

Factors Associated With Healthcare Utilization Among Children With Noncardiac Chest Pain and Innocent Heart Murmurs

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Objective To examine differences in factors related to health care utilization (HCU) among children eventually diagnosed with noncardiac chest pain (NCCP) or an innocent heart murmur (IHM).

Methods 67 pediatric patients with NCCP and 62 with IHM and their parent/guardian completed paper-and-pencil measures of psychological functioning and past HCU during an initial visit to the cardiologist's office. **Results** Children with NCCP utilized significantly more health care services compared to their IHM counterparts in the year prior to their cardiology visit. Children in the NCCP group had higher internalizing and somatic symptoms, and their parents experienced more anxious symptoms, than those in the IHM group. For the NCCP group only, child and parent psychological symptoms and parent HCU were positively related to child HCU. **Conclusions** Results identify possible child and parent psychological factors that may be the focus of interventions to reduce high rates of HCU among children with NCCP.

Key words healthcare utilization; noncardiac chest pain; psychological functioning.

Introduction

Chest pain among children is a common occurrence (Cava & Sayger, 2004) and often leads to visits to healthcare providers for further evaluation. While this symptom may indicate cardiac disease among adults, the cause of a child's chest pain is typically benign (Drossner et al., 2011; Eslick, 2010). In fact, less than 5% of pediatric chest pain cases are attributable to heart disease (Selbst, 1986), which is reflected in negative cardiac findings following diagnostic studies (Cava & Sayger, 2004; Rowe, Dulberg, Peterson, Vlad, & Li, 1990); subsequently, the vast majority of these children are diagnosed with noncardiac chest pain (NCCP). Despite these data, children's complaints of chest pain are often associated with concern about cardiovascular health and are worrisome for parents. The potential of morbidity and mortality from a serious heart condition, although improbable, leads parents to seek medical care for their child. Medical evaluation for chest pain is often extensive, and includes

radiography, electrocardiography, and other expensive diagnostic studies (Thull-Freedman, 2010). Medical approaches to ameliorating NCCP are largely unsuccessful (Cava & Sayger, 2004), and NCCP often continues for several years following diagnosis (Lipsitz et al., 2004; Selbst, Ruddy, & Clark, 1990). NCCP has been conceptualized as a disorder with both physical and psychosocial factors contributing to its development and maintenance (Gilleland et al., 2009), a pattern similar to other functional pain groups (Laurell, Larsson, & Eeg-Olofsson, 2005; Levy et al., 2004). The recurrent and chronic nature of NCCP may contribute to ongoing healthcare utilization (HCU) and associated costs. In addition to direct costs associated with healthcare, parents may experience lost wages related to absence from work in order to address their child's symptoms (Ho et al., 2008).

It is important to elucidate potentially modifiable factors beyond the child's health status that may contribute to healthcare seeking. In fact, child health status

(e.g., presence of pain) accounts for only a portion of the variance in the decision to seek healthcare services (Janicke, Finney, & Riley, 2001). Although past child HCU is the strongest predictor of future utilization, additional factors play a role in influencing the child's presentation to the physician's office (Janicke et al., 2001). For example, in related research, youth with comorbid asthma and internalizing disorders have higher rates of HCU when compared to children with asthma who do not have internalizing disorders (Richardson, Russo, Lozano, McCauley, & Katon, 2008). Additionally, child emotional distress, particularly symptoms of depression and anxiety, is associated with decisions to seek medical healthcare (Cote et al., 2003; Riley et al., 1993). Recurrent pain in children is also associated with children having additional somatic symptoms (Laurell et al., 2005), which may contribute to further visits to healthcare providers.

