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Generalized Anxiety Disorder Symptoms Stratified by Age in Primary Care

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Walden University
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Abstract

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MS, Walden University, 2012

BGS, University of Michigan, 1989

Dissertation Submitted in Partial Fulfillment

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Abstract

Little is known as to the age-related presentation of somatic complaints of those diagnosed with generalized anxiety disorder in primary care settings. A retrospective medical records review sought to identify the affective symptoms of generalized anxiety disorder (GAD) by age as recorded by primary care providers and to test the association of these symptoms by age. Guided by Engle's (1977) biopsychosocial (BPS) model, a large administrative claim database system was used to derive a sample of 1,336, including 500 patients diagnosed with generalized anxiety disorder between 2018 to 2021. Binary logistics regression, one-way ANOVA, chi-square, correlation, and logistical regression with SPSS software were used to describe the results. Logistic regression analyses determined there were significant associations between the diagnosis of GAD and indicative physical symptoms noted in primary care. These included sleep disorders, gastro-esophageal reflux, muscle conditions, abnormalities of heartbeat, abnormalities of breathing, pain in throat and chest, abdominal and pelvic pain, nausea and vomiting, and malaise and fatigue by age stratification. The need to develop an age specific case-finding algorithm to enable primary care practitioners to more readily identify and appropriately refer patients with generalized anxiety disorder was highlighted. This study may contribute to positive social change improvements for these patients, providers, healthcare systems, analytical processes, and psychometrics. These findings can contribute to the development of age-specific screening tools which could improve recognition and diagnosis of GAD in primary care patients.

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Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction to the Study

The failure of PCPs to recognize anxiety disorders in general and specifically general anxiety disorder (GAD) is well documented (Dillion-Naftolin, 2016; Olariu et al., 2015; Roberge et al., 2015). For example, Olariu et al. (2015) found that PCPs fail to recognize anxiety disorders in half of their patients and only a third of those cases are accurately and specifically diagnosed. In addition, Dillion-Naftolin, (2016) found that for children, despite the high prevalence in children, anxiety disorders are under identified and undertreated. Low recognition rates of anxiety disorders contribute to primary care patients undergoing unnecessary, costly, and potentially invasive diagnostic investigations (Olariu et al., 2015). For example, patients who suffer from somatic complaints may experience unnecessary referrals to specialists (e.g., gastroenterologists, cardiologists), or make frequent visits to emergency departments to identify organic disorders that do not prove to be present. Olariu et al. (2015) suggested that the use of screening tools or other case finding instruments might improve detection of anxiety disorders by PCPs.

In contrast to case finding of anxiety disorders, the U.S. Preventative Task Force (USPTF) recommended routine screening for depression in adult and adolescent patients presenting to their primary care facilities (O'Connor, 2016), supporting referrals for appropriate follow up treatment. Additionally, the insurance payors can use a case finding algorithm which helps to identify patients presenting with physical symptoms not related to an organic cause, but which may point to the likelihood of a depression or substance abuse disorder for which an appropriate referral is then recommended.

Currently there is no USPTF recommendation to screen for, or to use a case finding algorithm designed to recognize anxiety disorders in primary care patients and systematic screening is not currently conducted. As anxiety disorders present differently at various ages and stages of life, systematic case finding is further complicated by the absence of algorithms for age stratified symptom clusters of GADs as they present in the primary settings. This lack of case finding tools for GAD in primary care, in contrast to depression and substance abuse, applies to the U.S. healthcare system at large. The lack of screening and analysis exists in large health care systems despite numerous studies highlighting the propensity of PCPs to miss or misdiagnosis anxiety disorders in general and GAD specifically across the lifespan (Crawley et al., 2014: Olariu et al., 2015;). There are cost implications associated with this lack of screening or use of a case finding algorithm for GAD has serious implications for cost and quality of care outcomes (Olariu et al., 2015; Olfson et al., 2014). To address these concerns, the USTPF (2020) is systematically reviewing the literature to assess the need for anxiety and suicide risk screening in primary care. The case for identifying the age-related somatic symptoms was further examined in Chapter 2.

In this study, I addressed the gaps in the literature which suggest more research is needed to enhance PCP's recognition of the presence of an anxiety disorder . The gaps include establishment of an algorithm that will assist identification of signs of anxiety disorder relevant to various age groupings inclusive of children and older adults presenting in PCP offices (Dillion-Naftolin, 2016; Olariu et al., 2015).

Background

GAD is characterized as excessive worry and anxiety about day-to-day situations (Bandelow et al., 2013: Dillon-Naftolin, 2016; Locke et al., 2015: Mohammadi et al., 2020; Olariu et al., 2015; Roberge et al., 2015). The anxiety experienced is intrusive, usually accompanied by a variety of physical symptoms, and results in emotional distress and or functional impairment (American Psychiatric Association [APA], 2013; Bandelow et al., 2013; Buszewicz et al.,2017; Dillion-Naftolin, 2016). GAD is an underrecognized and misdiagnosed in primary care settings due to the similarity of the psychological and physical symptoms presentations to other common mental illnesses such as major depression and panic disorder (Dillon-Naftolin, 2016; Olariu et al., 2015). The presentation of GAD is further confusing as its presentation may also be like symptoms of physical or organic illnesses such as heart or gastrointestinal diseases (Dillon-Naftolin, 2016; Olariu et al., 2015). Locke et al. (2015) found that anxiety disorders such as GAD and panic disorder (PD) are often misdiagnosed due to symptoms that can be associated with physical causes.

Because people presenting to PCP rather than psychological or psychiatric services are most often concerned with physical symptoms, the The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition may not be the most useful diagnostic reference in that setting. The DSM-5 diagnostic criteria for GAD focuses more on affective symptoms than does the *International Classification of Diseases, 10th Revision, Clinical Modification* (ICD-10-CM) which lists a variety of physical and somatic symptoms in addition to affective presentation. For this reason, I focused on the

physical symptoms of GAD as identified in the ICD-10-CM. The DSM-5 was referenced in this research only as it related to the classification of the system used for mental disorders used by psychiatrists and psychologists in the United States (see APA, 2013).

In current research relating to PCP settings, the annually updated ICD-10-CM classification system may best support generalized discourse of symptomology. At present, most of the world primarily uses the ICD-10-CM; it is also used in American primary care settings such as physician offices, clinics, urgent care, and hospitals (World Health Organization [WHO], 2017). The ICD-10-CM code for GAD is F41.1 which was used in this study to identify and associate physical symptoms or clusters by age group. This criterion was explained in greater detail in Chapters 2 and 3.

The symptoms of GAD may also vary with age, creating further diagnostic challenges in primary care settings (Olariu et al., 2015). For example, PCPs may face difficulties identifying GAD in children and adolescents because children and adolescents might lack the capability to report behavioral, affective, and somatic symptoms (Olariu et al., 2015). Conversely, elderly patients may present with greater physical than psychological symptoms (Olariu et al., 2015). The literature is deficient in providing a stratified analysis of the clusters of the associated physical symptoms of GAD by developmental stage, presenting yet another area for research relevant to identification of anxiety in PCPs (Olariu et al., 2015).

Problem Statement

Case finding algorithms to help PCPs identify patients with GAD have yet to be developed. Furthermore, there is no recognized recommendation to screen for GAD using

a self-report diagnostic tool such as the GAD-7. This contrasts with the more developed approaches for depression screening in primary care (USTPF, 2016). Without a recommendation for screening or a case finding algorithm that recognizes GAD physical symptoms, PCPs may continue to underrecognize or misdiagnose GAD. The lack of attention to identifying GAD in PCP has serious cost implications for the primary care, hospital, and specialist practitioners as these patients often become high utilizers of healthcare services (Roberge et al., 2015). However, these patients, if diagnosed, would benefit from validated treatment approaches to symptom burden and improve their overall quality of life (Roberge et al., 2015).

In addition to a need for general recognition of GAD in PCP, there is also a need for greater insight to age-related symptom presentation. More attention to the physical and psychological symptom presentation and the biopsychosocial influences in child and elderly populations could help improve recognition rates for these groups who currently see the lowest diagnostic accuracy for GAD (Olariu et al., 2015). The research conducted by Olariu et al. (2015) concluded that a stratified analysis of the varied presentation of GAD by age in primary care settings might increase PCP recognition rates. A review of the literature in Chapter 2 highlighted the differences in symptom presentation that challenge accurate diagnosis.

Patients with anxiety disorders are mostly treated in primary care settings as outpatients and probably receive less attention than when seen by a psychiatrist (Bandelow & Michaelis, 2015). Due to the high failure rates of PCPs recognizing GAD and age-related symptom variations for GAD in primary care settings, it is clinically

important to identify the physical symptoms or symptom clusters of GAD when analyzed by age stratification. Groupings relevant to developmental stages could include children ages 2 to 11, adolescents ages 12 to 18, young adults ages 19 to 25, adults ages 26-55, and elderly adults aged 56- 80 (Essau et al., 2018; Olariu et al., 2015). A stratified analysis of the symptom clusters of GAD by age in primary care settings may support the development of an algorithm which may help increase PCP recognition rates. Identification of such clusters may help to reduce health care costs and the burden caused by illnesses. Differences in physical symptoms or symptom clusters listed in the ICD-10-CM for GAD such as restlessness, fatigue, fainting, sleep disturbance, restlessness, muscle tension, gastrointestinal symptoms, difficulty concentrating, irritability, and chronic headaches, may differ in presentation patterns when stratified by age.

