. Clinical characteristics and treatment outcomes of pediatric neurofibromatosis type 2: Neurosurgical series [master's thesis]. Seoul: Seoul National University; 2013. p. 1-45.

(6) Conference proceedings

Example:
Bell JM. Highlights from the 10th international family nursing conference. Making family nursing visible: From knowledge building to knowledge translation 10th international family nursing conference; 2011 June 24-48; Kyoto International Conference Center. Kyoto: Sage Publications; 2012. p. 135-139.

(7) Web

Example:

Statistics Korea. Cause of death statistics in 2015 [Internet]. 2016 [cited 2016 September 27]. Available from: http://kostat.go.kr/portal/eng/pressReleases/8/10/index.board?bmode=read&bSeq=&aSeq=357968&pageNo=1&rowNum=10&navCount=10&currPg=&sTarget=title&sTxt=

Example:

Statistics Korea. 2014 Maternal birth rate by age [Internet]. 2014 [cited 2015 February 10]. Available from: http://kosis.kr/index/index.do

7. Tables and Figures format

1) Table formatting

① All lines are to be single. Vertical lines should not be used.

② The title of a table should appear above the table. The first letter of important words in the title should be capitalized (title case).

Example: Table 1. Responses to Question Types

③ Tables should be numbered consecutively, e.g., Table 1., Table 2., and so on.

④ Table data should be explained in the footnotes. All abbreviations used in the tables should be defined in the footnotes of every table in which they appear.

Example: HR, heart rate; T, temperature.

⑤ In a table, use a superscript lowercase letter to indicate each footnote. The tables should be placed beneath the footnotes.

Example: [a)]Surviving case; [b)]Deceased case.

⑥ If the value of a decimal exceeds 1, a 0 should appear before the decimal point; otherwise, nothing should appear before the decimal point.

Example: $t = 0.26$, $F = 0.92$

Example: $p < .001$, $r = .01$, $R^2 = .61$

⑦ The statistical significance (p value) should be written without a footnote and should be rounded to three decimal places. (For example: $p = .003$)

If p is 0.000, then indicate that p is less than 0.001 ($p < .001$).

If p is 1.000, then indicate that p is greater than 0.999 ($p > .999$).

2) Illustration and Photograph Format Rules

① The title should appear below an image. Only the first letter of the first word should be capitalized (sentence case).

Example: Figure 1. Mean responses to questions by student grade categories.

② The size of the image should be 102 × 152 mm (4 × 6 inches). Larger images may be permitted; however, each image should not exceed 203 × 254 mm (8 × 10 inches).

③ If one figure contains 2 or more images, consecutive alphabet letters should be used to distinguish among the images.

Example: Figure 1-A, Figure 1-B

④ The photomicrograph of a tissue sample, the region from which the tissue was extracted, and the staining method should be noted. The magnification scale must be included.

⑤ The following symbols should be used in graphs in the following order: ●,■,▶,◆,○,□,▷,◇.

8. Quotations from Other Sources

Citations may follow any style, for example, NLM, APA, or others.

IV. Manuscript Submission, Review, and Publication Process

1. Submission process

1) Before submission

- The authors can use any files, such as MS Word, .hwp, and so on.
- Manuscripts must be submitted through the CHNR website (http://www.e-chnr.org/) or CHNR peer review system (http://www.chnr-submission.org/).
- Authors may review the submission instructions and access all submission forms, including the author checklist.

2) During submission

(1) Preview: The editorial committee of editorial staff members initially evaluates each submission. The main goal is quickly selecting which papers should not be put up for peer review and whether to send them for review. In order to prevent delays for authors who might want to seek publication elsewhere, papers that

do not meet basic standards or are unlikely to be published regardless of a favorable peer review, for example, because their novel contribution is insufficient or the relevance to the discipline is unclear, may be rejected at this stage.

(2) Peer review process

- All manuscripts are treated as confidential and peer-reviewed by experts in the field.
- The manuscripts are reviewed within a few days of submission to determine whether they adhere to the journal's policies and fit the submission guidelines. Any submission may be rejected for publication by the Editorial Board without cause.
- More details on other pertinent regulations are available on the journal's website. Should there be any questions on how to use the online submission system, authors may contact the editorial office of CHNR.

3) After the acceptance of the manuscript

After the acceptance of the manuscript, the author must submit the copyright transfer agreement and conflict of interest disclosure statement. All forms (the author's checklist, copyright transfer agreement, and disclosure of conflicts of interest) are available on the websites of the journal (http://www.e-chnr.org/) and the Korean Academy of Child Health Nursing (http://www.childnursing.or.kr).