Parents are integrally involved in decisions to seek healthcare for their children. Thus far, there have been discrepant findings regarding the association between parental psychological functioning and child HCU. In a review of psychosocial factors related to child healthcare seeking, Moran and O'Hara (2006) document that maternal psychological functioning (e.g., higher negative affect, anxiety, neuroticism) is associated with higher child HCU. Also, higher maternal depressive symptoms are associated with more visits for their children to the Emergency Department (ED) (Bartlett et al., 2001; Flynn, Davis, Marcus, Cunningham, & Blow, 2004) and to outpatient providers (Sills, Shetterly, Xu, Magid, & Kempe, 2007). However, the presence of depression in mothers was unrelated to child HCU in a sample of children and adolescents with type 1 diabetes (Cote et al., 2003) and among a group of primary-care patients (Watson & Kemper, 1995). Parents of children with abdominal pain (Levy, Whitehead, Von Korff, & Feld, 2000; Levy et al., 2004) or other functional pain disorders (Campo et al., 2007) also demonstrate higher rates of HCU for themselves, compared to control groups. This may relate to findings in the broader literature on somatization that exposure to illness models explains a significant portion of the variance in physical symptoms within families, even after controlling for demographic and personality factors (Schwartz, Gramling, & Mancini, 1994). In fact, maternal and child experience of somatic symptoms are positively correlated (Craig, Cox, & Klein, 2002; Gilleland et al., 2009; Walker & Greene, 1989). It is possible that parent use of excessive healthcare could be viewed by their children as an appropriate reaction to pain.

The current study advances research in this area by examining retrospective HCU, child and parental

psychological factors, and parental HCU among children with NCCP. These variables were also examined among children with innocent heart murmurs (IHM), a benign cardiac condition that also results in an evaluation by a cardiologist, yet does not involve any recurrent pain symptoms. The cardiology evaluation for both patient groups is similar (Swenson et al., 1997). Patients with IHM represent an ideal control group in that both patient groups are uncertain about their diagnosis until after the evaluation by the cardiologist, and both groups are eventually given a benign cardiac diagnosis. In addition to examining between group differences, the correlations between past HCU and other study variables were examined for both groups using guidance from diathesis-stress theory (Ingram & Luxton, 2005), which has been applied to past research examining child somatic symptoms (Blount, Morris, Cheng, Campbell, & Brown, 2004; Morris, Blount, Brown, & Campbell, 2001). Blount and colleagues (2004) found a significant relationship between child and parent psychological distress and syncope among children who were prone to experiencing physical symptoms based on a diagnosis of neurocardiogenic syncope, demonstrating that environmental stressors interact with a biological diathesis to exacerbate syncope episodes. A patient's diathesis or predisposition for experiencing physical symptoms and associated HCU could be derived from a history of any of the following: greater physical symptoms, expressing psychological distress through physical symptoms, parental fear or reinforcement of children's physical complaints, or parental modeling of high HCU. For children with NCCP, who we expected to have a greater diathesis for high HCU, current stress, in the form of parent and/or child psychological distress, was expected to be significantly associated with greater HCU. Children with IHM were expected to have a lower diathesis for HCU. Thus, we did not expect current stress factors to be strongly associated with greater HCU for this group. To our knowledge, there have been no investigations of this type among pediatric patients diagnosed with NCCP. Findings from this investigation may suggest points of intervention for reducing HCU among children with NCCP, which could reduce burden on the medical system and healthcare costs.

Children with NCCP were hypothesized to exhibit higher rates of past HCU compared to children with IHM. Although prior research findings have been mixed, parents of children with NCCP were expected to report greater internalizing symptoms and more visits to healthcare providers for themselves, when compared to parents of children with IHM. Parents of children with NCCP were also expected to endorse more internalizing symptoms for their child in relation to control group

parents. In addition to between group differences, correlational relationships within the two groups were examined and contrasted. Parent perception of increased child psychological distress was expected to be associated with greater past HCU for children with NCCP than for those with IHM. Finally, it was hypothesized that increased parent psychological symptoms and higher parental HCU would be more highly correlated with past child HCU for the NCCP group than for the IHM group. Although relationships between psychological functioning and HCU may exist for children with IHM, these patients have not been shown to be as high in child distress as those with NCCP (Lipsitz et al., 2004). Thus, we expect these relationships to be significantly stronger in the NCCP group.