Purpose Statement

The purpose of this quantitative study was to identify alongside affective symptoms, the specific physical symptoms of GAD that are recorded by PCPs and to stratify these by age (see Olariu et al., 2015). The research focused on associating the clusters of physical symptoms or symptom clusters of GAD when analyzed by age stratifications for (a) children, (b) adolescents (c) young adults, (d) adults, and (e) the elderly.

Research Questions and Hypotheses

This study focused on the following research questions:

RQ1: What is the current prevalence of GAD in the population cohort of primary care settings when compared to prior research for different age groupings

including children ages 2-11, for adolescents ages 12-18, for young adults ages 19-25, for adults ages 26-55, and for older adults ages 56-80?

$H_0$1: There are no significant differences in prevalence rates in the primary care population sample differentiated by age stratification when compared with previous research.

H_a1: There are significant differences in prevalence rates in the primary care population sample differentiated by age stratification when compared to previous research.

RQ2: What are the differences in physical symptoms or symptom clusters of each of the age groups, children ages 2-11, for adolescents ages 12-18, for young adults ages 19-25, for adults ages 26-55, and for older adults ages 56-80 as they present in primary care settings?

$H_0$2: There are no significant differences in physical symptoms or symptom clusters in the primary care population sample differentiated by age stratification.

H_a2: There are significant differences in physical symptoms or symptom clusters in the primary care population sample differentiated by age stratification.

RQ3: What is the association between diagnosis of GAD and physical symptoms of GAD in children ages 2-11, for adolescents ages 12-18, for young adults ages 19-25, for adults ages 26-55, and for older adults ages 56-80 as they present in primary care settings?

$H_0$3: There is not an association between diagnosis of GAD and physical symptoms of GAD in the primary care population sample differentiated by age stratification.

H_a3: There is an association between diagnosis of GAD and physical symptoms of GAD in the primary care population sample differentiated by age stratification.

Theoretical Framework

The theoretical framework for this study is based on the biopsychosocial theory of clinical care proposed by Engel (1977). The biopsychosocial theory incorporates the biological, social, psychological, and behavioral dimensions of illness (Engel, 1977). This theory supports a collaborative or integrative approach for behavioral health to patient care wherein medical care operates hand in hand with psychological care (Engel, 1977; Havelka, Luþanin, & Lubanin, 2009; Miller, 2013). The biopsychosocial practice model involves the integration of medicine and psychology which bridges conventional and alternative medical systems (Havelka et al., 2009; Miller, 2013). Integrative medicine within the context of biopsychosocial theory is broader than biomedical models due to its recognition that medicine alone cannot fully address the growing epidemics and burdens of chronic diseases in the United States (Havelka et al., 2009; Maizes et al., 2009). Regarding the presentation of GADs in PCP, more research is needed to understand the physical, psychological, and social differences of the disease (Bryant, 2010; Dillon-Naftolin, 2016; Olariu et al., 2015). The use of a dimensional approach as the framework for studying the interactions between an affective disorder (e.g., depression and anxiety)

medical illness, cognitive impairment, personality, and adverse biopsychosocial conditions could improve detection and treatment (Bandelow et al., 2015: Dillon-Naftolin, E., 2016; Locke et al., 2015: Mohammadi et al., 2020; Olariu et al., 2015 & Roberge et al., 2015).

Nature of the Study

I used a quantitative method to retrospectively review patient records to identify and to determine differences in symptom presentation of GAD in primary care by age group. The independent variable of this study was the multiple symptom clusters stratified by age group, while the dependent variables were the diagnosis of GAD and age. The study methodology also retrospectively reviewed via free-text coding of de-identified electronic medical records data collected from patients seen in urban primary care settings over the previous 18-month period.

Definition of Terms

The following terms were defined for the purpose of this study:

Adolescent: Individuals ages 12 to 17 years old (Essau et al., 2018).

Adults: Individuals ages 26-55 (Bryant, 2010).

Algorithm: A decision support tool comprised of a set of instructions designed to solve to problem. to detect a specific disease or to improve adherence to evidence-based guidelines in health care (APA, n.d).

Biopsychosocial theory: A practice model involves the integration of medicine and psychology that bridges conventional and alternative medical systems (Havelka et al., 2009; Miller, 2013).

Children: Individuals ages 2 to 11 years (Dillion-Naftolin, 2016; Essau et al., 2018).

Cohort: A group of individuals with common characteristics such as age or other demographic variables (Sandler et al., 2017).

Diagnostic and Statistical Manual of Mental Disorders Fifth Edition. (*DSM-5)*: A reference material containing diagnostic symptoms, and other criteria for diagnosing mental disorders (APA, 2013).

Elderly adults: Individuals ages 56-80 (Miloyan & Pachana, 2016; Olariu et al., 2015).

Free text coding: Written descriptions, also known as free text coding, are objective and subjective statements entered in the patient's chart by primary care practitioners and other medical staff during and post the PCP visit (Horng et al., 2017).

Generalized anxiety disorder: An anxiety disorder involving extreme worry and somatic complaints (APA, 2013; Gale & Millichamp, 2016).

General practitioner (GP): The medical professional first to provide health care services and acts as the gatekeeper to mental health care (Kessler et al., 2002).

ICD –10-diagnosis code: International Classification of Diseases 10th Revision (ICD-10) list of medical diagnosis and procedure codes used for statistical analysis and billing purposes (Centers for Medicare and Medicare Services [CMS] 2017WHO, 2017).

Inpatient setting: Hospitals and emergency rooms (Olariu et al., 2015).

Medical records: Also known as a health record and a medical chart, it is the documentation of a patient's medical history and care within a system (Roehrs et al., 2017).

Outpatient facility: Medical settings other than hospitals (Olariu et al., 2015).

Primary care practitioners (PCP): Medical doctors who are the first contact with a patient with a health concern, and provide continuing care (Olariu et al., 2015).

Primary care settings: Emergency rooms, hospitals, private practice and medical clinics.

Symptom cluster: A group of somatic and psychological symptoms (Olariu et al., 2015).

Young adults: Individuals ages 18 to 25 (Essau et al., 2018).

Assumptions

This research was based on multiple assumptions. First, I assumed that the ICD-10 code (F41.1) was applied accurately as the proper diagnosis code. The second assumption was that medical record data used for this study was accurate, complete, and provided by individuals who are trained and authorized as primary care practitioners. The list of practitioners included appropriately trained nonphysician staff. Third, I assumed patients were reporting to their primary care provider the symptoms or symptom clusters that they are experiencing. Fourth, it was assumed that no validated survey instrument was used to formulate a differential diagnosis. Fifth, it was assumed that free-text coding would yield accurate data regarding diagnosis, and symptoms and symptom clusters,

which mirrored the language used by ICD-10 standards. Finally, it was assumed that the criteria used to develop the database extract was sufficient for conducting the analysis.

Limitations

There were three limitations that could have affected this research study. First, data from primary care patient medical record data may not generalize to all health care system populations. Second, there was no avenue for controlling primary care practitioners' symptom interpretation (i.e., written descriptions) within the patient record or ensuring that what was recorded used ICD language. Third, using medical records as the primary data source largely disallowed inclusion of the patients' voice for adding opinion and perspective.

Significance

Results from this study may contribute to social change improvements for patients, providers, healthcare systems, analytical processes, and psychometrics. Data from this study could contribute to initiatives to increase intervention efficacy and reduce health care utilization costs for patients with GAD (Olariu et al., 2015). Further, primary care, emergency room and inpatient practitioners may be enabled by this research to more readily identify and appropriately refer patients with GAD who are currently being missed or incorrectly treated. Additionally, results from this study could also aid in the development of an actuarial algorithm for healthcare systems' analysis and the decision process of policy makers and funders in healthcare systems. Moreover, results from this study may contribute to the development of age-specific screening tools and case finding

instruments which could facilitate improved recognition and diagnosis of those age groups currently with lowest diagnostic accuracy (Olariu et al., 2015).

Summary

This chapter provided a brief overview of the research study by discussing the background of the topic. The problem statement, the purpose of the study, and research questions were detailed along with the supporting literature. Theoretical framework, nature of the study, and the definitions that were used throughout this study were presented. Assumptions and limitations were also detailed. Finally, the significance of the study and how it may impact social change was discussed.

In Chapter 2, there is a review of the literature and relevant research regarding the biopsychosocial practice model. The review also discusses symptom clusters of GAD as well as the psychological and social factors of the condition by age group. These symptom clusters were used in the study design as predictors of GAD. Further, the review discusses other studies involving the review of medical records. In addition, the literature review strategies and theoretical framework are also discussed in more detail. Finally, the chapter concludes with literature-based conclusions.

Chapter 2: Literature Review

This chapter begins by discussing the literature review research strategies and search terms used. A detailed description of the theoretical foundation for the study follows, with perspectives presented regarding the biopsychosocial practice model and other theories in primary care settings. Next, key factors of the study are presented with a detailed review of research on the biological symptom clusters of GAD as well as the psychological and social factors of the condition by age group. Studies involving reviews of medical records are also presented. Finally, this chapter concludes with an integrated summary of the literature review.

This chapter includes a review of literature guided by Engel's (1977) biopsychosocial theoretical model of care. This purpose of this review was to identify prior research which sought to identify the differences in physical symptom presentation of GAD and to age stratifications for (a) children, (b) adolescents (c) young adults, (d) adults, and (e) the elderly in primary care, as recorded by PCPs. The literature review strategy was to identify the theoretical biological and psychological dimensions of GAD in primary care settings.

A secondary purpose of this study was to determine if significant differences in the biological or physical symptom presentation as recorded by PCPs existed between the groups. The third purpose was to assess the prevalence of GAD within the population cohort of primary care settings when compared to prior research. A fourth purpose was to assess the association between physician diagnostic accuracy and physical symptoms of GAD in children ages 2 to 9; in adolescents ages 10 to 21 and in adults ages GAD in

adults ages 22 to 80 as they presented in primary care settings (see Essau et al., 2018; Olariu et al., 2015). A fifth purpose of this study was to determine if this study supported the need to develop a case finding algorithm to aid PCP detection of GAD by age.

