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Nausea, Pain, Fatigue, and Multiple Symptoms in Hospitalized Children With Cancer

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Purpose/Objectives: To describe the prevalence, frequency, severity, and distress of multiple symptoms in hospitalized children with cancer and to examine the overall symptom scores and global distress in patients reporting nausea, pain, and fatigue.

Design: Descriptive design with repeated measures.

Setting: Inpatient pediatric hematology-oncology unit.

Sample: 39 inpatients (ages 10–17) diagnosed with cancer.

Methods: Five-day data collection using the Memorial Symptom Assessment Scale (MSAS) Pediatric 10–18.

Main Research Variables: Thirty-one symptoms included in the MSAS Pediatric 10–18.

Findings: The most common symptoms (prevalence greater than 34%) were nausea, fatigue, decreased appetite, pain, and feeling drowsy. Differences in symptom experiences occurred in the presence of nausea, pain, and fatigue compared to days when they were not reported ($p < 0.001$). Prevalence of pain and fatigue symptoms decreased over the five days ($p < 0.05$), but not nausea ($p > 0.05$).

Conclusions: Nausea, pain, and fatigue were among the most prevalent symptoms in hospitalized children with cancer; however, the most prevalent symptoms were not always the most severe or distressing. The presence of these symptoms significantly impacted symptom experience, including total burden of symptoms experienced by the child (i.e., global distress).

Implications for Nursing: Additional examination of symptom management is needed. Nausea and its related symptoms have received little attention and more effective interventions are warranted. Multidimensional scales and the use of handheld electronic devices to track symptoms may be used to provide a more comprehensive assessment and treatment of symptoms.

Understanding the symptoms children with cancer experience is a valuable asset for medical professionals. Prevalence, severity, and distress of symptoms can vary throughout the course of the illness—during diagnosis, treatment, and hospitalization (Yeh et al., 2008). Although mortality rates for childhood cancer have declined by more than 50% since 1975, cancer is one of the leading causes of death in children, second only to accidents (American Cancer Society, 2011). Higher survival rates have been achieved through the use of improved treatments, aggressive chemotherapy, medication, and increased patient participation in clinical trials (American Cancer Society, 2011; Linder, 2005). However, the severity and distress of symptoms experienced by children as they undergo life-sustaining treatments continue to persist.

Since the early 2000s, an increase has occurred in the number of studies documenting symptom prevalence in children. Pediatric symptom research provides clinicians with the understanding of how growth, development, metabolism, and other physiologic factors affect a child's experience with cancer and treatment (Baggott, Dodd, Kennedy, Marina, & Miaskowski, 2009). Although several adult-focused studies on symptoms have been conducted, their findings cannot be generalized to the pediatric population because of physiologic differences between children and adults (Baggott et al., 2009). Adult-focused research provided direction for pediatric research in the areas of data collection and organization of symptoms, specifically through the use of multidimensional scales and the concept of symptom clusters (Collins et al., 2000; Hockenberry et al., 2010).

Current research has shown that symptom severity can potentially delay treatment, its effectiveness, and recovery. However, the very symptoms that potentially had a negative effect on long-term outcomes often were overlooked for the sake of disease-curing treatment interventions (Hockenberry & Hooke, 2007; Yeh et al., 2008). Acute and delayed side effects were present throughout the course of cancer diagnosis and treatment or during end-of-life

care (Hockenberry, 2004). Nausea, pain, lack of energy or fatigue, loss of appetite, and change in appearance (i.e., weight change or hair loss) were among some of the most prevalent symptoms reported among children with cancer (Baggott et al., 2009; Hedstrom, Haglund, Skolin, & von Essen, 2003). Multiple studies have cited nausea, pain, and fatigue among the most frequent, prevalent, severe, and distressing symptoms among children with cancer (Baggott et al., 2009; Collins et al., 2000; Yeh, Wang, Chiang, Lin, & Chien, 2009). In addition, these three symptoms were consistently included on multidimensional symptom checklists (Baggott et al., 2009). Gaining additional understanding of these most prevalent symptoms can be useful in supporting the child and family and, therefore, improving the treatment experience and compliance.

The specific aims of this study were to describe the prevalence, frequency, severity, and distress of physical and psychological symptoms during hospitalization in children and adolescents with cancer and to examine the overall symptoms scores and global distress in patients with nausea, pain, and fatigue.

Significance and Background

Children undergoing treatment for cancer can experience a wide array of symptoms, often occurring simultaneously (Chen & Tseng, 2006). Collins et al. (2000) identified the most common (prevalence greater than 35%) symptoms as lack of energy, pain, drowsiness, nausea, cough, and lack of appetite. Baggott et al. (2009) reported in their systematic review of multiple symptoms that the 10 most commonly occurring symptoms among nine studies were weight loss or weight gain, fever, sore throat, lack of energy, alopecia, drowsiness, bruising, round face, pain, and anorexia. Fatigue and gastrointestinal symptoms were among the symptoms that were the most frequently occurring in the studies reviewed (Baggott et al., 2009). Symptom type can vary according to etiology, including type of cancer, procedure or treatment, treatment side effects, and psychological side effects (Yeh et al., 2008). Hedstrom et al. (2003) reported that anxiety, painful medical procedures, fear of pain, fear of the unknown, and social and physical isolation were important components contributing to the distress of symptoms in children 0–19 years of age.