Methods

Participants

The final sample included 129 pediatric patients, between the ages of 8- and 18-years old, diagnosed with either NCCP (M age = 12.6 years, SD = 2.6) or IHM (M age = 12.7 years, SD = 2.6) and their parent/guardian. All participants had public or private health-insurance coverage. Characteristics of the sample are described in Table I. Potential participants were excluded if their primary language was not English (n = 1), they were not accompanied to the appointment by a legal guardian (n = 1), evaluation did not result in a diagnosis of NCCP

or IHM (n = 6) or they had a diagnosis that could account for physical symptoms and/or functional disability (e.g., cerebral palsy) or a dual diagnosis of NCCP and IHM (n = 9). Additionally, 12 potential participants did not complete all of the measures and were subsequently excluded from analyses. Eighteen (14%) families declined participation due to time demands or unknown reasons.

Measures

Demographic Questionnaire

The Demographic Questionnaire was completed by the participant's parent or guardian. It assessed child and parent demographic factors, including age, sex, ethnicity, and family structure.

HCU Questionnaire

This questionnaire was developed for this study to assess rates of child and parent HCU. Data on HCU were collected via self-report only. Parents were asked to indicate the number of visits they themselves, as well as the child participant, made to various healthcare settings, including primary-care physicians (PCP), specialists (e.g., cardiology), the ED, and inpatient hospitalizations during the past 12 months prior to receiving a diagnosis of either NCCP or IHM. Additionally, the child and parent provided the number of visits the child made to the school nurse within the past 12 months. A composite variable used in subsequent analyses was created by summing all visits within the past year to reflect overall HCU. Past research has found good agreement (r = .84) between parental report of HCU and medical record review (Craig et al., 2002). Also, correlations between the composite HCU variable and each visit type were all positive and significant: PCP (r = .805, p < .001), specialist (r = .348, p < .001), ED (r = .426, p < .001), hospitalizations (r = .259, p < .01), and school nurse (r = .733, p < .001).

Symptom Checklist-90-R

The Symptom Checklist-90-R (SCL-90-R; Derogatis, 1977) is a self-report measure that assesses symptoms of psychological distress in adults. Participants were asked to rate the degree to which they were affected by and experienced distress from symptoms during the previous 7 days. Responses to each question were rated on a 5-point Likert scale, from 0 ("Not At All") to 4 ("Extremely"). For the purpose of the present investigation, the Anxiety, Depression, and Somatization subscales were administered to the participants' caregiver. Subscale scores were converted to T scores based on parent sex, age, and clinical status. The SCL-90-R has been used as a screening instrument to assess psychological functioning in community

Table I. Participant Characteristics

Factor	NCCP (n = 67) n (%)	IHM (n = 62) n (%)
Child's sex		
Male	39 (58.2)	39 (62.9)
Female	28 (41.8)	23 (37.1)
Child's ethnicity		
Caucasian	46 (68.6)	31 (50)
African-American	17 (25.4)	22 (35.5)
Hispanic/Latino	4 (6)	1 (1.6)
Biracial	0 (0)	8 (12.9)
Parent marital status		
Single	5 (7.5)	10 (16.1)
Married/Committed partnership	52 (77.6)	42 (67.7)
Separated/Divorced	9 (13.4)	8 (12.9)
Widowed	1 (1.5)	2 (3.2)
Family income		
<\$20,000	5 (8.3)	8 (13.6)
\$20,000–34,999	9 (15)	9 (15.3)
\$35,000–54,999	8 (13.3)	9 (15.3)
\$55,000–74,999	13 (21.7)	6 (10.2)
>\$75,000	25 (41.7)	27 (45.8)

samples (Angst & Dobler-Mikola, 1984), and has demonstrated adequate validity (Peveler & Fairburn, 1990). In the current sample, Cronbach's α for the Anxiety, Depression, and Somatization scales were .87, .96, and .84, respectively.

Behavior Assessment System for Children–Second Edition Parent Rating Scales

The Behavior Assessment System for Children–Second Edition Parent Rating Scales (BASC-2 PRS; Reynolds & Kamphaus, 2004) is parent-report measure of children's psychological and behavioral functioning. Each item is rated according to frequency (Never, Sometimes, Often, Almost Always). The Child Form (PRS-C; 160 items) was used for children 8- to 11-years old and the Adolescent Form (PRS-A; 150 items) was used for children ages 12- to 18-years old. For the current study, the three subscales that comprise the Internalizing composite (i.e., Anxiety, Depression, and Somatization) were examined. Subscale scores were converted to *T*-scores. The BASC-2 PRS demonstrates solid psychometric properties (Reynolds & Kamphaus, 2004), and it has been used to assess parent-reported child psychological functioning among children with functional somatic symptoms (Hocking et al., 2010). In the current sample, Cronbach's α 's ranged from .72 to .94 for the child and adolescent versions.