Literature Search Strategy

Literature was searched via EBSCO, ProQuest, Google, Google Scholar, Springer, and the National Institute of Health, Centers for Disease Control, US Census Bureau and World Health Organization websites between the years of 2013 and 2020. Key terms included *generalized anxiety disorder, anxiety, anxiety disorders, prevalence, somatic, symptoms including its derivative forms of age elderly, adolescents, children, primary care settings* and *diagnosis*. The academic search premier database EBSCO was used for medical searches. Most articles were reviewed at the Walden University online library. Peer reviewed psychological and medical articles were mostly used for this review.

Theoretical Foundation

The theoretical framework for this study was based on the biopsychosocial theory of clinical care proposed by Engel (1977). The biopsychosocial model (BPS) incorporates the social, psychological, and behavioral dimensions of illness. In his theory, Engel posited that disease is the result of the interaction between biological, psychological, and social factors. Biological factors include genetic and biochemical factors such as genes, viruses, and somatic parameters. Psychological factors include mood, behavior, and personality. Social factors include familial, cultural, socioeconomic, and medical factors. This model is a departure from the biomedical model (BPM) with the premise that only

biological factors are attributable causes of disease. This way of thinking about disease as primarily the result of biological factors, ignores psychosocial issues, placing them outside of the medical doctor's training or responsibility.

The adoption of BPS as a departure from the BPM resulted in two opposing views. The first proposed that the natural cause of a disorder was organic as in cardiac or brain disease and should be treated only by a specialist such as a cardiologist or a neurologist. The "problems with living," associated with all other factors were to be treated by other nonmedical professionals (Engel, 1977, p. 379). A main criticism of the BPM is its tendency to reduce clinical phenomena to one single cause (Fava & Sonino, 2017). In this context, the BPM assumes that disease can only be detected by deviations from the measurable norms of biological or somatic variables, leaving out the psycho-social and behavioral determinants of illness (Engel, 1977). However, the BPS model presumes that patient perceptions of health, threats of disease, and the patient's social and cultural environment must be handled together. The BPS model also incorporates the social, psychological, and behavioral dimensions of illness (Engel, 1977). This theory supports a collaborative or integrative approach to patient care wherein medical care operates hand in hand with psychology (Engel, 1977; Havelka et al., 2009 Luþanin, & Lubanin, 2009; Miller, 2013 & Wijma, et al., 2016).

Forty years later, the BPS model involves the integration of medicine and psychology which bridges conventional and alternative medical systems (Fava & Sonino, 2017). Integrative medicine within the context of the BPS theory is broader than biomedical models due to its recognition that medicine alone cannot fully address the

growing epidemics and burden of chronic diseases in the United States and other areas of the world (Havelka et al., 2009; Maizes et al., 2009). In primary care settings, operating from a BPS framework requires a patient centered approach to care, incorporating all determinates of health (Fava & Sonino, 2017; Havelka et al., 2009; Maizes et al., 2009 & Wijma et al., 2016).

Critiques of the BPS point to its minimal use in education, clinical care, and research, due to the lack of guidance of how to administer assessments to collect the necessary relevant data (Fava & Sonino, 2017; Wijma et al., 2016). The BPS model requires additional time to conduct a thorough clinical assessment, thus increasing clinician burden (Wijma et al., 2016). However, Wijma and associates (2016) acknowledged that this type of assessment provides a contextual understanding of the patient.

A main criticism of the BPM was concerned with the medical community's tendency to reduce complex clinical presentations to a "single primary cause" (Fava & Sonino, 2017). For example, physicians may attribute the primary cause of breast cancer to genetics alone, ignoring influential other factors such as environment, psychological distress, and other factors. Another criticism of the BPM is that it ignores the cognitive capability of the patients and their tendency to communicate physical symptoms rather than psychological distress when seeking medical help. This is seen as a widespread clinical phenomenon that may involve 30-40% of medical patients. Contemporaries of Engel further criticized BPM in the practice of medicine as being associated with best external evidence and clinical expertise to influence or modify a patient's behavior. This

external evidence may then be used and manipulated with financial conflicts of interest (Ionnidis, 2017). The net result can be that the clinician is potentially biased to only to see patient problems in a certain way (Fava & Sonino, 2017). Said another way, the BPM in all its contemporary forms continues to treat complex phenomena through the lens of a single cause for a disorder.

More holistic perspectives have arisen in the health care industry with the influence of the debates introduced by BPM theory. A recent statement made by the American Diabetes Association (ADA, 2016) is in line with Engels' 1977 model, proposing that providers should consider a holistic assessment of diabetes symptoms including depression, anxiety, disordered eating, and cognitive capacities. They recommend using patient-appropriate validated tools at the initial visit and throughout the treatment plan. Further evaluation of patient status and outcomes should occur at periodic intervals. Further developing the BPM model in care, the ADA expanded the assessment to include the social network of patients' caregivers and family members (Young-Hyman, et al. 2016).

Literature Review

This purpose of this review was to identify prior research which sought to identify the differences in physical symptom presentation of GAD and the age stratifications for (a) children, (b) adolescents (c) young adults, (d) adults, and (e) the elderly in primary care as recorded by PCPs. The literature review strategy was to identify the theoretical biological and psychological dimensions of GAD in primary care settings. A secondary purpose of this study was to determine if significant differences in the biological or

physical symptom presentation as recorded by PCPs exists between the groups. The third purpose was to assess the prevalence of GAD within the population cohort of primary care settings when compared to prior research. A fourth purpose was to assess the association between physician diagnostic accuracy and physical symptoms of GAD in children, adolescents and adults as they present in primary care settings (see Essau et al., 2018, Olariu et al., 2015). A fifth purpose of this study was to determine if this study supports the need to develop a case finding algorithm to aid PCP detection of GAD by age.

In the following sections I reviewed relevant literature for my study. A history of provider perspectives regarding GAD was presented as context for current expectations in the primary care community. This was followed by review of literature regarding anxiety as it presents across the continuum of human development in relation to the proposed research focus on age stratification of anxiety symptomology. Finally, current challenges to primary care providers for screening and referral of anxiety were reviewed, along with gaps in the literature yet to be filled.

History of Generalized Anxiety Disorder

Phenomenologically, GAD has been described in the literature since the inception of modern psychology in the late 18th century. Researchers initially reported GAD as a type of chronic anxiety which could result in paroxysmal attacks (Crocq, 2017). Paroxysmal was a medical term meaning a severe attack, recurring periodically, (i.e., a panic attack). As such, panic attacks and GAD became lumped under the same illness. Following that, in the early 20th century GAD was defined as *neurasthenia*, a diagnostic

term whose extreme popularity was matched by its vagueness. Finally, the disorder was termed *anxiety neurosis*, which immediately preceded the modern definition of GAD (Crocq, 2017).

As early as 1621, Burton described physical symptoms of anxiety attacks in socially anxious people (Bandelow & Michaelis, 2015). This early description for anxiety was as a fear that causes men to be red, pale, tremble, sweat, to suddenly become hot or cold over all the body, or to experience palpitations of the heart (Bandelow & Michaelis, 2015). The modern definition GAD has not changed compared to Burton's description. However, Crocq (2017) also described GAD as a long-term, free-floating anxiety with anxious apprehension or excessive worry about the circumstances of daily life. Such vague descriptions being reported by some patients may shed some light onto the challenges in detecting the disorder in primary care settings (Crocq, 2017). As described before, some patients may lack the cognitive capability or insight to describe their psychological or affective distress clearly (Fava & Sonino, 2017). Instead, they communicate the physical symptoms when seeking medical help (Fava & Sonino, 2017). This heterogeneity in symptom presentation and communication poses challenges in assessing prevalence rates.

Psychiatric epidemiological studies are often helpful in determining the prevalence rates as well as information on the burden for health service utilization of diseases and conditions (Bandelow & Michaelis, 2015). Epidemiological studies may also help to assess the lifetime and annual prevalence of individuals suffering from an anxiety disorder. Results from epidemiological surveys are thought to obtain reliable and

generalizable results for illnesses due to their very large size. Additionally, these studies facilitate subgroup analyses comparing prevalence rates by age, gender, ethnicity, and other factors (Bandelow & Michaelis, 2015). The following section will develop this perspective further in relation to the proposed research.

Epidemiology of Generalized Anxiety Disorder

Anxiety is a normal reaction to stress. It is protective as it helps an individual cope with situations perceived as dangerous, tense, or difficult. When anxiety becomes an excessive and irrational dread of everyday situations, it develops into a disabling disorder (National Institute of Mental Health, [NIMH], 2016). GAD is characterized by excessive out-of-control worry about daily life (APA, 2013; Locke et al., 2015). The anxiety can be intrusive, and may cause functional impairment with work, health, and finances (Locke et al., 2015; Remes et al., 2018). The anxiety can negatively impact a patient's quality of life (Locke et al., 2015; Remes et al., 2018). Patients with anxiety disorders are thought to receive less clinical attention because they are mostly treated as outpatients compared to those with other disorders that require inpatient treatment, such as patients with schizophrenia or bipolar affective disorders (Bandelow & Michaelis, 2015).

