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Children's Coping Strategies for Chemotherapy-Induced Nausea and Vomiting

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Pediatric cancer treatment often includes the use of chemotherapy agents that can cause multiple and sometimes severe side effects. Chemotherapy-induced nausea and vomiting (CINV) is a common occurrence, with as many as 60% of pediatric patients with cancer reporting nausea or vomiting at some point during chemotherapy treatment (Tyc, Mulhern, & Bieberich, 1997). Despite the prevalence of CINV, the actual frequency and duration of nausea and vomiting among children throughout chemotherapy treatment is not well documented. CINV has been reported as one of the most feared and distressing side effects of cancer treatment (Holdsworth, Raish, & Frost, 2006; Miller & Kearney, 2004). Poorly controlled CINV has been linked to physical and psychosocial consequences including anorexia, malnutrition, fluid and electrolyte imbalances, poor functional status, and anxiety (Dewan, Singhal, & Harit, 2010; Miller & Kearney, 2004). Those issues can make pediatric patients vulnerable to additional complications, treatment delays, and decreased quality of life. In addition, CINV can have significant financial consequences, such as loss of work for the caregiver and a need for increased medical visits (Miller & Kearney, 2004).

Chemotherapy agents are classified into groups based on their unique emetic potential (see Figure 1). Highly emetogenic chemotherapy (HEC) medications are likely to cause nausea or vomiting 90% of the time, whereas moderately emetogenic chemotherapy (MEC) medications are likely to cause nausea or vomiting 30%–90% of the time (Schwartzberg, 2007). To avoid detrimental outcomes in children who are receiving chemotherapy agents that are likely to cause nausea and vomiting, offering strategies to minimize or eliminate CINV is vital. However, caregivers must fully understand the symptom experience to recommend effective strategies.

Purpose/Objectives: To identify anticipatory, acute, and delayed chemotherapy-induced nausea and vomiting (CINV) frequency and coping strategies used among pediatric patients with cancer.

Design: Prospective, cohort design.

Setting: A pediatric teaching hospital in the southern United States.

Sample: A convenience sample of 40 children aged 7–12 years scheduled to receive either moderately emetic chemotherapy or highly emetic chemotherapy for cancer treatment.

Methods: Children completed the Adapted Rhodes Index of Nausea and Vomiting for Pediatrics and the Kidcope–Younger Version.

Main Research Variables: CINV and coping strategies.

Findings: CINV occurred during the anticipatory, acute, and delayed times, with the highest frequency occurring during the delayed time. The most frequently used coping strategies were distraction and wishful thinking, whereas the most effective strategies were social support and distraction. No statistically significant differences were observed in the frequency or efficacy of coping strategies over time.

Conclusions: CINV occurs throughout chemotherapy treatment. The most efficacious coping strategies included active and passive coping, with active coping strategies being more effective.

Implications for Nursing: Nurses should recognize that CINV occurs at all points of chemotherapy treatment. Nurses can assist children in developing active coping strategies to manage their CINV.

Conceptual Framework

Symptom Management Theory provided the conceptual framework for this study. The theory states that, to provide effective symptom management, three components need to be evaluated: the symptom

experience, symptom management strategies, and outcomes (Dodd et al., 2001). The process begins by evaluating the symptom experience, which consists of assessing the perception and response of the symptoms. With a thorough understanding of the symptom experience, management strategies can be provided to create positive outcomes (Dodd et al., 2001).

This research study evaluated the symptom experience by assessing the perception and response of CINV in children undergoing MEC or HEC. The children's perception of the symptom was assessed by quantifying nausea and vomiting frequency, duration, and distress, whereas the symptom response was assessed by documenting coping strategies that children used with their CINV. A comprehensive understanding of the CINV symptom experience will allow caregivers to propose more effective management strategies to reduce the incidence and consequences of nausea and vomiting, which can ultimately provide better outcomes in children receiving MEC or HEC.