Procedure

Prior to initiating data collection, Institutional Review Board approval was obtained from participating institutions. Participants were recruited on an ongoing basis from three satellite cardiology clinics in the Southeastern United States over a period of 6 years. Patients were screened for eligibility (e.g., age, presenting problem) by research personnel prior to clinic appointments. Potentially eligible patients and their families were approached by a research assistant or trained nurse practitioner in the waiting area or examination room and provided a verbal description of the study and details about their involvement. Informed consent, assent, and Health Information Portability and Accountability Act (HIPAA) authorization were obtained from interested families prior to measure completion. Caregivers completed self- and proxy-report paper-and-pencil measures while waiting to see the physician. All measures were completed prior to receiving feedback from the cardiologist about the results of the child's medical evaluation. Following the clinic visit, the patient's medical chart was accessed to collect information on medical history (for exclusion purposes) and the diagnosis from the visit.

Results

Preliminary Analyses

Chi-square analyses were conducted to determine if the two groups of interest, NCCP and IHM, differed on demographic variables. A significant difference was found in terms of ethnic composition of the groups, in that the NCCP group had significantly more Caucasian individuals, $\chi^2(3) = 13.19, p = .004$. Due to a relatively small number of individuals in each non-Caucasian category, ethnicity was dichotomized into Caucasian versus Other. To determine the appropriateness of entering ethnicity as a covariate in subsequent analyses, one-way analyses of variance (ANOVA) were conducted. Within the NCCP group only, there was a significant effect of ethnicity on child HCU, in that Caucasians had significantly more healthcare visits ($M = 7.27, SD = 7.64$), compared to non-Caucasian participants ($M = 3.86, SD = 3.25$), $F(1,125) = 4.99, p < .05$. Therefore, ethnicity was entered as a covariate for all subsequent analyses involving child HCU. No significant differences on any other demographic factors (e.g., age, sex, parent marital status, family income, health insurance status) emerged between the two groups.

To test assumptions for ANOVA, histogram plots, as well as skewness and kurtosis statistics, were examined to evaluate the distribution of each variable of interest. All variables of interest were positively skewed. Therefore, log transformations were conducted to normalize these variables. Partial η^2 was used as a measure of effect size and was interpreted using Cohen's (1988) criteria (small effect = .01, moderate effect = .06, large effect = .14).

Group Differences in HCU and Psychological Functioning

Differences in rates of child and parent HCU and scores on measures of psychological functioning were examined using analysis of covariance (ANCOVA), with ethnicity entered as a covariate. Prior to receiving a diagnosis, children with NCCP had an average of 6.18 ($SD = 6.7$) visits, while children with IHM had, on average, 3.59 ($SD = 3.2$) visits to health care providers within the past 12 months, $F(1,124) = 5.50, p = .02, partial \eta^2 = .08$. Children in both groups presented to various health care settings, with significant differences emerging for visits to the school nurse, as children with NCCP made significantly more visits than their IHM counterparts, $F(1,124) = 5.26, p = .02, partial \eta^2 = .07$. The difference between visits to the PCP approached, but did not reach, statistical significance. Rates of hospitalizations, ED admissions, or visits to medical specialists were low for both groups, and no significant differences were found for these aspects of HCU. Rates

of HCU by provider are presented in Table II. No significant difference emerged between rates of parental HCU.

In terms of child psychological factors, parents perceived children with NCCP ($M = 53, SD = 12.8$) as having greater difficulties with overall internalizing symptoms, compared to children with IHM ($M = 48, SD = 10.9$), $F(1,120) = 6.46, p = .01, partial \eta^2 = .07$. This difference was driven by parental ratings that children with NCCP ($M = 56.6, SD = 11.8$) experienced significantly more somatic symptoms than their IHM counterparts ($M = 48.8, SD = 9.3$), $F(1,120) = 18.07, p < .001, partial \eta^2 = .13$. Rates of child anxious or depressive symptoms, as reported by parents, did not significantly differ between the two groups. Tests of differences between parent psychological functioning revealed that parents of children with NCCP ($M = 49.7, SD = 12.1$) reported experiencing significantly more anxious symptoms than parents of children with IHM ($M = 44.2, SD = 10.6$), $F(1,116) = 7.49, p < .01, partial \eta^2 = .07$. No significant differences between the groups were found for depressive and somatic symptoms.