Gender, marital status, lower education levels, health conditions, and life stressors are contributing factors to GAD (Locke et al., 2015; Remes et al., 2018). The age of onset for GAD is variable and can occur in children, adolescents, and adults of all ages. According to the DSM-5, the median age of onset is 30 years old (APA, 2013). The 12-month prevalence for GAD among adults in the United States 18 to 64 years of age is 2.9% (Locke et al., 2015). The gender distribution of GAD is equal for females and males

in children, and 6:1 female-to-male in adolescents (APA, 2013). The age of onset of GAD in children varies from as early as 2 years old (Dillon-Naftolin, 2016; Ghandour et al., 2019). Older adolescents are likely to exhibit more symptoms than younger children (APA, 2013).

Locke et al. (2015) reviewed data searched from Essential Evidence Plus, PubMed and Ovid Medline using the keywords generalized anxiety disorder, diagnosis, treatment, medication, epidemiology, etiology, pathophysiology, differential diagnosis, and complementary and alternative medicine. Their review of the literature for the diagnosis and management of GAD in adults found the 12-month prevalence for GAD for adults ages 18-64 years in the United States is 2.9% and the lifetime prevalence is 7.7% in women and 4.6% in men. Citing the etiology of GAD using multiple theoretical models with varying empirical support, the authors suggested emerging research best explains the phenomena. They highlighted the main theme of current research which suggests that GAD patients may experience activation in the brain regions associated with mental activity and inner thinking following stimuli which introduces worry. Their research confirms the high rates of missed diagnosis for GAD due to symptoms being often ascribed to physical causes. Locke et al. (2015) also published findings on symptom presentations and diagnostic criteria which was e reviewed in the section of GAD in adults. The authors did not include in their review, the symptom presentation leading to a GAD diagnosis in children and adolescents diagnosed with GAD nor did they list symptom. A discussion of GAD in children and adolescents will follow.

Olfson et al. (2014) sought to analyze national patterns leading to trends in office based mental health utilization of adults, adolescents and children. In this study then reviewed the 1995 – 2010 National Ambulatory Surveys (*N*=44,642) for adults over the age of 21, adolescents ages 14 -20, and children ages 0 – 13 for mental health indicators from their most recent visit. Their review also included background and clinical data. Logistic regression models were used to assess time and probability of visits with outcomes of mental disorder diagnosis, psychotropic prescriptions, psychiatric or psychotherapy care. Their study found when compared to adult mental health care, children and adolescents showed more rapid increase in mental health care and increased psychotropic medication use in office based medical practice. Additionally, they found GAD in children as presented in primary care was characterized as excessive worry about activities and events accompanied by at least one physical symptom.

The Olfson et al. (2014) study provided data on mental health care utilization and points to the expansion of these services as well significant increases of psychotropic medication prescriptions. These results generalized to the general population. Their conclusions were limited for four reasons. First, it sampled visits recorded in the National Ambulatory Medical Care survey instead of patients. This method provided no method for parsing out duplicates to determine the unique number of patients presented during the research window. Secondly, the study sample was limited to physician visits in physician offices or community health centers. Thus, other primary care settings such as hospital outpatient clinics, emergency departments, community mental health centers and other settings were not captured. Third, the diagnosis of a mental illness was not specific

to GAD. The fourth and final reason was that diagnosis was subject to the independent judgement of the treating physician. This posed risks related to misdiagnosis and delivery of non–evidence-based care, adverse medication effects and poorly coordinated services.

Their research results pointed to the need implement effective models of collaboration amongst providers to meet the needs of children and adolescents. It informed that the lifetime prevalence of GAD in children and adolescents ranged from 2.9-4.6%. The researchers noted that the lifetime prevalence of anxiety disorders in the US population over the age of 18 is 28%. Further, they found that 14 -36% of patients with untreated anxiety disorders presented to primary care clinics (Olfson et al., 2014).

Diagnosis of Generalized Anxiety Disorder

The following sections detail diagnosis process and systems for GAD, providing further context for the perspectives that are important for primary care providers to consider in the presentation of their client populations.

Detection of GAD in Primary Care Settings

Research has typically shown low rates of recognition of GAD by primary care providers is often due to somatic symptoms attributed to a variety of clinical presentation, to vague complaints or to physical problems not otherwise identified. For example, recognition of GAD in primary care is dependent on upon symptom overlap of comorbid psychiatric disorders e.g., depression. For example, Roberge et al., 2015 informed GAD is often diagnosed and treated in primary care settings.

In their study, data was obtained from the Dialogue project a study conducted in 67 primary care clinics in Quebec, Canada. The sample consisted of 373 adults meeting

DSM-IV criteria for Generalized Anxiety Disorder in the past 12 months. Of this sample. 345 cases were analyzed to identify detection and health service utilization rates and treatment adequacy. Using multilevel regression models, the research sought to describe and determine the correlates of treatment adequacy of GAD in the cases. Their results showed that 67.2 % of participants were informed by a physician of an anxiety disorder. While only 52.5 % were specifically informed of a GAD diagnosis in the past 12 months. Of the detected cases, 36.2 % received a pharmacological or psychological treatment (19.2 %) minimum clinical practice guidelines. The study results found participants had at least one psychiatric comorbidity, in the past 12 months 71% had diagnosis of major depression and 60.6 % had an anxiety disorder. Over 82% of participants (82.6 %) had at least one chronic physical condition.

Their findings inform that GAD is recognized in the context of real-world primary care and its detection of GAD is an important correlate of treatment adequacy, and this suggests that further efforts should be invested in specific GAD screening and diagnosis. Further they informed that the majority of patients with GAD who seek care from general practitioners, this setting provides an optimal context for shared decision-making, a multiplicity of treatment choices and resources. Their research suggested that increased efforts towards GAD detection in primary care setting could increase delivery of evidence-based treatments. The researchers concluded that detection of GAD is associated with treatment adequacy, and further efforts should be invested in specific screening and diagnosis of GAD in primary care settings.

This study while providing support for increased efforts to detect GAD in primary care settings, was focused on overall treatment adequacy. Additionally, this study had several limitations. First, data was derived from self-reported data from a cross-sectional primary care mental health survey. Whereas the reporting of mental health service use was compared to administrative data has been highlighted in previous studies. A second limitation is the result do not provide a complete understanding of the correlates of treatment adequacy. Third, analysis of the Dialogue data provided evidence of bias where approximately 40% of those survey perceived in adequate treatment for psychotherapy.

Physical Symptoms of GAD

The physical symptoms of GAD can include irritability, sleep disturbance, muscle tension, restlessness, chronic headaches, fatigue, and gastrointestinal symptoms (Dillon-Naftolin, 2016; Locke et al., 2015). Common physiological symptoms such as feeling like one is choking, hyperventilation, and heart palpitations, may not be reliably diagnosed in primary care centers. These complaints may appear as individual symptoms or in clusters which may direct a PCP to investigate a primary symptom such as chronic headaches or gastrointestinal distress as relating to a physical condition or disease, while ignoring the total body or pattern of symptoms.

As an anxiety disorder, GAD symptoms are common or shared with other anxiety disorders such as social anxiety or panic disorder (Roberge et al., 2015). The psychological and pharmacological treatments are similar across anxiety disorders (Roberge et al., 2015). However, research has shown that help-seeking behaviors, service

utilization, and recognition of this and other anxiety disorders by health care professionals varies and may impact on the probability of receiving potentially adequate treatments (Dillon-Naftolin, 2016 & Roberge et al., 2015).

GAD according to the DSM-5

The differential diagnosis of GAD according to the DSM-5 (APA, 2013) requires three or more symptoms to accompany worry and anxiety in adults, but only one in children (see Table 1). These behavioral correlates of anxiety include feeling keyed up or on edge, aggression, increased irritability, avoidance behavior, self-injury, unnecessary motor activity, trouble focusing, and difficulty concentrating or having the mind go blank (APA, 2013; Locke et al., 2015; NIMH, 2016). Avoidance of feared stimuli and situations may mirror other anxiety disorders such as panic or social anxiety (Locke et al., 2015; NIMH, 2016). The DSM-5 is widely used primarily within the psychiatric clinical settings. Primary care practitioners have adopted the ICD-10-CM (WHO, 2002) for diagnosis of GAD. This system of diagnosis is presented in the next section.

Table 1

DSM-5 Diagnostic Criteria for Generalized Anxiety Disorder (300.02)

A.	Excessive anxiety and worry (apprehensive expectation), occurring more days than not for at least 6 months, about a number of events or activities (such as work or school performance).
B.	The individual finds it difficult to control the worry.
C.	The anxiety and worry are associated with three (or more) of the following six symptoms (with at least some symptoms having been present for more days than not for the past 6 months): Note: Only one item required in children. 1. Restlessness, feeling keyed up or on edge. 2. Being easily fatigued. 3. Difficulty concentrating or mind going blank. 4. Irritability. 5. Muscle tension. 6. Sleep disturbance (difficulty falling or staying asleep, or restless, unsatisfying sleep).
D.	The anxiety, worry, or physical symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.
E.	The disturbance is not attributable to the physiological effects of a substance (e.g., a drug of abuse, a medication) or another medical condition (e.g., hyperthyroidism).
F	The disturbance is not better explained by another medical disorder (e.g., anxiety or worry about having panic attacks in panic disorder, negative evaluation in social anxiety disorder [social phobia], contamination or other obsessions in obsessive-compulsive disorder, separation from attachment figures in separation anxiety disorder, reminders of traumatic events in posttraumatic stress disorder, gaining weight in anorexia nervosa, physical complaints in somatic symptom disorder, perceived appearance flaws in body dysmorphic disorder, having a serious illness in illness anxiety disorder, or the content of delusional beliefs in schizophrenia or delusional disorder).
	Source: American Psychiatric Association, 2013

GAD According to the ICD-10

The ICD-10 provides clinical descriptions and diagnostic guidelines for conditions and diseases and is generally used by primary care providers (WHO, 2017). The diagnostic code for GAD includes physical complaints such as feeling tired, muscle tension, restlessness, problems with sleep, shortness of breath, tachycardia, sweating, and dizziness. ICD-10 behavioral criteria include apprehension of danger and dread, free-flowing worry, or fear of an actual or imagined danger, vulnerability, and uncertainty lasting at least 6 months (WHO, 2017).