Literature Review

Chemotherapy-Induced Nausea and Vomiting

Although CINV has been reported to occur among 60% of children undergoing chemotherapy treatment (Tyc et al., 1997), clinicians and some researchers have noted the incidence to be higher. A study of symptom occurrence among 35 children aged 7–12 years undergoing chemotherapy treatment found that 83% of the children reported acute nausea and 41% reported acute vomiting (Hockenberry et al., 2010). Another descriptive study of acute CINV in 11 children found that 100% reported nausea and 36% reported vomiting while undergoing chemotherapy treatment (Williams, Schmideskamp, Ridder, & Williams, 2006).

Studies with repeated measures found higher incidences of CINV in children and adolescents over time. A study evaluating anticipatory and delayed nausea with 66 children receiving chemotherapy found 47% of the children reported nausea prior to chemotherapy and 80% reported nausea one week after chemotherapy (Baggott et al., 2010). An adolescent study of anticipatory and acute CINV (N = 10) found that 40% reported anticipatory nausea and 20% had anticipatory vomiting, whereas 90% reported acute nausea and 30% had acute vomiting (Baker & Ellett, 2007). More studies need to be performed across time to fully identify changes in symptom experiences throughout the course of chemotherapy.

Symptoms are a distressing part of chemotherapy treatment. A qualitative study to examine symptom experiences among 39 children with cancer and their parents discovered that children never got used to

Moderately Emetogenic Chemotherapy

- Carboplatin
- Cyclophosphamide lower than 1,500 mg/m²
- Cytarabine higher than 1 g/m²
- Daunorubicin
- Doxorubicin
- Epirubicin
- Idarubicin
- Ifosfamide
- Irinotecan
- Oxaliplatin

Highly Emetogenic Chemotherapy

- Carmustine higher than 250 mg/m²
- Cisplatin higher than 50 mg/m²
- Cyclophosphamide higher than 1,500 mg/m²
- Dacarbazine
- Mechlorethamine
- Streptozocin

Figure 1. Emetogenic Chemotherapy Agents

Note. From "Guideline Update for MASCC and ESMO in the Prevention of Chemotherapy- and Radiotherapy-Induced Nausea and Vomiting: Results of the Perugia Consensus Conference," by F. Roila, J. Herrstedt, M. Aapro, R.J. Gralla, L.H. Einhorn, E. Ballatori, . . . ESMO/MASCC Guidelines Working Group, 2010, *Annals of Oncology*, 21(Suppl. 5), p. v233. Copyright 2010 by Oxford University Press. Adapted with permission.

treatment-related symptoms (Woodgate & Degner, 2003). In addition, children and parents believed that symptoms were an expected part of treatment that the child had to experience to get better (Woodgate & Degner, 2003). Additional research to examine symptom experiences during chemotherapy treatment is needed because children may not voluntarily report their experiences.

Children's Coping

Children with cancer are exposed to numerous stressors related to their diagnosis and treatment that require them to manage challenging experiences (Spirito, Stark, & Williams, 1988). Coping has been identified as a means to manage those challenging experiences and can be categorized as an active- or approach-oriented coping style or a passive- or avoidance-oriented coping style (Aldridge & Roesch, 2007). Coping research within pediatric oncology primarily focuses on managing their diagnosis. A qualitative study of 14 adolescent patients who were diagnosed with cancer within the prior two months showed an active coping style of using social support as the major way to manage their disease and treatment (Kyngas et al., 2001). In a study by Engvall, Mattsson, von Essen, and Hedstrom (2011), 56 adolescents were questioned about their coping styles related to their recent cancer diagnosis; most adolescents reported using active coping strategies of positive thinking (n = 27) and problem solving (n = 28) to manage their physical concerns about their cancer diagnosis and treatment.