Associations between Parental and Child Factors and Child HCU

To further explore how child and parental psychological factors contributed to child HCU, correlations were conducted. Given that ethnicity significantly influenced rates of HCU within the NCCP sample, partial correlations were calculated to control for variance accounted for by ethnicity. For the IHM sample, Pearson product moment correlations were calculated given that ethnicity was not significantly associated with HCU within this sample.

Within the NCCP group, several child and parent factors were related to child HCU. With regard to the child’s emotional functioning, child HCU was positively associated with overall internalizing symptoms ($r = .41, p \leq .01$), as well as anxious ($r = .36, p \leq .01$), depressive ($r = .31, p = .02$), and somatic ($r = .31, p = .03$)

Table II. Rates of HCU by Group

Component of HCU	NCCP (n = 67)		IHM (n = 62)		p	η_p^2
	M (SD)	Range	M (SD)	Range		
Total HCU visits	6.2 (6.7)	0–36	3.6 (3.2)	0–18	.02*	.08
Primary-care provider	3.1 (2.3)	0–12	2.3 (2.0)	0–14	.06	.04
Specialty clinic	0.4 (0.8)	0–4	0.5 (1.3)	0–8	.75	.01
Emergency department	0.6 (1.1)	0–6	0.3 (0.6)	0–2	.22	.03
Hospital admissions	0.1 (0.4)	0–3	0 (0)	–	.25	.02
School nurse visits	2.1 (4.6)	0–20	0.5 (1.1)	0–5	.02*	.07
Parent total HCU visits	2.6 (3.0)	0–16	2.5 (2.0)	0–8	.52	.01

Note. η_p^2 = partial η^2 .
* $p \leq .05, **p \leq .01$.

symptoms. In terms of parental factors, child HCU was positively related to parent HCU ($r = .33, p = .02$) and parental depressive symptoms ($r = .30, p = .03$). No significant associations were found between child and parental factors and child HCU within the IHM sample. Correlations are presented in Table III.

Fisher’s r -to- z transformations were calculated to compare correlation coefficients between the NCCP and IHM groups and determine if the coefficients were significantly different (Fisher, 1932). Significant differences between the groups’ correlation coefficients were found for the following factors correlated with child HCU: child internalizing symptoms ($z = 8.20, p < .001$), anxious ($z = 5.43, p < .001$), depressive ($z = 7.06, p < .001$), and somatic ($z = 6.69, p < .001$) symptoms; parent HCU ($z = 3.95, p < .001$), and parent anxious ($z = 12.39, p < .001$), depressive ($z = 11.29, p < .001$), and somatic ($z = 6.93, p < .001$) symptoms. In all cases, correlations were positive and larger in the NCCP group than the IHM group. These data are presented in Table III.

Discussion

The present study investigated the relationship between child and parental factors and HCU among a sample of children and adolescents with NCCP and control patients with IHM. In the year prior to receiving their diagnosis, children with NCCP utilized healthcare services at a greater rate than children with IHM. Several child and parent psychological factors differed between the two groups, with the NCCP participants having more symptoms. Additionally, child and parent factors were positively associated with HCU for the NCCP group only, suggesting that both child and parent psychological functioning have a

Table III. Correlations with Child HCU for both Groups and Differences between Correlations

Factor	Pearson correlations		z-score difference between correlations	p
	NCCP ^a	IHM		
BASC-2: Internalizing composite	.41**	.19	8.20	<.001***
BASC-2: Anxiety	.36**	.21	5.43	<.001***
BASC-2: Depression	.31*	.12	7.06	<.001***
BASC-2: Somatization	.31*	.12	6.69	<.001***
Parent HCU	.33*	.22	3.95	<.001***
SCL-90-R: Anxiety	.21	-.11	12.39	<.001***
SCL-90-R: Depression	.30*	-.01	11.29	<.001***
SCL-90-R: Somatization	.17	-.01	6.93	<.001***

Note. ^aAssociations between factors and child HCU are displayed as partial correlations.
* $p \leq .05, **p \leq .01, ***p \leq .001$.

stronger influence on how often these children present for medical care, relative to families of children with IHM. These findings are consistent with hypotheses, and they extend previous research by comparing factors that may relate to HCU in children presenting to specialty healthcare providers. It is the first investigation of its kind for pediatric patients diagnosed with NCCP.