Bandelow et al. (2015) discussed the ICD-10 diagnosis of GAD while providing more information on physical symptoms as they present in primary care (see table 2). According to Bandelow and colleagues, the ICD-10 compared to the DSM-5 diagnosis of GAD provides contextual information about the nature and quality of the anxiety which rapidly generalizes to catastrophic worries about family relationships, health, and occupational or financial situation. These worries often manifest in somatic symptoms leading to extensive medical diagnostic evaluations (Bandelow et al., 2015).

ICD-10 Diagnostic Criteria for Generalized Anxiety Disorder (F41.1)

Table 2

ICD-10 Diagnostic Criteria for Generalized Anxiety Disorder (F41.1)

Tension, worries, and fears about everyday events and problems for at least six months, with the following symptoms and signs:
Vegetative manifestations such as: increased heart rate, sensation of heartbeat, rapid heart rate, diaphoresis, tremor, or dry mouth
Symptoms in the chest or abdomen: respiratory symptoms, feeling of tightness, chest pain, abdominal discomfort, nausea
Mental symptoms dizziness, unsteady, faith or light-headed, derealization, fear of losing control, fear of dying
General symptoms (hot or cold flashes, paresthesia)
Symptoms of tension (muscle tension, agitation, inability to relax, feeling wound up, nervousness, emotional tension, foreign-body sensation in throat, dysphagia.
Other, nonspecific symptoms exaggerated startle response, lack of concentration, irritability, difficulty falling asleep

Note: Adapted from Bandelow et al., 2015

Generalized Anxiety Disorder Across Developmental Stages

Studies have found that general practitioners (GPs) fail to diagnose GAD because the presentation may differ by age. GAD is under-recognized and misdiagnosed due to its similarity to other physical and psychological illnesses. The presentation of GAD varies by age, resulting in PCPs failing to consistently recognize GAD in their patients. Missed diagnoses of GAD are typically due to symptoms that are often associated with physical causes (Dillon-Naftolin, 2016; Locke et al., 2015 & Olariu et al., 2015).

In Aydin et al (2020) physicians expressed the difficulty of recognizing mental health problems and using structured screening assessments. They found that in order to help with detecting anxiety disorders in primary care, physicians should become more knowledgeable and aware of the typical signs of anxiety, its prevalence and relevance of typical signs of anxiety at early-onset at age of 11 years as well as the increased risk of

adulthood anxiety if, left untreated. The researchers concluded that improving GPs' familiarity with initial symptom presentation in anxiety disorder may improve timely recognition, and more information on the behavioral symptoms may be needed to improve timely recognition. In this qualitative study, using a vignette design, physician recognition of anxiety disorders could be enhanced with systematically varied symptom presentations with causal inferences. Said another way, detection of GAD by primary care practitioners could be enhanced with a decision support tool.

Essau and colleagues (2018) noted the differences in presentation by developmental phases is largely ignored and has been overlooked by the current diagnostic classification systems in both the DSM-5 and ICD-10. They argued that the DSM-5 should incorporate a developmental perspective, with explicit information on the differences in symptom presentation across age (children versus adolescents versus adults). In their study they sought to examine anxiety incidence, recurrence, and comorbidity rates across four developmental (age) periods namely, during childhood (5 – 12.9 years), adolescence (13 – 17.9 years), emerging adulthood (18 – 23.9 years), and adulthood (24 – 30 years). They used self-reported measures in combination with a semi-structured interview completed twice in a sample of 816 participants from a large community sample with data obtained from the Oregon Adolescent Depression Project (OADP). The OADP was a 16-year longitudinal study containing a large cohort of high school students who were randomly selected from nine high schools in western Oregon. For comparison purposes of this study will define emerging adulthood as equivalent to young adulthood. The sample included children ages 5.0 – 12.9 years (N = 816),

adolescents ages 13.0 – 17.9 years (N= 741); emerging adults (young adults) ages 18.0 – 23.9 years N= 707) and adults ages 24- 30 years (N=671).

The researchers sought to examine all diagnosis of anxiety disorders which included generalized anxiety disorder, separation anxiety disorder, post-traumatic stress disorder, overanxious disorder, panic disorder, simple phobia, social phobia, agoraphobia, and obsessive-compulsive disorder. They found significant differences in the incidence of anxiety disorders across the four age groups. Those rates were significantly higher in children and adults compared to adolescents and young adults. Incidence rates of anxiety disorders were found to be comparable in adolescents, young adults, and adults. However, the incidence rate overall was significantly higher in adults than in the other developmental stages.

The study results were limited because it could not be determined the extent their findings were generalizable to other populations due to the restriction of the sample to one geographical location of the United States containing predominantly individuals of European-American. The generalizability of the study's findings was difficult, given differences in prevalence rates of anxiety disorders across ethnic groups. Third, the generalizability was limited due to high rates of attrition and changes in diagnostic criteria over the 16-year longitudinal OADP study. Fourth, diagnoses were assessed via self-report.

The relevance to this study is revealed in the researcher's conclusion that anxiety disorders that present during childhood and adolescence significantly increased the probability of having an anxiety disorder during young adulthood. They recommended

future studies to explain the biological, psychological, physiological, and social processes that cause differences in the incidence rates across developmental stages. Referring back to Engel's theoretical, the researchers, stated that more knowledge is needed to understand the BPS factors of individuals with anxiety disorder. This is important to this study because it highlights the differences in symptom presentation and the need for more research by age of GAD.

Dillion-Naftolin (2016) sought to examine what constitutes a GAD given age and context. Dillon-Naftolin (2016) summarizes their review of the literature and found that children present in primary care settings with somatic complaints and no mention of anxiety. Their findings suggested that as high as 20% of these children meet the criteria for an anxiety disorder after screening; with GAD as the second most common amongst this population. These children, like other age groups, often undergo extensive medical evaluations and tests to find the cause of these somatic complaints. Their study was focused on treatment for anxiety disorders in children. However, they found that there are no screening tools targeted at GAD or other anxiety disorders in pediatric settings. They recommended screening should occur early in the diagnostic process. They also suggested that more research is needed to examine treatment-resistant GAD and the outcomes after successful or unsuccessful treatment. The authors suggested that employing a developmental perspective in the assessment of anxiety features in children would assist physicians in recognizing that the core diagnostic criteria might present differently in the young. Thus, GPs should employ special assessment strategies and recognize special features that are unique to this age group. Special assessment strategies

to aid diagnosis by age group may include questionnaires, surveys, and case finding instruments such as algorithms.

Generalized Anxiety Disorder in Children

Differentiation between normal and pathological anxiety can be difficult to decipher in children because they often experience fears and anxiety as a part of normal development (Gale & Millichamp, 2016). While these fears may be acutely distressing, they are often transient, such as anxiety due to separation in children 12-18 months, or fears of thunder or lightning at 2 to 4 years old (Dillion-Naftolin, 2016; Essau et al., 2018). There is a lack of criterion for distinguishing normal and pathological anxiety in children (Essau et al., 2018). The literature as shown that the most common psychiatric disorders.

Another challenge in the assessment of anxiety in children is that they may lack the cognitive or language ability to communicate the associated distress in terms of emotions, impairments, or avoidance. According to Dillion-Naftolin (2016), the prevalence of GAD in children is estimated to be 15 and co-occurs with other anxiety disorders. A barrier to recognition of GAD in children is that PCPs may not be familiar with the symptom presentation. Children present initially to primary care settings with complaints of physical symptoms such as pain, stomach problems, headaches, or heart racing heart.

Dillon-Naftolin summarized their review of the literature and found that children present in primary care settings with somatic complaints and no mention of anxiety. Their findings suggested that as high as 20% of these children meet the criteria for an anxiety

disorder after screening; with GAD as the second most common amongst this population. These children, like other age groups, often undergo extensive medical evaluations and tests to find the cause of these somatic complaints. Their study was focused on treatment for anxiety disorders in children. However, they found that there are no screening tools targeted at GAD or other anxiety disorders in pediatric primary care settings. They recommended screening should occur early in the diagnostic process. They also suggested that more research is needed to examine treatment-resistant GAD and the outcomes after successful or unsuccessful treatment.

As stated before, A barrier to recognition of GAD in children is that PCPs may not be familiar with the symptom presentation. For example, in a Dutch study, researchers sought to quantify GP's sensitivity to anxiety disorders (ADs) in children (Aydin, et al., 2020). The study population of 229 Dutch GPs at a continuing medical education conference used a vignette to test the detection of anxiety disorders in children. The study method included the use of audio fragments or vignettes designed to mimic childhood anxiety symptom presentation in general practice. The researchers found that GPs reached a recognition rate of 14.8% (167 out of 1128 possibilities) and were less likely to diagnose a specific disorder. The results of the study showed that despite the high prevalence of anxiety disorders in children, GPs overlooked anxiety in their early diagnosis. The researchers concluded that improving GPs' familiarity with initial symptom presentation in anxiety disorder may improve timely recognition, and more information on the behavioral symptoms may be needed to improve timely recognition (Aydin et al., 2020). The researchers additionally found that physicians expressed

difficulties with using screening measures to aid detection due to lack of knowledge and clinical time with patients.