Nausea

Nausea was included as one of the most prevalent symptoms reported by pediatric patients with cancer (Baggott et al., 2010; Collins et al., 2000; Rheingans, 2008). Nausea is a subjective sensation or awareness in which an individual feels the urge to vomit. Symptoms of nausea are related to chemotherapy, radiation, malignant bowel obstruction, constipation, opioid use, and anxiety (Naiem et al., 2008; Santucci & Mack, 2007). Most chemotherapeutic agents are classified by their emetogenic potential (likelihood of vomiting based on a percentage score) rather than their likelihood of inducing nausea because of the subjectivity of the feeling of nausea (Robinson & Carr, 2007). Two phases of nausea exist in chemotherapy-induced nausea: (a) the acute phase, within the first 24 hours after chemotherapy administration, and (b) the delayed phase, which can extend for up to seven days after administration (Smith, Repka, & Weigel, 2005). Acute and chronic symptoms of nausea can be devastating to children, interfering with their nutritional status, desire to eat and drink, and overall quality of life (Naiem et al., 2008). Hospital length of stay has been correlated with higher levels of nausea (Baggott et al., 2010). In addition, researchers found that adolescents exhibited consistently higher levels of nausea than younger children (Dolgin, Katz, Zeltzer, & Landsverk, 1989).

Several studies in the adult population have focused on the treatment of nausea, particularly the use of new agents; however, research on this topic is lacking in the pediatric population (Holdsworth, Raisch, & Frost, 2006). Management of nausea symptoms typically includes medications (antiemetics and anxiolytics), distraction, emotional support, and family involvement (Rheingans, 2008). Nontraditional methods of treatment, including hypnosis, acupuncture, aromatherapy, and herbal therapies, are under investigation for efficacy (Jindal, Ge, & Mansky, 2008; Quimby, 2007).

Pain

Pain in children with cancer has previously been the most prevalent symptom reported in pediatric cancer literature (Hockenberry & Hooke, 2007). Pain is a symptom defined by the individual's physical, psychological, and emotional experience (Enskar et al., 2007). Not only is pain a highly prevalent symptom, it was identified as the most frightening and anxiety-provoking part of hospitalization for children with cancer (Enskar et al., 2007; Jacob, McCarthy, Sambuco, & Hockenberry, 2008). Cancer pain is multifactorial, resulting from bone and central nervous system metastases, postoperative pain, and oral mucositis, as well as procedures such as bone marrow aspiration, lumbar puncture, and venipuncture (Jacob, Hesselgrave, Sambuco, & Hockenberry, 2007). Hockenberry and Hooke (2007) reported that 40% of all pain episodes were procedure related; cancer survivors continue to relive the vivid memories of the painful procedures they endured during treatment.

The physical, psychological, and emotional consequences of pain manifest itself throughout the child's level of functioning, behavior, and coping (Varni, Burwinkle, & Katz, 2004; Woodgate & Degner, 2003). Children's experience of pain can impact their sleep

disturbance, and both short- and long-term emotional distress and the side effects of analgesia can impact their level of fatigue, nausea, and appetite (Hockenberry & Hooke, 2007; Santucci & Mack, 2007; Varni et al., 2004). Research since the early 2000s has focused on procedural pain interventions, the use of hospital pain teams and specialists, pain assessment, pharmacologic advancements in analgesia, and complementary and alternative medicine therapies (Hockenberry, 2004; Ladas, Post-White, Hawks, & Taromina, 2006). Research findings have supported pharmacologic and nonpharmacologic methods, as well as therapies such as acupuncture and hypnosis (Jindal et al., 2008; Rheingans, 2008; Rogovik & Goldman, 2007). In addition, the research has confirmed that treatment interventions must be focused on treating the physical and psychological effects of pain (Varni et al., 2004).

Fatigue

Although fatigue is one of the most frequently reported symptoms by children with cancer, it also is one of the most complex and least explained phenomena in cancer research (Lai et al., 2007; Mooney-Doyle, 2006). Cancer-related fatigue (CRF) is a condition characterized by the inability to function because of a decreased energy level ranging from tiredness to exhaustion (Gibson, Mulhall, Edwards, Ream, & Sepion, 2005; Lai et al., 2007). Research has identified cancer treatment (i.e., chemotherapy, radiation, bone marrow transplantation) as the main factor inducing fatigue (Gibson et al., 2005, Lai et al., 2007). Additional etiologies for CRF include altered muscle metabolism, endocrine dysfunction, circadian sleep disruption, anemia, and cognitive and mood disturbances (Gibson et al., 2005). The effects of fatigue on children with cancer can be devastating, both physically and psychologically. These effects include immunosuppression, anorexia, inability to concentrate, muscle wasting, and slowed physical healing (Hinds et al., 2007). For adolescents in particular, fatigue causes increased dependence on others, leading to a loss in self-confidence and increased social isolation and guilt (Mooney-Doyle, 2006).

Fatigue has a subjective and objective component and can be perceived by children, adolescents, and their parents differently (Hockenberry, 2004). Children associate fatigue with physical sensation or weakness, adolescents associate fatigue with physical or mental exhaustion, and parents associate fatigue with decreasing or total loss of energy (Lai et al., 2007; Mooney-Doyle, 2006). Study findings by Lai et al. (2007) recommend measurement tools that examine fatigue across developmental stages.

Developmental stages can confound the analysis of fatigue (Ream et al., 2006). Fatigue is one of the symptoms most commonly reported among healthy adolescent males and females (Hinds et al., 2007). Adolescents face multiple challenges and changes in terms of educational and social development and physiological and emotional change; therefore, that the combination of adolescence and cancer treatment negatively impact fatigue status is not surprising. A phenomenological study conducted by Gibson et al. (2005) further validated that fatigue was experienced by adolescents with cancer and that the symptom of fatigue complicates the achievement of normal growth and development. One study examining the effects of fatigue on quality of life in adolescent patients during and after cancer treatment (Ream et al., 2006) reported fatigue and disruption to daily activities and outings with friends up to five years after cancer treatment had ended.