As hypothesized, children with NCCP utilized greater rates of healthcare services when compared to children with IHM. Children with NCCP made significantly more visits to the school nurse than their IHM counterparts. While school nurse visits are initiated by the child, parents may influence children's decisions to seek medical care at school. Parents may convey that it is appropriate to seek healthcare for pain or minor physical symptoms and model this behavior by frequently taking their child to a physician. There was also a trend for parents of children with NCCP to report more visits to their children's PCPs; however, this difference did not reach statistical significance. It is unclear if differences in HCU were related to complaints of chest pain or other symptoms. No differences were found in visits to medical specialists, ED visits, or hospital admissions, with rates for these aspects of HCU being low for both groups. Contrary to expectation, there was no difference in rates of parent HCU between the groups.

In terms of child psychological functioning, parents of children with NCCP reported that their children experience significantly more internalizing symptoms compared to children with IHM, which has been reported previously (Lipsitz et al., 2004). Examination of the specific components that comprise the internalizing dimension of the BASC-2 revealed that this group difference is due primarily to differences in rates of somatic symptoms, rather than anxious or depressive symptoms, lending partial support to our hypothesis. Children with NCCP experience a larger constellation of somatic symptoms than those with IHM, which may contribute to ongoing HCU (Gilleland et al., 2009).

The hypothesis related to differences in parent psychological functioning between the two groups was partially supported. As hypothesized, parents in the NCCP group experienced significantly more anxious symptoms than parents of children with IHM. This finding is consistent with past research related to presence of psychological symptoms among parents of children with functional abdominal pain (Walker & Greene, 1989), and may reflect a greater level of distress experienced by parents who have a child with unexplained chest pain. Conversely, parents who are more anxious may be more likely to have children who experience psychological and physiological (i.e., pain,

somatic symptoms) distress. Contrary to expectation, parents of children with NCCP did not report more depressive or somatic symptoms in relation to their IHM counterparts. Failure to find these between group differences may be related to relatively low endorsement of these symptoms among parents in the present sample.

Correlational relationships were also examined to assess the differential association of child and parent factors on child HCU for the two groups. As expected based on diathesis-stress theory, child HCU was significantly and positively related to several child and parent factors for the NCCP group. More specifically, parents' reports of their children's internalizing (i.e., anxious, depressive, somatic) symptoms, as well as their own depressive symptoms, were positively related to child HCU for the NCCP group only. Additionally, parental HCU was positively associated with the frequency of HCU by their child with NCCP. It is possible that parents who perceive their child to have both pain and internalizing symptoms may be increasingly likely to seek medical care for their child. This indicates that for children with NCCP, the combination of chest pain symptoms and heightened child or parent psychological distress are associated with increased HCU. Furthermore, high HCU may be part of a larger internalizing pattern of behavior within the family. As hypothesized based on diathesis-stress theory, there were no significant associations found between child and parent factors and child HCU in the children diagnosed with IHM. Furthermore, the correlations with child HCU were significantly different between the two groups, suggesting that these relationships are unique to children with NCCP. Additionally, the lack of significant correlations between child and parental factors and child HCU for the IHM group indicates that decisions to visit healthcare providers do not appear to be influenced by parent or child psychological functioning for these children.