Behavioral symptoms of children ages 2 to 10 with GAD include restlessness, apprehensiveness, fatigue, irritability, problems with sleep, difficulty concentrating, and difficulty making decisions, handling uncertainty, or catastrophizing everyday situations (Dillon-Naftolin, 2016). Unlike adults, children with GAD experience extreme worry that inhibits the child's ability to relax and enjoy everyday activities. Gale and Millichamp (2016) assert that school-age children exhibit specific fears of objects, animals, germs, or natural disasters. They can also experience withdrawal, timidity, and shyness, accompanied by school or performance anxiety (Dillon-Naftolin, 2016; Gale & Millichamp, 2016).

Physical symptoms of children include fatigue, pain, muscle tension and aches, sweating, trembling, hyperventilation, twitching, nausea, diarrhea or irritable bowel syndrome, heart palpitations and headaches (Dillon-Naftolin, 2016). The aforementioned physical symptoms will comprise the first cluster, or group of symptoms to be used in the analysis for this study. It is important to note that children must have three of these symptoms to meet the criteria for GAD (APA, 2013; WHO, 2017). According to their research GAD is the second of the most common anxiety diagnosis in children. They reported there are no measures focused exclusively on GAD in children. They cited the findings of Chavira et al. (2014) where out of a sample of 714 families screened for an anxiety disorder in primary care over 20% met the clinical criteria for an anxiety disorder. The researchers suggested physicians should screen for anxiety disorders while

investigating somatic complaints. The screening should occur early in the clinical process to prevent children from undergoing costly and invasive medical tests to find the sources of somatic complaints. For example, high caffeine intake, hyperthyroidism, seizure disorders, asthma, hypoglycemia, lead intoxication, central nervous system disorders, cardiac arrhythmias and pheochromocytoma are physical conditions that mimic anxiety disorder.

Generalized Anxiety Disorder in Adolescents

GAD has a similar presentation in adolescents ages 12-18 to younger children, including fatigue, muscle tension and aches, sweating, trembling, hyperventilation, twitching, nausea, diarrhea or irritable bowel syndrome, and headaches (Dillon-Naftolin, 2016). They may also worry about catastrophic events, be overly conforming, perfectionistic, unsure of themselves, or engage in seeking approval and require excessive reassurance (Essau et al., 2018). GAD may be over-diagnosed in children, thus, requiring a thorough examination to rule out other anxiety disorders (Essau et al., 2018). For adolescents, these symptoms have a chronic course lasting for at least six months, and they may interfere with the individual's school attendance or activities (Essau et al., 2018).

Few studies have examined GAD in adolescents. Research has shown that the median age of onset of GAD in adolescents is 12 medians =11.83 years). In their study, Burstein et al., 2014 sought to investigate the diagnostic threshold of GAD adolescents. They examined the threshold and subthreshold forms of GAD in a nationally representative sample of US youth. Their research examined a sample of 1012

adolescents ages 13-18 in the US to test differences in sociodemographic and clinical characteristics between threshold and subthreshold forms of the disorder and to define the prevalence, and sociodemographic and clinical characteristics of the sample.

Citing a paucity of studies considering a scientific consensus of the burden of GAD in the general population, they proposed that the diagnostic threshold of GAD, e.g., 6 months poses challenges for researchers and practitioner. For example, research has found that approximately 75% of adults and 25% of youth present to treatment but fail to meet the GAD diagnostic criteria by a single criterion. This results in a diagnosis of anxiety disorder not otherwise specified (NOS) and not GAD. Using a modified World Health Organization Composite International Diagnostic Interview, a fully structured interview of DSM-IV, adolescents were asked about experiences with worry and any associated symptoms during episodes. Amongst these were restlessness, getting easily fatigued, difficulty concentrating, irritability, muscle tension, and sleep disturbance.

Burstein and colleagues found that using the required DSM-V 6 month required duration for GAD that approximately 3% of adolescents met criteria the. They also found that when the duration was reduced from 6 months to 3 months of symptom presentation resulted in a 65.7% increase in the cases or a prevalence 5.0%. Subtraction of the control for duration all together resulted in a 20.7% increase in the number of positive cases and an increase in prevalence from 5.0 to 6.1%. Their examination of the clinical characteristics showed that GAD in adolescents was marked by substantial impairment and co-morbidity with other disorders. Their research found few significant differences in the clinical characteristics and sociodemographic factors between subthreshold and

threshold cases of GAD in adolescents. More importantly, their research found age related differences in the symptoms and clinical course of GAD. Thus, the researchers to concluded that age related differences provided support for capturing the developmental specific clinical features of GAD. Specifically, the associated symptoms of GAD developed as early as 6 years of age with significant increases in prevalence after age 10 years among threshold GAD cases. GAD increased in sub-threshold cases after age 12 years. In their sample of adolescents, restlessness, irritability and poor concentration were found to be the most common and muscle tension the least common of symptoms. Additionally, their research found that younger adolescents had fewer associated symptoms compared to older adolescents. Moreover, lower threshold criteria with only one symptom in children and adolescents make a case for criteria sets that yield to age-related differences in symptom manifestation.

Burstein and colleagues concluded that while their study provided data on associated symptom frequency of GAD it did not contribute to the knowledge base as to which symptoms contribute to a diagnosis of GAD. Given their observation of lower rates of treatment amongst adolescents, especially for subthreshold GAD, they concluded that there may be a substantial number of impaired youth in which the disorder is undetected and or treated. Therefore, further investigation in the diagnostic threshold of GAD in youth. In addition to the need for future attention to the clinical characteristics of sub-threshold GAD in adolescents. The clinical features (symptoms) of GAD revealed in this study results were limited and may not generalize to children of younger ages because the NCS-A sample included from the period of adolescence. Further, they inform

that the estimates of the age-related differences in symptom presentations were conservative. It was important for additional work to investigate how clinical features of GAD may vary across the entire early life course. the researchers suggested that more work is needed to develop criteria sets that are sensitive to the developmental (age) differences in symptom expression.

Generalized Anxiety Disorder in Young Adults and Older Adults

Across the development span, Gad has shown to have relatively high rates of comorbidity with other psychiatric disorders as well as high rates of disability and impairment (Burstein et al.2014). The lifetime prevalence for GAD among adults worldwide is estimated to be from 1.8% to 6.9% (Burstein et al.2014).

Young adults ages 18 – 25 seen in primary care settings report symptom present with fatigue, muscle tension, aching or sore muscles, dry mouth and insomnia (Miloyan et al., 2014). Their study found there is a distinct set of symptoms attributable to each age group. This suggest that the degree and kind of symptoms that distinguish between with and without GAD can explain some of the challenges surrounding the detection GAD.

Generalized Anxiety Disorder in Adults

Across the development span, Gad has shown to have relatively high rates of comorbidity with other psychiatric disorders as well as high rates of disability and impairment (Burstein et al., 2014). The lifetime prevalence for GAD among adults worldwide is estimated to be from 1.8% to 6.9% (Burstein et al.2014).

GAD in adults is more prevalent than other anxiety disorders and may also be difficult to diagnose (Bekhuis et al. 2016; Bryant et al., 2013; Olariu et al., 2015). One

school of thought was that anxiety is increasingly heterogeneous later in life but qualitatively different from the anxiety experienced by younger adults (Bryant et al., 2013). For example, it is difficult to recognize panic disorders in older adults due to decreased autonomic nervous system activity (Bryant et al., 2013).

While children and adolescents may lack the cognitive capability to recognize anxiety, adults, especially the elderly, may under report psychological distress due to sensitivity of stigma associated with disclosure of psychiatric symptoms these patients are less likely to disclose symptoms of anxiety in primary cares settings as compared to their younger counter parts (Bryant et al., 2013).

Several studies have confirmed that adults with GAD present with somatic symptoms (Bryant et al., 2013; Combs and Markman, 2014 & Olariu et al., 2015). GAD symptoms specific to adults include autonomic arousal, heart palpitations, chest and abdomen pains, sweating, trembling, dry mouth, difficulty breathing, feeling of choking and nausea. Other somatic complaints are hot flushes, cold chills, muscle tension, numbness or tingling, aches, pains and difficulty swallowing (Bryant et al., 2013). Adults with unrecognized GAD report more complaints in primary care settings that can lead to unnecessary and invasive diagnostic procedures (Bryant et al., 2013: Olariu et al., 2015). This population is more likely to receive referrals to specialists to rule out organic diseases (Bryant et al., 2013: Olariu et al., 2015).

Critiques of Screening for Generalized Anxiety Disorder in Primary Care

Countervailing views on the need to examine the individual symptoms of GAD by age. Firstly, since major depressive and anxiety disorders tend to cooccur in patients, the

USTF did not find it necessary to recommend screening for anxiety disorders in primary care setting in light of the 2016 recommendation to screen for depression (USPTF, 2016).

Bekhuis et al. (2016) and Brahmbhatt et al. (2021) informed on the somatic complaints found in patients from ages 2 to 65 years of age. In their study, the aimed to gain insight into the associated symptoms of Major depressive disorder (MDD) and generalized anxiety disorder (GAD) which can often co-occur with somatic symptomatology in primary care patients. Their study assessed the symptoms of MDD or GAD in 2,981 participants between the ages of 41 and 66 using from The Netherlands Study of Depression and Anxiety (NESDA) using the Inventory of Depressive Symptomatology (IDS). Their purposeful sample was reduced to 652 or 22% health controls with no diagnosis of MDD or GAD and 1,411 or 47% with a past month diagnosis. The study participants was further reduced to 918 or 31% of the original population using the Composite International Diagnostic Interview [CIDI] version 2.1 to establish a diagnosis. They found there are different associations between the individual symptomatology when MDD/GAD co-occur. Their results found strong associations between the somatic symptoms between MDD and GAD such as neurovegetative and cognitive/affective symptoms. There were other symptoms which showed no connections or were differentiated between the disorders. This is contrary to prior research with contradicts the need for separate screen of depression and anxiety disorder. They suggested that more research is needed to further our understanding of the interaction between these symptoms. This study finds value in the age stratifications as well as the specific age-related symptoms of GAD. Their summary is listed in Table 3.