Use of Multidimensional Rating Scales to Assess Symptoms

Yeh et al. (2009) examined the prevalence, frequency, severity, and distress of symptoms in Taiwanese pediatric patients with cancer aged 10–18 years. Their study focus included determining the most prevalent, frequent, severe, and distressing symptoms experienced by participants and the use of multidimensional rating scales in determining those symptoms. Limited information is available regarding the use of multidimensional scales on pediatric patients with cancer; however, symptom assessment scales are essential in identifying the most severe and prevalent symptoms experienced by children with cancer. Not only do assessment scales make it possible to measure subjective data, but this information can be used to distinguish priorities for research and efficacy of treatment (Linder, 2005). Assessment scales have been created to assess single symptoms (e.g., Childhood Fatigue Scale) and multiple symptoms (e.g., Memorial Symptom Assessment Scale [MSAS]). These scales have provided researchers with the ability to identify the presence of symptoms and, more importantly, their frequency, severity, and distress (Linder, 2005). Additional understanding of symptoms will lead to the development of more effective interventions—a critical component in improving the quality of life of pediatric patients with cancer.

Conceptual Framework

The conceptual framework for this study was guided by the University of California, San Francisco (UCSF) Symptom Management Model (Dodd et al., 2001). This model recognizes the importance of addressing symptom control, as symptoms can impact an individual's overall distress, as well as physical and psychological status. The interrelated components of symptom experience, management strategies, and outcomes are highly dependent on each other (Dodd et al., 2001). The current study examined the dimensions of symptom experience and outcomes of hospitalized children with cancer. Specifically, the study evaluated the children's

symptoms and their perception of them through the use of the MSAS to identify symptom presence and severity and distress. In addition, the outcome is symptom status, defined as a global distress index score, which helps identify the effect of symptom status on the child. The calculated global distress index score represents how symptom presence may impact the child's functional and emotional status represented within the framework.

Methods

Design

A descriptive design with repeated measures was used to examine nausea, pain, fatigue, and multiple symptoms. As part of a larger study that examined pain and symptoms in hospitalized children with cancer, participants were asked to complete the MSAS (Jacob et al., 2007). Data were collected at the time of enrollment into the study and once daily for five days. The period of recall for the original MSAS instrument was "the past week;" however, permission was granted by the author (Collins et al., 2000) and Elsevier, the publisher of *Journal of Pain and Symptom Management* (where the MSAS was initially published), to modify the instructions to include "the past day" instead of "the past week." Demographic and health-related information was collected on the day of enrollment. Of 49 patients who participated in the larger study, 39 individuals completed the MSAS 10–18 questionnaire. Children were recruited from a hematology-oncology unit of a children's hospital in the south central United States.

Eligibility Criteria

Inclusion criteria for this study were children aged 10–17 years, diagnosed with cancer, enrolled within 24 hours of admission, and having a parent or legal guardian available for consent. Although the criteria increased the risk of a heterogeneous sample, the authors were interested in describing symptom prevalence and severity during hospitalization regardless of type of cancer diagnosis, phase, and type of treatment. The treatment for symptoms is similar regardless of type of diagnosis, phase, and type of treatment.

Children were excluded from the study if they did not speak English, the parent or child refused to participate, the child was unable to complete the questionnaire, the child had neurologic or cognitive impairments that hindered completion of outcome measures, or, in the opinion of the hematology-oncology team, the patient was not appropriate for participation in the study.

Procedures

A list of all patients in the hematology-oncology unit was obtained daily. The medical team and the child's nurse were consulted prior to screening and recruitment. The child was enrolled in the study after assent and informed consent were obtained. A research assistant or the principal investigator collected data once daily during the hospitalization for a maximum of five days. Patients were instructed to complete the questionnaire at about the same time each day (during late afternoon or early evening). Demographic information was collected by the principal investigator at the time of the child's enrollment into the study. The study was approved by the institutional review board at Baylor College of Medicine.

Outcome Measures

The MSAS is a well-validated instrument (Collins et al., 2000) and has two versions: Pediatric 7–12 and Pediatric 10–18. Only data from the MSAS Pediatric 10–18 were reported in this article. The MSAS Pediatric 10–18 scale has been adapted from a well-validated version that measures multiple symptoms in adults (Collins et al., 2000). The MSAS Pediatric 10–18 measures 31 symptoms for their presence ("yes" or "no" responses), as well as frequency, severity, and level of distress. Symptom frequency, severity, and distress were measured using a Likert-type scale (four or five points, depending on the category). Frequency was determined by the question "How often did you have it?" and the responses ranged from 1 (almost never) to 4 (almost always). Severity was measured by the question "How severe was it usually?" and the responses were 1, slight; 2, moderate; 3, severe; and 4, very severe. The level of distress was measured by the question "How much did

Table 1. Participant Characteristics

Characteristic	$\bar{X}$	SD	Range
Age (years)	13.5	2.2	10–17
Characteristic		**n**	
Gender			
Female		22	
Male		17	
Ethnicity			
Hispanic		18	
Caucasian		16	
African American		5	
Diagnosis			
Leukemia or lymphoma		23	
Sarcoma		7	
Germ cell tumor		3	
Other		6	
Reason for hospitalization			
Chemotherapy		25	
Fever or neutropenia		9	
Diagnostic workup		3	
Other		2	