Studies evaluating coping strategies for CINV among pediatric patients with cancer are lacking. Only two studies have evaluated the coping strategies of children with cancer when experiencing CINV. One study evaluated frequency and efficacy of coping strategies used for acute CINV among 57 children with various oncology diagnoses (Tyc, Mulhern, Jayawardene, & Fairclough, 1995). When experiencing nausea, 86% of patients used a passive strategy of wishful thinking and active strategies of emotional regulation and distraction, whereas 83% of patients used social support, an active coping strategy. When managing vomiting, 88% of patients used an active coping strategy of emotional regulation and 83% used a passive coping strategy of wishful thinking. The most efficacious coping strategies for CINV included social support and emotional regulation, which are active coping strategies. Tyc et al.'s (1995) study showed that pediatric patients use a variety of active and passive strategies to cope with acute CINV, but active coping strategies are most effective. Another study evaluated the frequency of coping strategies for anticipatory CINV among 59 children with various oncology diseases (Tyc et al., 1997). About 90% of patients in the study reported using active coping strategies of distraction, emotional regulation, and social support, as well as a passive coping strategy of wishful thinking, to manage anticipatory CINV. No efficacy was evaluated. Tyc et al.'s (1997) study again showed that active and passive strategies were used for CINV. Some have speculated that passive coping styles have short-term benefit with acute stressors, such as bone marrow or lumbar puncture procedures; however, the long-term use of passive coping strategies may cause harm because of the repression or avoidance of adjusting to the stressor (Aldridge & Roesch, 2007).

Additional research is needed to assess coping strategies used throughout the chemotherapy course so that children's responses to CINV can be recognized. In addition, the efficacy of active and passive coping strategies in relation to CINV should be analyzed so the most effective strategies can be promoted with future CINV experiences. The purpose of this research study was to describe the symptom experience of CINV by evaluating the frequency, duration, and distress of CINV and the frequency and efficacy of coping strategies in school-aged children before, during, and after MEC or HEC treatment.

Methods

Setting and Sample

A convenience sample of 40 patients with cancer was recruited from a large pediatric teaching hospital in the southern United States. Children were recruited from the inpatient and outpatient settings of a cancer center and bone marrow transplantation (BMT) unit. Although

oncology and BMT treatments vary in intensity, MEC and HEC agents have specific definitions that allow the treatment groups to be combined for comparison.

A sample size of 40 was needed to make estimates with a sampling error of no higher or lower than 5% at the 95% confidence level. Sample size was established using determinations from health studies (Lemeshow, Hosmer, Klar, & Lwanga, 1993). Inclusion criteria were children aged 7–12 years who were English speaking, had a diagnosis of cancer, and were scheduled to receive either MEC or HEC. Children completed at least one previous cycle of chemotherapy to have some potential experience with side effects to accurately evaluate anticipatory CINV. Children were excluded from the study if they or their primary caregiver did not speak English because instruments used for the study only are available and validated in English.

Instruments

Children were identified as having nausea or vomiting through a self-reported survey using the **Adapted Rhodes Index of Nausea and Vomiting for Pediatrics (ARINVc)**. The survey is a six-item patient-rated tool evaluating the frequency, duration, and distress of nausea and the frequency, amount, and distress of vomiting over the prior 12 hours. Patients rate their feelings on a five-point Likert-type scale ranging from 0 (no feelings are present) to 4 (significant nausea or vomiting). The survey has a total potential score of 24, with higher scores indicating more significant nausea or vomiting. The ARINVc is a modification of the original Rhodes Index of Nausea and Vomiting; no reliability has been established for the ARINVc, but the original instrument has a Cronbach alpha of 0.89–0.97 and a split-half procedure of 0.83–0.99 (Rhodes, Watson, & Johnson, 1984). Concurrent validity was established between the ARINVc and the National Cancer Institute nausea and vomiting grading criteria ($r = 0.52–0.88$, $p < 0.01$) (Lo & Hayman, 1999).

The **Kidcope–Younger Version** was used to evaluate patients' coping. The Kidcope is a 15-item questionnaire that assesses 10 general coping strategies (5 active and 5 passive coping strategies). The child is asked to complete yes or no questions regarding the use of various coping strategies. If the child reports yes, then he or she completes a three-point Likert-type scale on the effectiveness of the strategy, with higher scores indicating more effective help from the coping strategy. Reliability of the tool was determined with test-retest correlations. Correlations of 0.56–0.75 were obtained when participants rated their coping on the same personal stressors 3 days apart, and similar correlations of 0.41–0.83 were obtained when participants rated their coping 3–7 days apart; however, correlation declined to 0.15–0.41 when coping was rated 10 weeks apart (Spirito et al., 1988). Criterion-related