Table 3

Somatic complaints of primary care patients with Generalized Anxiety Disorder

Children (2-11 years)	Fatigue, muscle tension and aches, sweating, trembling, hyperventilation, twitching, nausea, diarrhea or irritable bowel syndrome, heart palpitations and headaches
Adolescents (12-18)	Fatigue, muscle tension and aches, sweating, trembling, hyperventilation, twitching, nausea, diarrhea or irritable bowel syndrome, and headaches
Adults (18-65 years)	Sleep disturbance, restlessness, muscle tension, gastrointestinal symptoms, and chronic headaches, psychomotor agitation, abdominal pain; weight/appetite increase, sleep disturbance, dry mouth, shortness of breath; chest pain, back pain, bloated feeling, dizziness/feeling lightheaded, muscle pain, nausea, neck pain, palpitations, excessive perspiration, blurred vision, seeing spots in front of the eyes, tachycardia.

(Bekhuis et al., 2016 and Brahmbhatt et al., 2021)

Challenges to Detection of Generalized Anxiety Disorder in Primary Care

Olariu et al. (2015) performed meta-analysis of the literature regarding the challenges of diagnosing GAD and other anxiety disorders. Therein the researchers searched articles from January 1980 to June 2014 from Embase, Ovid Journals, PubMed, PsycINOFO (via EBSCO), Scopus, Web of Science and Science Direct using the search terms *anxiety disorders, diagnosis* and *primary care*. Of the 3424 identified abstracts from their search 24 studies were analyzed after application of exclusion criteria. The pooled sample was 34,902 patients with a mean sample of 1,396 per study (SD-3494.6), mostly from studies conducted in Europe. The mean age from the population was 48.8 years; 64% were women and 59.9% were married or living with a partner. The findings indicated that GP's have difficulty diagnosing anxiety disorders even with assistance. Assistance was defined as screening instruments, case finding questions, or severity measure scales. For GAD, the estimates were similar in terms of sensitivity or specificity (sensitivity: 42.6%, specificity: 85.7%) when compared to all anxiety disorders combined (sensitivity: 44%; specificity: 91.2% P-value -.445) (Olariu et al., 2015).

This study found that recognition does not vary by anxiety type or questionnaires (Olariu et al., 2015). From the population of studies reviewed, there were only 5 which examined the diagnostic accuracy of GPs. Their study found that diagnostic accuracy does not seem to change over time. Given these results, Olariu and colleagues suggest that strategies focused on increasing GP's suspicion of the presence of an anxiety disorder may be beneficial. Further they suggested that adoption of a case finding instrument and recommendations for screening, as has occurred in the United Kingdom and the United States for depression, may be a solution to this problem (Olariu et al., 2015).

Olariu and colleagues cautioned that routine screening of all patients for anxiety disorder symptoms was not recommended. Instead, they recommended the use of case finding strategies to enhance GPs' ability to distinguish distress from anxiety disorder symptoms (Olariu et al., 2015). The research study also identified barriers which prevent or reduce detection of GAD by primary care providers, which were discussed in the next section.

Barriers to Detection of Generalized Anxiety Disorder in Primary Care

Results from the meta-analysis performed by Olariu et al., 2015, identified patient, provider, and system barriers, as factors contributing to lower detection rates of GAD. They posited that patient resistance to disclosing anxiety symptoms can be due to personal and cultural beliefs and may impede an admission of psychological distress (Olariu et al., 2015). Further, patients in primary care settings often present with somatic symptoms versus emotional complaints (Olariu et al., 2015),

Providers are affected by different barriers which affect recognition of anxiety. One example is that GPs lack sufficient knowledge and or training to diagnose anxiety disorders (Olariu et al., 2015). They may also lack the ability to recognize or read non-verbal cues, be untrained in conducting interviews. Time limited appointments that provide little opportunity for patient education or counseling can also become barriers to identifying anxiety in PCPs (Olariu et al., 2015). Finally, provider beliefs may hinder diagnosis of anxiety disorders, or because they are viewed as burdensome diagnoses, lower identification rates may occur (Olariu et al., 2015).

Results from the Olariu et al., 2015 study were limited because it did not adjust for symptom severity which according to past studies, is strongly associated with diagnostic accuracy. Further, their conclusions were limited due the paucity of studies providing results and analysis stratified by age (children, adolescents, adults, and the elderly) (Olariu et al., 2015). A protocol of that study purported that the presentation of anxiety symptoms may differ by age was not performed (Olariu et al., 2015). This is significant because children and adolescent may lack cognitive or communication abilities to report details to apply either the DSM-5 or ICD-10 classification system. They also reported that the elderly may report more physical rather than emotional symptoms (Olariu et al., 2015). Research was limited because only two of the studies included both adolescents and adults (Olariu et al., 2015).

Bekhuis et al., 2016 and Brahmbhatt et al., 2021 inform that between 25% and 50% of patients present to their primary care providers with anxiety symptoms and medically unexplained physical complaints. These vague complaints make diagnosis

GAD challenging as they often overlap with other medical conditions (arrhythmia pheochromocytoma, hyperthyroidism, hyperparathyroidism, or obstructive pulmonary diseases) (Brahmbhatt et al., 2021). These symptoms additionally overlap with other psychiatric conditions (major depressive disorder, bipolar disorder and substance use). Much of the prior research has focused on the cognitive symptoms in this age group such as excessive worry in multiple domains. Over the past decade the focus on accurately diagnosing anxiety disorders and GAD, because rates of misdiagnosis is estimated to be as high of 71%. Bekhuis and collegues reported that only 13% of individuals seeking care in primary settings for GAD report anxiety as their primary concern. Conversely, only 47.8% of these patients report somatic complaints.

In Haller et al. 2014, a review of the evidence found high prevalence of subthreshold GAD in all populations but higher in adolescents and older adults. Subthreshold GAD, that is not meeting either DSM-5 or ICD-10 criteria, was identified as a significant predictor or risk factor of developing GAD and other anxiety, mood disorder. Their study suggested that more efforts to recognize subthreshold cases of GAD in primary care patients would be bolstered by employing treatment algorithms to flush out these cases.

Gaps in the Research

This study aims to add to address several gaps in the literature related to the age-related differences in somatic complaints of GAD in primary care patients. Specifically, this study will attempt to address the gaps in the literature proposed by Burstein et al., 2014; Crawley, et al., 2014; Essau et al., 2018 and Olariu et al., 2015. These studies

indicated the need for further research on the age differences in physical symptoms or symptom clusters of GAD in primary care settings.

First, the primary focus of this study will attempt to answer the call for more research suggested by Olariu et al., 2015. Therein, they identified an area of literary deficiency in providing a stratified analysis of the clusters of the associated physical symptoms of GAD by developmental stage in primary care settings. In their study, they also suggested more research is needed to understand the challenges to detection of GAD in primary patients which results in differences in incidence rates. Olariu and colleagues suggested that because the presentation of GAD in primary care settings may differ by developmental stage, there is a need to conduct stratified analyses by age. An age stratification of the physical symptoms of GAD in primary care settings for children/adolescents, adults, and the elderly could not be performed in their study. To that end, this study's research questions RQ2 and RQ3 will seek to examine the differences in symptom presentation.

Second, Essau and colleagues (2018) noted the differences in a presentation by developmental phases have been overlooked by the current diagnostic classification systems in both the DSM-5 and ICD-10. They recommended future studies to explain the biological, psychological, physiological, and social processes that cause differences in the incidence rates across developmental stages. In this study RQ1– What is the current prevalence of GAD in the population cohort of primary care settings when compared to prior research for different age groups will seed to add to the knowledge base on this topic.

Third, Crawley, et al. (2014) in their study that examined somatic complaints in anxious youth, suggested that more research is needed to examine relationships between physical and psychological symptoms. When youth present in primary care settings with frequent somatic complaints this should raise PC's suspicions of the presence of an anxiety disorder. For this study, the focus was narrowed to examine only GAD. To that end, this study's research questions RQ2 and RQ3 will seek to examine the differences in symptom presentation in children ages 2 to 11.

Finally, Burstein et al. (2014) examined the clinical characteristics of threshold and subthreshold GAD in US adolescents. They found age-related differences in GAD symptoms in clinical settings. The researchers suggested that more work is needed to identify age-sensitive criteria sets that are representative of the differences in symptom expression of GAD. This area of concern is also addressed in RQ2 and RQ3.