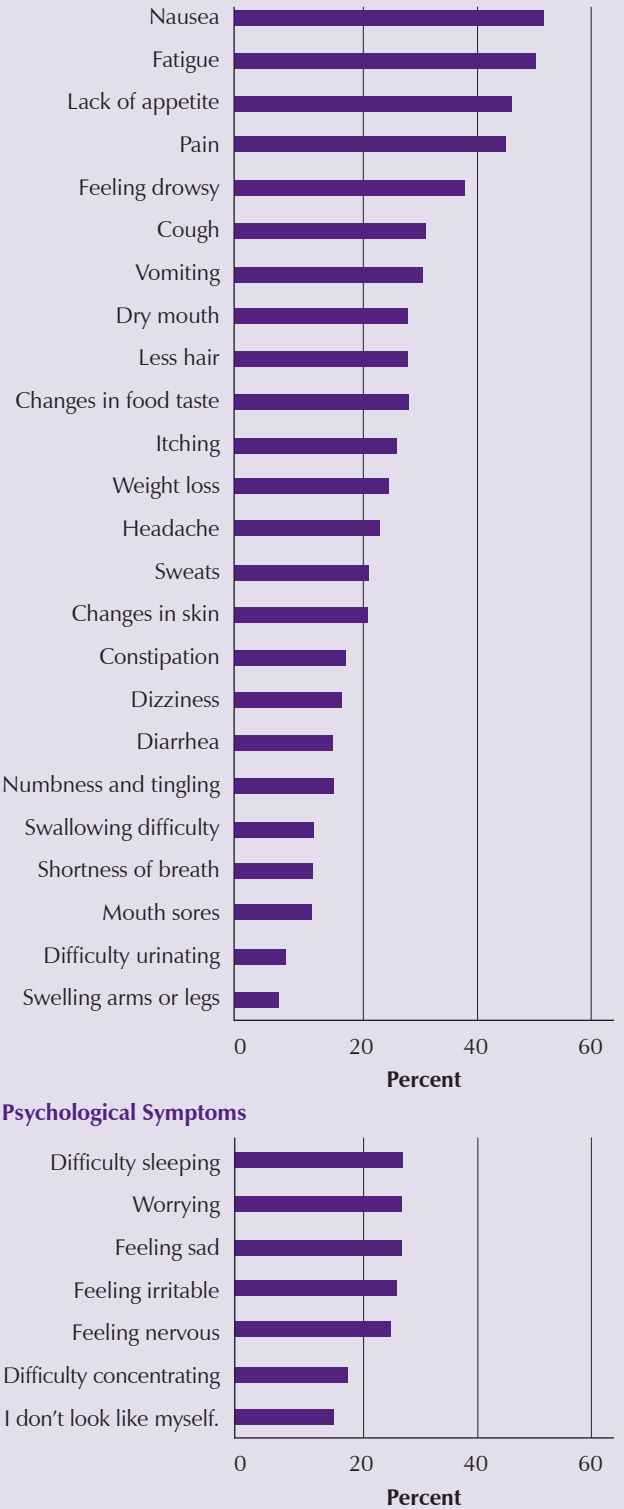
N = 39

it bother or distress you?" and the responses were 0, not at all; 1, a little bit; 2, somewhat; 3, quite a bit; and 4, very much. The MSAS was completed once each day for five days during hospitalization and took about five minutes to complete.

Twenty-three of 31 symptoms were evaluated using the three dimensions of frequency, severity, and distress. The other eight symptoms were evaluated using the two dimensions of severity and distress when frequency was unable to be measured (e.g., "I don't look like myself"). The MSAS provides three valid and reliable subscale scores: psychological, physical symptoms, and global distress index. An individual symptom score can be calculated for each symptom listed on the MSAS. The symptom score is the average score of the frequency, severity, and distress of the 23 symptoms; for eight symptoms, the average of the severity and distress. The psychological subscale score is the average of the symptom scores for six psychological symptoms: feeling sad, worrying, feeling irritable, feeling nervous, difficulty sleeping, and difficulty concentrating. The physical symptoms subscale is the average of the symptom scores for 11 symptoms: lack of appetite, lack of energy, pain, feeling drowsy, constipation, dry mouth, nausea, vomiting, change in taste, weight loss, and dizziness. The global distress index is the average of the frequency scores for feeling sad, worrying, feeling irritable, and feeling nervous as well as the distress scores for lack of appetite, lack of energy, pain, feeling drowsy, constipation, and dry mouth (Chang, Hwang, Feuerman, Kasimis, & Thaler, 2000; Collins et al., 2000; Lobchuk, 2003; Yeh et al., 2009). The MSAS total score is the average of the mean scores for the 31 symptoms.

Reliability and validity of the MSAS Pediatric 10–18 were previously established by Collins et al. (2000). The reliability of the psychological, physical symptoms, and global distress index scores were confirmed by alpha coefficient scores greater than 0.7. The psychological, physical symptoms, and global distress index scores yielded alpha coefficients of 0.83, 0.87, and 0.85, respectively, thus establishing adequate internal consistency. Convergent and discriminate validity were confirmed by significant correlations between the MSAS Pediatric 10–18 and other measurement scales (e.g., nausea visual analog scales [VASs], global physical VAS, global psychological VAS, and Memorial Pain Assessment Card–Pediatric). Kappa analysis was used to verify concurrence ($p < 0.05$) between child and parent reports of symptom ratings. Construct validity was verified (chi square, $p < 0.01$) by improved symptom rating when a medical intervention was used (e.g., nausea score was improved when an antiemetic was used). Additional findings confirmed construct validity when greater symptoms and distress were found in inpatients and those receiving chemotherapy when compared to outpatients and those who were not receiving treatment (Collins et al., 2000).

Reliability analysis for the current study showed that the reliability coefficient among the dimensions (frequency, severity, and distress) of symptoms was



Note. Prevalence is displayed as the percentage of patients reporting the symptom throughout the number of total hospital days (N = 137).

Figure 1. Physical and Psychological Symptom Prevalence Among Patients Aged 10–17 Years

statistically significant ($p < 0.001$). Specifically, the reliability coefficient between mean frequency and mean distress score was $r = 0.93$, between mean frequency and mean severity score was $r = 0.95$, and between mean severity and mean distress score was $r = 0.95$. Additional positive correlations were found between the relationship of individual symptoms and the subscale scores. Pearson's correlation coefficient determined significant relationships ($p < 0.001$) among the individual symptoms and frequency and severity ($r = 0.92$, range = 0.81–1), frequency and distress ($r = 0.83$, range = 0.69–0.95), and severity and distress ($r = 0.85$, range = 0.57–1). The positive correlations support the reliability of the modified MSAS that was used in this study.

Statistical Analysis

All data were entered into SPSS®, version 19.0, and all entries were double checked by two research assistants. Prior to analysis, descriptive statistics were used to summarize the frequency, severity, and distress of symptoms. The Likert-type scales were transformed into a 0–10 scale to standardize the metrics and be able to perform statistical tests such as correlations and t tests (Bland & Altman, 1996). The transformation to the 0–10 scale was selected because the metric is common and familiar to clinicians (von Baeyer & Hicks, 2000). The psychosocial, physical, global distress index, and overall symptoms scores were calculated using these transformed data.