All authors should print their names and sign the copyright transfer agreement and conflict of interest disclosure form.

2. Peer review process

1) Number of reviewers

Two or more reviewers and the editor will conduct a double-blind peer review of each of these manuscripts.

2) Peer review process and the author's response to the reviewers' comments

There is a two-week peer review period, and the first decision is made after the evaluation is finished. Following the review, the Editorial Board will decide between the options: acceptable options include minor revision, major revision, or rejection. The Editorial Board may request authors to make changes to the manuscript in response to reviewers' comments. The author should reasonably indicate if the reviewer's opinion is unacceptable or if the reviewer is thought to have misinterpreted the data. The authors should try their best to comply with any requests made by the reviewers to modify the manuscript.

After making changes to the manuscript, the author should upload the updated files along with a response to each reviewer's comment. Revisions from the author must be finished within 15 days of the request. The Editorial Board will inform the author if it is not received by the deadline. The author should discuss an extension with the Editorial Board if they want to prolong the revision window past 15 days. Up to two rounds of the manuscript evaluation process may be offered. The Editorial Board may consider further review if the authors request it. The Editorial Board will ultimately decide whether to approve the submitted manuscript for publication and may, if necessary, ask for additional alterations, edits, and deletions to the article text. Statistical editing is also done if a statistician needs to review the data professionally.

The editor-in-chief of CHNR will make the final decision regarding the manuscript's publication based on the reviewers' comments and the scientific merits of the manuscript. Any potential or existing conflict and issues in the manuscript must be discussed in detail with the Editorial Board.

All manuscripts from editors, employees or editorial board members are processed the same way as other unsolicited manuscripts. Editors will not handle their own manuscripts even if they are commissioned ones. During the review process, they will not engage in the selection of reviewers and the decision process.

V. Article-processing Charge

After the acceptance of the manuscript, the author is responsible for the following fees: a publication fee, a special typesetting fee, and the printing fee for each volume of the paper.

Upon acceptance, an article-processing charge (APC) of 600 USD (600,000 Korean won) per article is requested from the corresponding author.

Authors in developing countries (https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/publication/ldc_list.pdf) may be exempt from author fees after negotiation with the Editorial Board.

If at least one of the authors is a Korean Academy of Child Health Nursing member, the paper will qualify for a discounted submission.

VI. Copyright, Open Access Policy, and Data Sharing Policy

1. Copyright

1) After the acceptance of the manuscript, the author must submit the copyright transfer agreement to the Korean Academy of Child Health Nursing. All authors should print their names and sign the copyright transfer agreement.

2) All manuscripts published in CHNR are protected by copyright. The copyright and the transfer right of the digital content of the published paper and journal are owned by the Korean Academy of Child Health Nursing. All authors should agree to the copyright transfer during the submission process.

2. Open access policy

Child Health Nursing Research (CHNR) is an open-access journal. Articles are distributed under the terms of the Creative Commons Attribution - Non Commercial - No Derivatives (CC BY-NC-ND) license, which permits copying and distributing the material in any medium or format in unadapted form only, for noncommercial purposes only, and only so long as attribution is given to the CHNR. This is in accordance with the Budapest Open Access Initiative definition of open access. It also follows the open access policy of PubMed Central at United States National Library of Medicine

Table 3. Examples of data sharing statements that fulfill the requirements of the International Committee of Medical Journal Editors.

Element	Example 1	Example 2	Example 3	Example 4
Will individual participant data be available (including data dictionaries)?	Yes	Yes	Yes	No
What data in particular will be shared?	All individual participant data collected during the trial, after deidentification.	Individual participant data that underlie the results reported in this article, after deidentification (text, tables, figures, and appendices).	Individual participant data that underlie the results reported in this article, after deidentification (text, tables, figures, and appendices).	Not available
What other documents will be available?	Study protocol, statistical analysis plan, informed consent form, clinical study report, analytic code	Study protocol, statistical analysis plan, analytic code	Study protocol	Not available
When will data be available (start and end dates)?	Immediately following publication. No end date.	Beginning at 3 months and ending at 5 years following the article publication.	Beginning at 9 months and ending at 36 months following the article publication.	Not applicable
With whom?	Anyone who wishes to access the data.	Researchers who provide a methodologically sound proposal.	Investigators whose proposed use of the data has been approved by an independent review committee (“learned intermediary”) identified for this purpose.	Not applicable
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