Table 1. Sample Characteristics

Characteristic	n
Gender	
Male	32
Female	8
Ethnicity	
Caucasian	22
Hispanic	8
African American	5
Other	5
Age (years)	
7	6
8	5
9	9
10	7
11	6
12	7
Cancer diagnosis	
Leukemia	18
Solid tumor	10
Lymphoma	6
Medulloblastoma	6
Chemotherapy	
Moderately emetic	30
Highly emetic	10
Radiation	
Received radiation	4
No radiation	36
Bone marrow transplantation	
None	29
Autologous	6
Allogeneic	5

N = 40

validity was demonstrated with concurrent validity showing adequate correlation between the Kidcope and the Coping Strategies Inventory (Spirito et al., 1988). Construct validity was supported with the known-groups technique showing statistically significant differences between psychologically sound and psychologically distraught children (Spirito et al., 1988).

Procedure

The institutional review board of the Baylor College of Medicine in Houston, TX, approved the study. Eligible patients and their parents or legal guardians were introduced to the study by the primary investigator or the research coordinator. If they agreed to participate, a consent and separate assent were signed. Patients were included in the study for one chemotherapy course consisting of any MEC or HEC agent that was delivered in either an outpatient or inpatient setting. The first data collection to evaluate anticipatory CINV occurred within 48 hours prior to the MEC or HEC administration, the second data collection to evaluate acute CINV occurred within 24 hours of the MEC or HEC agent infusion, and the third data collection to evaluate delayed CINV occurred within 24 hours and

up to seven days after the last administration of the MEC or HEC agent. At each data collection time point, patients completed the ARINVC and Kidcope questionnaires. The research coordinator or primary investigator reviewed the completed tools at each time point to ensure no missing data.

Data Analysis

SPSS®, version 15.0, was used for statistical analyses. Univariate descriptive statistics were used to determine frequencies, measures of central tendency, and variability for the ARINVC and Kidcope questionnaires. A one-way repeated-measures analysis of variance (ANOVA) was used to evaluate whether CINV scores, frequency of coping strategies, or efficacy of coping strategies differed significantly across time. If significance was noted, a post hoc analysis using Bonferroni's test was used to identify where the differences occurred.

Results

Recruitment occurred from May 2009 to June 2010. Four patients who were approached for the study declined to participate for various reasons (e.g., wanting financial compensation, did not want to discuss their CINV). Patients completed the study instruments at all data collection times. Characteristics of the 40 children who participated in the study are listed in Table 1. Children's ages were distributed among the 7–12 year range; however, most children in the study were male and Caucasian. More patients received MEC than HEC, whereas few received concurrent radiation therapy or a BMT. All of the patients who had concurrent radiation therapy received a BMT.

Data collection for the anticipatory time point occurred within 48 hours prior to MEC or HEC administration, and 39 of 40 children were outpatients during the anticipatory time point (see Table 2). Children were more commonly hospitalized during the acute data collection time point. The mean data collection for delayed CINV

Table 2. Patient Location During Data Collection Time Points

Time Point and Location	n
Anticipatory	
Outpatient	39
Inpatient	1
Acute	
Outpatient	18
Inpatient	22
Delayed	
Outpatient	32
Inpatient	8

N = 40

occurred at 4.9 days (SD = 2.3), with a range of 1–7 days after chemotherapy. Most children were outpatients during the delayed data collection time points.