MSAS subscale and total scores were compared between patients exhibiting the symptoms of nausea, fatigue, and pain and those who did not. The presence of the symptom was determined by the "yes" or "no" response to the question asking whether the patient experienced the symptom in "the last day." T tests were used to assess the significance of the presence of these symptoms in comparison to those who did not. Additional correlations were calculated to investigate the impact of symptom severity on MSAS subscales and total score.

Results

Demographic information for study participants can be found in Table 1. The 39 patients who participated in this study accumulated a total of 137 patient days of MSAS data. Participants completed the MSAS questionnaire for five days. Out of 39 patients, 18 (46%) completed five days of self-report, 22 (56%) completed four days, 25 (64%) completed three days, and 33 (85%) completed two days.

Physical Symptoms

In the majority of the days that patients were hospitalized (n = 122 days; 89%), the participants reported no symptoms or mild physical symptoms (physical symptom subscale scores were $\bar{X} = 1.2$, SD = 0.9 [on a 0–10 scale], range = 0–3.5). In 11% of the days (n = 15), the participants reported moderate to severe physical symptoms (physical symptom subscale scores were $\bar{X} = 5$, SD = 1.1 [on a 0–10 scale], range = 4–7.3).

The five most prevalent physical symptoms (see Figure 1) were nausea (50.4%), lack of energy or fatigue (49.6%), lack of appetite (46.7%), pain (45.3%), and feeling drowsy (34.3%). Nausea was not only the most prevalent; it also was reported to be the most severe ($\bar{X} = 5$, SD = 2.1) and most bothersome ($\bar{X} = 4.9$, SD = 3.5). These symptoms were rated as moderately severe with a range of scores of 4–7 on a 0–10 scale (see Figure 2). The most bothersome were nausea ($\bar{X} = 5$, SD = 3.4) and pain ($\bar{X} = 4.8$, SD = 3.4). Although not among the most prevalent symptoms, the item "less hair than usual" (26%) was among the most severe ($\bar{X} = 7.2$, SD = 2.9), and the symptom of vomiting (28%) was among the most bothersome or distressful symptoms ($\bar{X} = 5.6$, SD = 3.8).

Psychological Symptoms

On the majority of the days (n = 120 days; 88%), the participants reported, on average, no or mild psychological symptoms (psychological subscale scores were

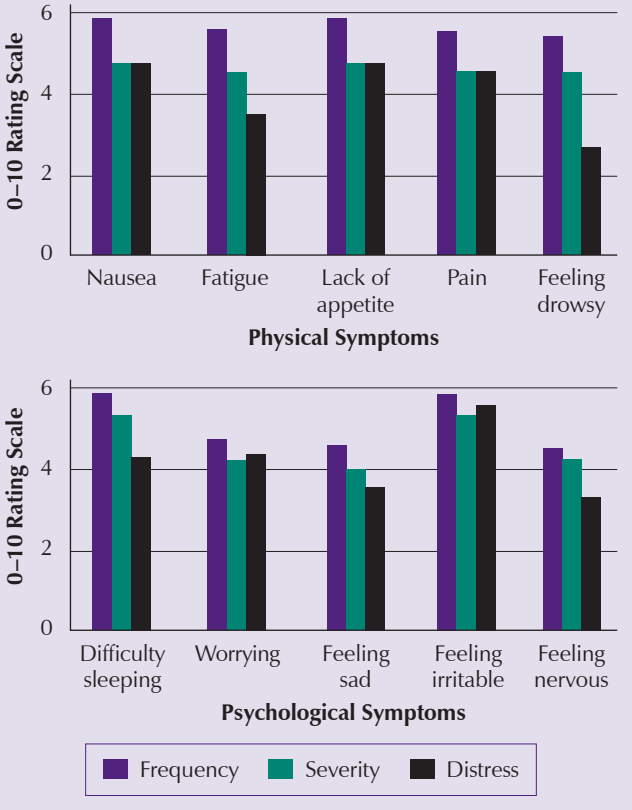


Figure 2. Frequency, Severity, and Distress of the Most Frequent Physical and Psychological Symptoms

$\bar{X}$ = 1.2, SD = 0.9 [on a 0–10 scale], range = 0–3.5). On 12% of the days (n = 16), the participants reported moderate psychological symptoms (psychological subscale scores were $\bar{X}$ = 4.8, SD = 0.9 [on a 0–10 scale], range = 3.8–6.5).

The five most prevalent psychological symptoms were difficulty sleeping (28.5%), worrying (27.7%), sadness (27.7%), being irritable (27%), and being nervous (25.5%). Among these, the most severe were difficulty sleeping ($\bar{X}$ = 5.5, SD = 2.6) and irritability ($\bar{X}$ = 5.5, SD = 2.2). The most bothersome were feeling irritable ($\bar{X}$ = 5.7, SD = 2.9) and worrying ($\bar{X}$ = 4.7, SD = 2.9).

Overall Symptoms Scores

On the majority of days (n = 130; 95%), the participants reported, on average, no overall symptoms or mild overall symptoms (MSAS total scores were $\bar{X}$ = 1, SD = 0.9 [on a 0–10 scale], range = 0–3.4). In 5% of the days (n = 7), the participants reported moderate overall symptoms (MSAS total scores were $\bar{X}$ = 4.7, SD = 1.2 [on a 0–10 scale], range = 3.6–6.6).

Global Distress Index

On the majority of the days that patients were hospitalized (n = 122; 89%), the participants reported no global symptom distress or mild global symptom distress (global distress index scores were $\bar{X}$ = 0.9, SD = 0.9 [on a 0–10 scale], range = 0–3.3). On 11% of the days (n = 15), the participants reported moderate global symptom distress (global distress index scores were $\bar{X}$ = 4.7, SD = 1.1 [on a 0–10 scale], range = 3.5–6.5).