Interestingly, the ethnic composition of the NCCP and IHM groups significantly differed. Specifically, there were significantly more Caucasian participants in the NCCP group when compared to the IHM group. Given that ethnic composition was not reported in some previous research comparing children with NCCP and IHM (Lipsitz et al., 2004), it is unclear if ethnic differences are unique to the current sample. In the current investigation, ethnicity was differentially related to child HCU according to group. Specifically, Caucasian children with NCCP utilized more healthcare services in relation to non-Caucasian children with NCCP. No ethnic differences in HCU were found the IHM group. It is unclear why ethnicity contributed to child HCU for the NCCP sample in the present study. Past research suggests that access to healthcare coverage

contributes to HCU (Newacheck, Stoddard, Hughes, & Pearl, 1998); however, in the present study, all participants had public or private health insurance coverage. It has also been documented that non-Caucasians have a greater risk of not utilizing healthcare services compared to Caucasians (Flores & Tomany-Korman, 2008), though this discrepancy appears to be related to lack of insurance coverage and access to services (Ngui & Flores, 2007). Further research is needed to replicate this finding, as well as identify mechanisms that may underlie the relationship between ethnicity and child HCU.

Findings from the present investigation must be considered within the context of limitations of the study design. First, the cross-sectional nature of this study prohibits the identification of causal relationships between factors. It is unclear whether child and parent psychological functioning influenced or was influenced by rates of child HCU. Future research in this area should utilize longitudinal designs to identify modifiable predictors of future HCU. Second, the size of the current sample is small relative to large epidemiological studies of HCU. Third, although retrospective self-report of HCU is commonly employed, it is possible that parents in both groups inaccurately estimated the number of visits made to healthcare providers for themselves and their child within the past year (Bhandari & Wagner, 2006). However, caregivers commonly attend, and must provide consent for, child healthcare visits, which lends support to the utility of parental report. Benefits of self-reported retrospective assessment of HCU include the identification of healthcare use patterns prior to diagnosis, as well as the ability to assess the number of visits across multiple medical settings. Additionally, the psychometric properties of the HCU measure are unknown. Validation of the HCU measure may involve comparison to medical record review. Furthermore, specific details regarding the reason for medical visits among children and parents within the past year were not collected. Although children were excluded from analyses if a chronic medical condition was documented to co-occur with NCCP or IHM, visits to primary or specialty providers for children in both groups may have been warranted from a medical standpoint. However, the finding that children with NCCP utilized twice as many health services than those with IHM suggests that other factors were likely influencing these visits. In future research, investigators should also assess the reason for presentation to the physician and the medical findings or diagnoses from those visits. This additional information may elucidate the appropriateness of visits made to medical settings. Finally, given the interest in parent perception of children's emotional

functioning and how it relates to medical visits, only parent report was examined. Parents may lack insight into their child's experience with internalizing symptoms. Child self-report measures of emotional functioning should be included in future research.

Other areas for future research should be considered. Future studies in this area should assess the way in which medical feedback and recommendations are given by the cardiologist, and how this may affect future HCU. Additionally, it would be interesting to assess how the pattern of HCU changes subsequent to receiving a benign cardiac diagnosis. Researchers may also consider additional factors that may influence child HCU, such as the role of the physician-family relationship. Additionally, given the finding that children with NCCP present to the school nurse more often when compared to healthy peers, researchers should consider incorporating school nurse visits in their assessment of HCU. Findings from this study are consistent with past research with other functional pain groups in that these children also experience additional somatic symptoms. Future research in this area may benefit from examining children with various pain symptoms (e.g., chest, abdominal, headache) concurrently.

Overall, results from this study suggest that parent and child emotional functioning are associated with HCU in the year prior to diagnosis for children with NCCP. Parents' perception of their children's internalizing symptoms, as well as their own HCU and depressive symptoms, were significantly associated with greater child HCU in the past year. This investigation points to the desirability of conducting screening assessments of child and parent psychological functioning when children present to healthcare settings with chest pain. In cases of poorly defined or benign symptoms, such as NCCP, coupled with high HCU, medical professionals, including school nurses, should be careful to avoid inadvertent reinforcement of these complaints. Offering education to parents and healthcare providers (e.g., physicians, nurses) regarding the relationship between somatic symptoms and psychological functioning may lead to referrals for further psychological assessment and intervention, which may prove to be a viable treatment approach for at least a portion of the pediatric patients who present with chest pain. Providing psychologically based intervention to children and parents for psychological symptoms that co-occur with HCU would likely result in a reduction in NCCP symptoms and may also help alleviate rising economic and resource costs associated with excessive or ineffective HCU.

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