Chemotherapy-Induced Nausea and Vomiting

Patients reported nausea or vomiting during all three time periods: 12 patients (30%) experienced anticipatory CINV, 22 patients (55%) had acute CINV, and 28 patients (70%) had delayed CINV. The total scores for CINV, representing the frequency, severity, and distress of nausea and vomiting, steadily increased over time. A repeated measures ANOVA was conducted with the total CINV scores to evaluate the effect of patients receiving BMT versus chemotherapy alone at the three assessment periods. The between-subjects effect was not significant for total CINV scores. Patients reported the highest mean score during the delayed time frame (see Figure 2). A repeated measures ANOVA was conducted to evaluate the change of patients' reports of anticipatory, acute, and delayed CINV. The analysis revealed a statistically significant change across time, $\Lambda = 0.65$, $F(2, 38) = 10.243$, $p < 0.001$. Follow-up pair-wise comparison testing using the Bonferroni approach showed statistically significant changes between anticipatory and acute CINV scores ($p < 0.05$) and between anticipatory and delayed CINV scores ($p < 0.001$). CINV was highest after the chemotherapy administration during the delayed time period. Reliability of anticipatory, acute, and delayed CINV scores using the ARINVc among the 40 children in this sample showed a Cronbach alpha of 0.84–0.92.

Coping Frequency

Multiple coping strategies were reported during the anticipatory, acute, and delayed time frames (see Figure 3). A repeated-measures ANOVA was conducted

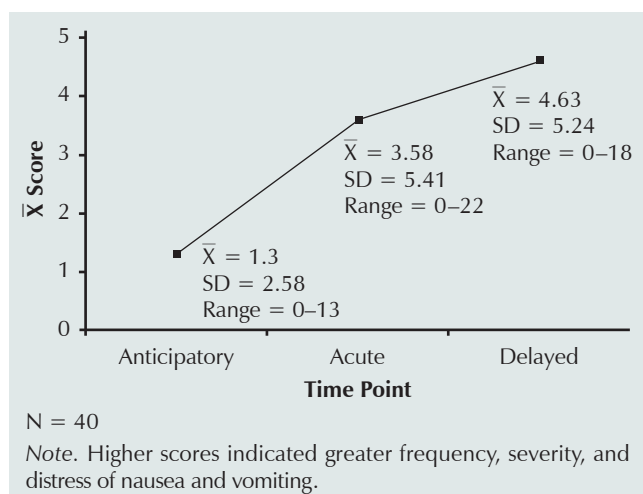


Figure 2. Estimated Marginal Means of Adapted Rhodes Index of Nausea and Vomiting for Pediatrics Scores Over Time

with the frequency of coping strategies to evaluate the effect of patients receiving BMT versus chemotherapy alone at the three assessment periods. The between-subjects effect was not significant for frequency of coping strategies. A repeated-measures ANOVA showed no statistically significant differences in the frequency of coping strategies used during the three time periods (anticipatory, acute, and delayed). The types of coping strategies used for anticipatory, acute, and delayed CINV were comparable. The most frequently used coping strategies included one passive coping strategy of wishful thinking and three active coping strategies of distraction, emotional regulation, and problem solving. Active coping strategies were used twice as often as passive coping strategies. The most commonly used active coping strategy was distraction, which consisted of children trying to forget about their CINV or doing activities such as watching television or playing a game. The most commonly used passive coping strategy, wishful thinking, consisted of children wishing that the CINV never happened or that they could make things different. That passive coping strategy consists of an avoidance attitude, with the child not being active in managing his or her CINV.

Coping Efficacy

Patients who used coping strategies were asked to rate the efficacy of each strategy on a three-point Likert-type scale. A repeated-measures ANOVA was conducted with efficacy of coping strategies to evaluate the effect of patients receiving BMT versus chemotherapy alone at the three assessment periods. The between-subjects effect was not significant for efficacy of coping strategies. A repeated-measures ANOVA showed no statistically significant difference in the effectiveness of any coping strategy over time. Coping strategies that received the highest efficacious scores included social support, distraction, and problem solving, which all were active coping strategies (see Figure 4). Blaming others for delayed CINV was the only strategy to receive the highest score of helping a lot; however, only one child from the sample reported using this passive coping strategy.