Nausea

Significant differences in symptom experiences were found in the days when nausea was reported compared to the days when nausea was not reported. The mean differences ranged from 1.2–1.8 on a 0–10 scale ($p < 0.001$ for the physical [$\bar{X}$ = –1.8, SD = 0.2], psychological [$\bar{X}$ = –1.3, SD = 0.2], total symptoms [$\bar{X}$ = –1.2, SD = 0.2], and global distress index [$\bar{X}$ = –1.8, SD = 0.2] scores) (see Table 2 and Figure 3). The number of patients reporting nausea did not change significantly over the five days (23 of 39 patients [59% on day 1] versus 6 of 18 patients [33% on day 5], $p > 0.05$).

Pain

Significant differences were noted in symptom experiences in the days when pain was reported compared to the days when pain was not reported. The mean differences ranged from 1.3–1.7 on a 0–10 scale ($p < 0.001$ for the physical [$\bar{X}$ = –1.7, SD = 0.2], psychological [$\bar{X}$ = –1.4, SD = 0.2], total symptoms [$\bar{X}$ = –1.3, SD = 0.2], and global distress index [$\bar{X}$ = –1.6, SD = 0.2] scores) (see Figure 3 and Table 3). The number of patients reporting pain decreased significantly over the five days (22 of 39 patients [56% on day 1] versus 5 of 18 patients [28% on day 5], $p < 0.05$).

Table 2. Comparison of Physical, Psychological, Total (MSAS), and Global Distress Index Symptom Scores Between Days With and Without Nausea

Scale	n	$\bar{X}$	SD	$\bar{X}$ Diff	SED	95% CI
Physical*						
No	68	0.7	0.9			
Yes	69	2.5	1.6	–1.8	± 0.2	[–2.2, –1.4]
Psychological*						
No	68	0.6	0.8			
Yes	69	1.9	2	–1.3	± 0.3	[–1.8, –0.8]
Total (MSAS)*						
No	68	0.6	0.6			
Yes	69	1.7	1.4	–1.2	± 0.2	[–1.5, –0.8]
Global distress index*						
No	68	0.7	0.9			
Yes	69	2	1.7	–1.2	± 0.2	[–1.7, –0.8]

* $p < 0.001$ for all

CI—confidence interval; diff—difference; MSAS—Memorial Symptom Assessment Scale; SED—standard error of the difference

Note. Number of days is represented with n value.

Fatigue

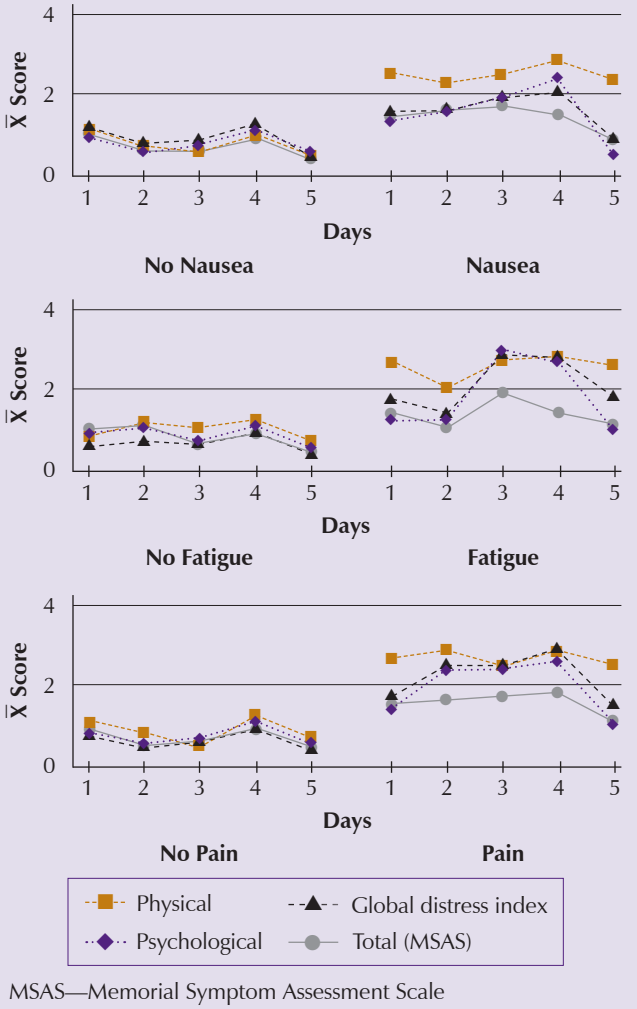
Significant differences also were noted in symptom experiences in the days that fatigue was reported compared to those days when fatigue was not reported. The mean differences ranged from 1.3–1.7 on a 0–10 scale ($p < 0.001$ for the physical [$\bar{X}$ = –1.6, SD = 0.2], psychological [$\bar{X}$ = –1.3, SD = 0.3], total symptoms [$\bar{X}$ = –1.1, SD = 0.2], and global distress index [$\bar{X}$ = –1.6, SD = 0.2] scores) (see Figure 3 and Table 4). The number of patients reporting fatigue decreased significantly over the five days (24 of 39 patients [62% on day 1] versus 5 of 18 patients [28% on day 5], $p < 0.05$).

Discussion

This current study examined the prevalence, frequency, severity, and distress of symptoms experienced by hospitalized children and adolescents with cancer. Similar to previous reports, nausea, fatigue, lack of appetite, pain, and drowsiness were identified as the most prevalent symptoms (Collins et al., 2000; Hockenberry & Hooke, 2007; Yeh et al., 2009). Although previous reports documented the prevalence of symptoms (Collins et al., 2000, Enskar & von Essen, 2008; Hedstrom et al., 2003; Yeh et al., 2009), the current study is the first to report severity and distress associated with symptoms, particularly for nausea, pain, and fatigue. The authors found that nausea was not only the most prevalent symptom, but also was the most severe and most bothersome or

distressful among all symptoms. Previous reports have demonstrated that pain and fatigue were the most prevalent symptoms (Collins et al., 2000; Yeh et al., 2009). Of interest was that the most frequent symptoms were not always the most severe or most bothersome (e.g., less hair than usual, vomiting).

Yeh et al. (2009) reported that lack of appetite is one of the most distressing symptoms among Taiwanese adolescents. Discrepancies between symptom experiences could be related to culture, treatment differences, population size, and difficulty of symptom measurability (Robinson & Carr, 2007). In traditional Chinese medicine, for example, the use of natural foods is important in the healing process. Treatment differences such as type of medications used for chemotherapy, antiemetic medications, and pain management may be important factors regarding variations in reporting of symptoms. In addition to these factors, Woodgate and Degner (2003) described the low expectations of children and their families in achieving successful symptom relief as an additional factor contributing to differences in symptom reports.



MSAS—Memorial Symptom Assessment Scale

Figure 3. MSAS Subscales and Total Scores Among Patients With and Without Nausea, Fatigue, and Pain Over Five Days

Quantification of multiple symptoms presents a challenge to researchers and clinicians. The current study is the first to transform the four- and five-point Likert-type scales in the MSAS into a 0–10 metric. The benefits are twofold: the 0–10 metric scale is familiar and widely accepted among clinicians and interpretation of the scale is easier (von Baeyer & Hicks, 2000). To achieve transformed scores, the scores of 1, 2, 3, and 4 of the four-point scale were assigned the values of 2.5, 5, 7.5, and 10, respectively. The scores of 0, 1, 2, 3, and 4 of the five-point scale were assigned the values of 0, 2.5, 5, 7.5, and 10, respectively. The range of scores for the top five most severe and distressing symptoms were low on the 0–10 scale, corresponding to "slight" amount of severity and "a little bit" of distress ratings on the original MSAS. Because of the large number of items included on the MSAS that had low prevalence (less than 20%), the estimation of the overall symptoms scores and distress associated with it may be low. Yeh et al. (2009) suggested using an alternative rating scale to properly assess the symptoms in pediatric patients with cancer. As previously stated, multidimensional scales are extremely important in measuring the symptoms of this population; however, the scale may need to be redefined to focus on the more prevalent symptoms to better provide the most accurate interpretation of symptom frequency, severity, and distress.

The authors found significant differences in symptoms experiences on the days when participants reported having nausea, fatigue, or pain compared to the days when they did not report these symptoms. Participants reported higher physical and psychological symptoms, as well as a higher global distress index in the presence of nausea, pain, and fatigue. The presence of these symptoms and their impact on physical and psychological behavior may impact a child's development, treatment, and recovery. Qualitative studies of children and families' symptom experiences help illustrate the impact of symptom presence on daily living (Gibson, Aldiss, Horstman, Kumpunen, & Richardson, 2010; Woodgate & Degner, 2003). Previous studies reported that symptom presence slowed mental and developmental functioning, contributed to the need to alter the chemotherapy regimen, increased the amount of sorrow and suffering among children and family, impacted school performance and attendance, and decreased the child's freedom and participation in activities, thus impacting their feeling of normalcy (Gibson et al., 2010; Woodgate & Degner, 2003).

Pain and fatigue symptom prevalence diminished while the prevalence of nausea remained constant over the five days. Baggott et al. (2010) reported similar results for nausea in children one week after the administration of myelosuppressive chemotherapy. They reported that children who were hospitalized longer

Table 3. Comparison of Physical, Psychological, Total (MSAS), and Global Distress Index Symptom Scores Between Days With and Without Pain

Scale	n	$\bar{X}$	SD	$\bar{X}$ Diff	SED	95% CI
Physical*						
No	75	0.8	1			
Yes	62	2.5	1.6	–1.7	± 0.2	[–2.2, –1.2]
Psychological*						
No	75	0.6	1.1			
Yes	62	2	1.8	–1.4	± 0.2	[–1.9, –0.8]
Total (MSAS)*						
No	75	0.6	0.6			
Yes	62	1.9	1.4	–1.3	± 0.2	[–1.6, 0.8]
Global distress index*						
No	75	0.6	0.8			
Yes	62	2.2	1.6	–1.6	± 0.2	[–2.1, –1.2]

* $p < 0.001$ for all

CI—confidence interval; diff—difference; MSAS—Memorial Symptom Assessment Scale; SED—standard error of the difference

Note. Number of days is represented with n value.

had higher rates of nausea. Multiple factors may be attributed to the persistent nausea experience during hospitalization, possibly including ineffective symptom management, delayed phase of nausea related to type of chemotherapeutic regimen, type of cancer or tumor location, age, and gender. In addition, symptoms of nausea can lead to a lack of appetite and vomiting. The authors found that lack of appetite was more prevalent than vomiting (46% versus 28%). Research is needed to explore strategies for not only relieving nausea, but also for improving appetite and increasing effectiveness of antiemetic strategies (i.e., complementary and alternative medicine). Because of low sample size, the authors did not explore the possibility that age, gender, and type of cancer or tumor location may affect these symptom experiences.

Similar to previous studies (Jacob et al., 2007, 2008), pain symptoms experienced by children with cancer during the course of hospitalization were predominantly none or mild, and a few reported moderate symptoms. The low level of pain reported in the current study could be the result of adequate pain management, decrease in painful treatments or procedures, or failure to report by the patients. Historically, childhood cancer pain was difficult to treat because of multiple challenges among the healthcare team, including barriers to assessment, fear of opioid analgesia, and lack of empirical data to support treatment methods to control pain (Patterson, 1992). Research since the early 1990s has resulted in better use of opioid and non-opioid medication, topical anesthetic creams (e.g., EMLA®), moderate to deep sedation for invasive procedures, psychosocial support and distraction through the use of child life specialists, and the use of a specialized multidisciplinary pain team (Bryant, 2003). Quality improvement guidelines for the treatment of pain in children required hospitals to demonstrate timely pain assessments, interventions, and reassessment of pain to ensure that patients have minimal levels of pain (Oakes, Anghelescu, Windsor, & Barnhill, 2008). A higher knowledge of symptom management has been correlated with better attitudes to pain management among nurses working with children with cancer (Enskar et al., 2007). In addition, physician and nursing education in the field of pain assessment and management has helped achieve better symptom management (Enskar et al., 2007).