Discussion

This research represents the first descriptive study to prospectively evaluate the frequency, duration, and distress of anticipatory, acute, and delayed CINV along with the frequency and efficacy of coping strategies used for CINV among school-aged children receiving a course of MEC or HEC. CINV was prevalent in the anticipatory, acute, and delayed time frames, with CINV frequency significantly increasing over time. Occurrences of nausea or vomiting in the current study (30%

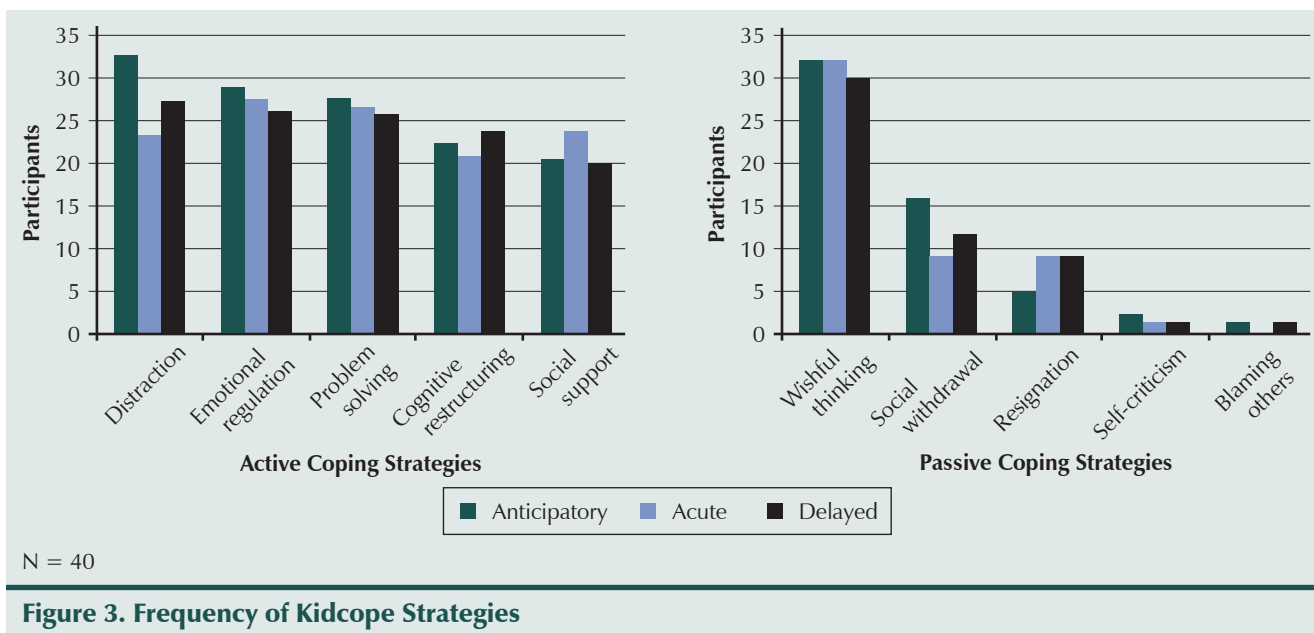


Figure 3. Frequency of Kidcope Strategies

for anticipatory, 55% for acute, and 70% for delayed) were similar to the 60% prevalence rate reported in the literature (Tyc et al., 1997). However, one should note the high occurrence of CINV in the delayed time frame. An important nursing consideration is that nausea or vomiting can occur in patients long after chemotherapy treatment has ended. Children may be reluctant to report symptoms because they expect side effects to occur from their chemotherapy treatment and just accept them. Consequently, nursing assessment of nausea and vomiting before, during, and after chemotherapy treatment is key to the management of CINV.

The most frequent coping strategies used by children participating in the current study included active and passive coping strategies consisting of distraction, wishful thinking, emotional regulation, and problem solving. The coping strategies were similar to those reported in the literature (Tyc et al., 1995, 1997). Although minimal literature is available regarding the efficacy of coping strategies, study findings mirror those reported by Tyc et al. (1995). The current participants and children in the Tyc et al. (1995) study found active coping strategies as the most effective when dealing with CINV. The most effective coping strategies were not always the most frequently used strategies by children with CINV. In addition, the efficacy of coping strategies did not significantly change over time. Children may need to be introduced to and instructed on how to use various coping strategies to make them more effective in helping to reduce or alleviate CINV.

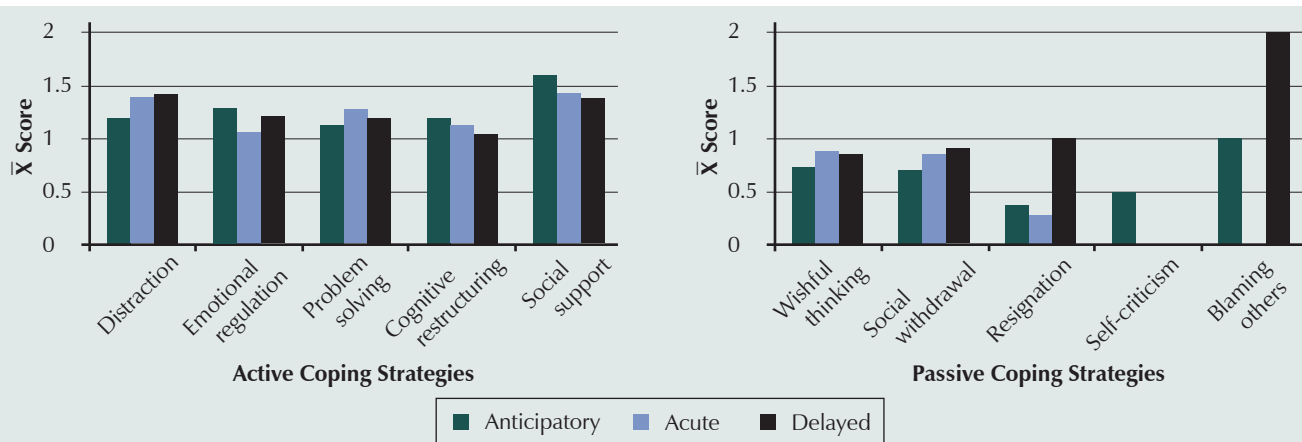
Limitations

The current study provided only a snapshot of the CINV experience because data were collected only once

during each of the three time periods. Future studies should include qualitative research that could provide a comprehensive description of CINV experiences and coping strategies. In addition, qualitative studies would allow children to express the effectiveness of specific coping strategies used for CINV in their own words. The potential of recall bias exists because participants were being questioned about their nausea and vomiting experience. Generalizability of the current study is very limited. Studies should be performed to validate the findings using a larger, more diverse sample from different institutions. Additional studies also should be conducted to evaluate differences between inpatient versus outpatient status and patients with cancer versus BMT recipients.

Conclusions and Implications for Nursing Practice

Nurses often are the healthcare providers that serve as the most common point of contact for patients and their families and, therefore, are an essential part of identifying and assisting in management strategies for CINV (Ouwkerk, 1994). Nurses need to recognize the importance of their role in caring for patients with CINV. With an increased knowledge of effective coping strategies reported in the current study, nurses can assist school-aged children with CINV to develop and use those effective strategies. Subsequently, nurses can teach primary caregivers useful strategies to relieve nausea and vomiting in children receiving chemotherapy. Pediatric oncology nurses are the ideal providers to recognize the frequency of CINV, be knowledgeable about the time periods that are most



N = 40

Note. Mean effectiveness scores indicated as follows: 0 (not effective), 1 (a little effective), 2 (a lot effective).

Figure 4. Mean Effectiveness Scores of Kidcope Strategies

distressful to children regarding CINV, and assist patients and caregivers with the use of effective coping strategies and interventions for this common side effect of childhood cancer treatment.

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Author Sheds New Light on Topics Discussed in This Article



With a simple click of your computer mouse, listen as *Oncology Nursing Forum* Associate Editor Diane G. Cope, RN, PhD, ARNP-BC, AOCNP®, interviews Cheryl Rodgers, PhD, RN, CPNP, CPON®, about the occurrence of nausea and vomiting in children receiving chemotherapy and the strategies children use to cope with this distressing side effect.

Rodgers is a clinical instructor in the Department of Pediatrics at Baylor College of Medicine and a pediatric nurse practitioner in the Cancer and Hematology Service at Texas Children's Hospital, both in Houston. Her research program focuses on symptom experiences and symptom management interventions for pediatric bone marrow transplantation recipients.

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