The presence of fatigue in children with cancer can be attributed to therapy, disturbed sleep, activity level, and treatment side effects (Ream et al., 2006). Hospitalized children have been reported to be disturbed an average of 15.32 times per night during each night of their hospitalization (Hinds et al., 2007). Children undergoing treatment have reported higher rates of fatigue and disruption to daily activities (Ream et al., 2006). Consequently, an increase in fatigue prevalence the longer the child is hospitalized seems likely; however, the current study reported lower fatigue during the course of hospitalization. The heterogeneous sample used in this study contributed to the difficulty in determining the etiology of this finding. An additional important consideration is that, unfortunately, many children and families have the expectation that symptom suffering throughout the course of cancer is an inevitable part of the disease process (Woodgate & Degner, 2003). This belief may impact the parent and patient's report of symptoms and their reassessment of symptoms following interventions (Woodgate & Degner, 2003).

Completion rates for the MSAS questionnaire did decrease (100% on day 1, 85% on day 2, 64% on day 3, 56% on day 4, and 46% on day 5) throughout the five days of data collection. This decline may have contributed to the possibility that peak symptom experience was not captured, specifically, for patients discharged after a two- or three-day course of chemotherapy. Early discharge, a child's unwillingness to participate, and change in level of care were factors contributing to the decline in survey completion rates. A hand-held electronic device-based symptom management tracking system has recently been developed to facilitate optimal data collection (Kearney et al., 2009). This tracking system, replacing paper and pencil data collection, would theoretically catch the patients that did not complete the five days of participation and record their symptom assessment as they experience changes in their plan of care (e.g., discharge, transfer to intensive care). This new technology is more patient-centered in its approach to data collection and could give a more accurate representation of symptom experience (Kearney et al., 2009).

Table 4. Comparison of Physical, Psychological, Total (MSAS), and Global Distress Index Symptom Scores Between Days With and Without Fatigue (Lack of Energy)

Scale	n	$\bar{X}$	SD	$\bar{X}$ Diff	SED	95% CI
Physical*						
No	69	0.8	1			
Yes	68	2.4	1.6	–1.6	± 0.2	[–2.1, –1.2]
Psychological*						
No	69	0.6	1			
Yes	68	1.9	1.9	–1.3	± 0.3	[–1.8, –0.8]
Total (MSAS)*						
No	69	0.6	0.8			
Yes	68	1.7	1.3	–1.1	± 0.2	[–1.5, –0.8]
Global distress index*						
No	69	0.5	0.8			
Yes	68	2.2	1.6	–1.6	± 0.2	[–2.1, –1.2]

* $p < 0.001$ for all

CI—confidence interval; diff—difference; MSAS—Memorial Symptom Assessment Scale; SED—standard error of the difference

Note. Number of days is represented with n value.

Several factors may limit generalizations and interpretability. First, variations existed in pharmacologic factors such as type of chemotherapy used for treatment, antiemetic regimen, and pain medications that may affect symptom reporting. Second, psychological factors such as presence or absence of family and friends at the child's bedside, availability of child life services, and ability to leave the patient's room (e.g., for exercise, to visit a playroom) may have influenced a child's self-report of symptoms. And third, other factors such as medications after surgical procedure, NPO status, and stage of cancer treatment may contribute to the multiple symptoms experienced during hospitalization. A major limitation to the study was the small sample size, which prevented more sophisticated analyses to account for these factors. In addition, patients who were admitted to another unit (e.g., pediatric intensive care), parents or children who refused to participate, children who did not have a diagnosis within 24 hours of admission, patients with advanced cancer, or patients not recommended by the hematology-oncology team could not be enrolled into the study and, therefore, may have different symptom experiences than the reported findings.

Conclusions and Implications for Nursing Practice

The authors examined the prevalence, frequency, severity, and distress associated with symptoms experienced by hospitalized children and adolescents with cancer and found nausea as not only the most prevalent, but also the most severe and distressing symptom. Future research is warranted to examine the impact of innovative strategies that target not only nausea, but accompanying symptoms such as lack of appetite, particularly in treatments involving highly emetogenic chemotherapy (Smith et al., 2005). Combination antiemetic therapy consisting of a 5-hydroxytriptamine-3 antagonist and a corticosteroid is the current treatment regimen of choice, with new neurokinin-1 receptor agonists (e.g., aprepitant) being investigated in the adolescent population (Smith et al., 2005). In addition to pharmacotherapy, the use of complementary and alternative medicine should be examined to determine synergistic effects with pharmacologic agents. Acupuncture, healing touch, and hypnosis are interventions that could impact those with nausea. Nursing interventions could include the use of a nausea scale, similar to a pain scale, to determine the degree of nausea so that interventions can be tailored based on severity. Additional research could ultimately impact the way nausea is treated, similar to the impact of pain scales on the treatment of pain. In addition, future studies are needed to examine the role of nausea in the outpatient and home setting, giving insight into the psychosocial aspect of nausea.

Symptom management is an essential area of research that could continue to change outcomes in children with cancer. Longitudinal studies describing how symptoms change over time within specific populations and treatment groups could help identify knowledge gaps, effectiveness of interventions, and symptom clusters. The addition of wireless hand-held technology could provide researchers with improved communication and superior data collection, providing real-time assessment of patients' symptoms, such as nausea, pain, and fatigue (Gibson, Aldiss, Taylor, Maguire, & Kearney, 2009; Jacob et al., 2010). The development of an electronic symptom management system using wireless hand-held devices could improve timely management of symptoms, facilitate communications between patient and clinicians, and could become an integral part in symptom research, paving the way for improved symptom relief.

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