Other research gaps have been identified and was covered in Chapter 5. These may support the need for additional research. For example, according to Olariu and colleagues, more research is needed to provide better and unbiased estimates of GP's recognition rates and diagnostic accuracy in age groups present in primary care (Olariu et al., 2015). Olariu and colleagues also suggested the adoption of a case-finding instrument to enhance GP's suspicion of the presence of an anxiety disorder may be beneficial (Olariu et al., 2015). Other research has concluded that improving GPs' familiarity with initial symptom presentation in anxiety disorder may improve timely recognition, and more information on the behavioral symptoms may be needed to improve timely recognition (Aydin et al., 2020). Additionally, Roberge et al., 2015 informed GAD is

often undiagnosed and not treated in primary care settings. Their findings informed that GAD is recognized in the context of real-world primary care and its detection of GAD is an important correlate of treatment adequacy, and this suggests that further efforts should be invested in specific GAD screening and diagnosis. Miloyan and Pachana informed that a more dimensional approach may benefit older adults by reducing reliance on meeting syndrome criteria for the disorder. Haller et al., 2014 proposed more studies that employ treatment algorithm to help primary care providers identify subthreshold conditions. Others have proposed that there is also a need to develop an algorithm that will assist identification of signs of anxiety disorders relevant to various age groupings inclusive of children and older adults, presenting in PCP offices (Dillion-Naftolin, 2016; Olariu et al., 2015). Recommendations for future research may also support address the GAP in the literature identified by Remes et al., 2017. Therein pointing to the need to better understand the bi-directional relationships between physical and mental health in the case of anxiety disorders, specifically GAD. Remes and colleagues also concluded that more population-based research using primary and secondary data retrieved from administrative health databases should provide a more complete understanding of the burden of anxiety in its various forms on the health care system.

In summary, this study was guided by Engel's BPS model of care. The theoretical framework posits that the adoption of the BPS of care involves the need to understand the BPS factors of individuals receiving patient care. For this study, the review of the literature supports the need for further research to understand the biological (physical) psychological, and social presentations of primary care patients with GAD. This

investigation will focus on the physical (somatic) presentations age of primary care patients with GAD.

Summary and Conclusions

A review of the literature has found that clusters of physical complaints are associated with GAD, and that these can vary by age group. When these patients present in primary care settings, their report of somatic complaints often accompanies psychological distress (Bryant et al., 2013 & Combs and Markman, 2014). Physicians without the aid of a diagnostic tool are more likely to investigate individual or clusters of somatic complaints when employing the disease model of medicine rather than the BPS of health. This can lead to ongoing unnecessary physical assessment rather than identification of anxiety as the cause for the reported symptoms.

Studies are needed to identify psycho-social, and physiological processes that account for the age differences in the incidence rates (Bryant et al., 2013; Combs and Markman, 2014; Dillon-Naftolin, 2016; Essau et al., 2018 & Olariu et al., 2015).

Symptoms of GAD presenting in primary care include a host of age related somatic or physical complaints reported by patients with GAD that span from a stomach ache to chest pains Table 4. Prior research has also shown that these symptoms have the potential to significantly impact the quality of life for these patients. Moreover, the literature supports the conclusion of the high economic burden of employing potentially invasive procedures to investigate for physical conditions or disease as a primary cause for these reported symptoms. The research and development of a case finding instrument or process could reduce invasive and expensive procedures (Combs and Markman, 2014).

Table 4

Somatic complaints of primary care patients with Generalized Anxiety Disorder

Children (2-11 years)	Fatigue, muscle tension and aches, sweating, trembling, hyperventilation, twitching, nausea, diarrhea or irritable bowel syndrome, heart palpitations and headaches
Adolescents (12-18)	Fatigue, muscle tension and aches, sweating, trembling, hyperventilation, twitching, nausea, diarrhea or irritable bowel syndrome, and headaches
Adults (18-65 years)	Sleep disturbance, restlessness, muscle tension, gastrointestinal symptoms, and chronic headaches, psychomotor agitation, abdominal pain; weight/appetite increase, sleep disturbance, dry mouth, shortness of breath; chest pain, back pain, bloated feeling, dizziness/feeling lightheaded, muscle pain, nausea, neck pain, palpitations, excessive perspiration, blurred vision, seeing spots in front of the eyes, tachycardia.

(Bekhuis et al., 2016 and Brahmbhatt et al., 2021)

Prior research informs on the differentiation of GAD symptoms by age (Bekhuis et al., 2016 and Brahmbhatt et al., 2021). However, there is a lack of studies confirming these findings in the primary care patient population. According to Olariu et al. (2015), future research stratifying these symptoms by age would aid the detection and treatment of GAD in primary care settings. Further there is a need to develop algorithm that will assist in the identification of signs of an anxiety disorder relevant to the various age cohorts that is inclusive of children and older adults, presenting in PCP offices (Dillion-Naftolin, 2016; Olariu et al., 2015).

Chapter 3: Research Method

The purpose of this quantitative study was to identify the specific physical symptoms of GAD that were recorded by in medical records and to stratify these by age. The research was focused on associating the clusters of physical symptoms of GAD record when analyzed by age stratifications for (a) children, (b) adolescents, (c) young adults, (d) adults, and (e) the elderly.

Chapter 3 provided information regarding the selection of the study approach and research design, rationale, hypothesis and the research questions. A description of the population data and sampling procedures was given along with an explanation of the power analysis to determine sample size. This chapter also provided information the independent and dependent variables. Additionally, detailed information on the procedures, ethical considerations, and data analysis was included. This chapter concludes with a description of delimitations and limitations.

Research Design and Rationale

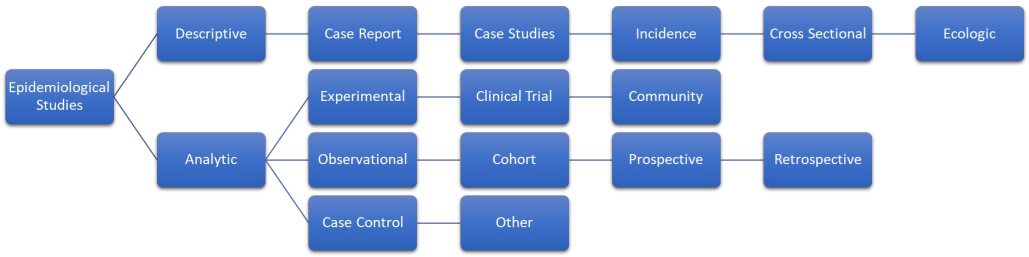
I aimed to identify and characterize the physical complaints listed by patients with a diagnosis of GAD as they present in primary care settings, if any differences exist by developmental age. To accomplish this objective, a quantitative study design was used to test for associations between variables. Creswell (2014) informed that quantitative designs are used to test theories and relationships between variables. In this study, Engle's (1977) BPS theory guided the inquiry into the associations between the variables under study and the research questions. Engle's worldview posited that disease must be analyzed using biological, psychological and social constructs. Use of the BPS theory in

this research required the integration between biological (physical, somatic) symptoms, psychological (behavioral, affective) symptoms and social factors when diagnosing GAD. I sought to identify the biological symptoms which accompany behavioral symptoms as they present in primary care setting by developmental age. This method was aligned with prior research studies (see Bryant et al., 2013; Combs& Markman, 2014; Dillon-Naftolin, 2016; Essau et al., 2018 Locke et al., 2015; Olariu et al., 2015).

For this study, an analytical quantitative approach was used to retrospectively review patient medical records. A retrospective study involves the collection from records for the outcome of interest. This design enabled me to identify, characterize and analyze the physical complaints listed by patients with a diagnosis of GAD as they present in primary care settings; to associate those symptoms to age groups and to determine if any differences exist by developmental age as recorded in the patient record. To accomplish this objective, this study utilized an analytical quantitative design to test for associations between variables. Ranganathan and Aggarwal (2018) referred to this as a type of epidemiological study which retrospectively refers to a timeline in relation to the development of the outcome or cases. Figure 1 provided the approach to classification of research study designs.

Figure 1

Epidemiological Approaches to Classification of Research Study Designs



Source: (Ranganathan & Aggarwal, 2018)

To accomplish this, a quasi-experimental observational retrospective cohort study design was used to conduct analysis of deidentified medical records. A retrospective case control study is a type of epidemiological study which follows a group of individuals over time to investigate the hypothetical associations between risk factors and outcomes (Sertia, 2016). Data for these types of studies is usually collected from existing records or databases (Sertia, 2016). Important to this inquiry, free text clinical data from the electronic medical records was used to support the identification of patient symptoms. Support for using free text data can be found in a recent study by Horng, et al. (2017). In their study, they proposed that free text data contains symptoms presentation cited by patients which is routinely corrected by primary care clinical staff and is rarely structurally coded. Medical records searches for vague symptoms contained in the free text data may enhances recognition and discriminability of the associated symptoms of a disorder.

Advantages and Disadvantages.

There are specific advantages to this type of study design. First, these types of studies are inexpensive compared to other methods such as randomized control trials, survey methods and the like because they require a smaller sample (Mamouris et al., 2021). Second, these studies are easy to investigate outcomes once clearly defined controls and outcomes are defined. They provide opportunities for generalization because they include real world data. They are quick due to the use of medical records data, and which can be examined in a short time frame. Another advantage of this type of study is that it proposes to establish an association between the variables. This allows for the collection clearly defined cases based on clearly defined inclusion and exclusion criteria. Finally, there is no follow up required from the participants (Ranganathan & Aggarwal, 2018).

To answer each research question, one or more electronic health data bases was analyzed. I sought to compare the somatic complaints of children, adolescent, adult, and elderly patients who had a diagnosis of GAD. No consideration was given to the treatment provided. To date, few studies have examined the differences in presentation of physical complaints in primary care settings by developmental age. Making use of available secondary data contained in approximately 312,295 patients between 2020-2021 provided the opportunity to explore the relationships between clusters of symptoms that were not previously reported. This additional research may help to improve knowledge and PCP recognition of GAD in primary care.

Methodology

I conducted a retrospective case control study originally planned to be nested within the data derived from the TriNetx (Cambridge, MA) Research Network. The TriNetx data was not available at the time of the study. Instead, data was obtained from the Michigan Department of Health and Human Services (MDHHS) administrative claims database warehouse.

The purpose of the analysis was to identify physical symptom clusters predictor variables of GAD. This method was aligned with prior research studies (see Bryant et al., 2013; Bekhuis et al., 2016; Combs & Markman, 2014; Dillon-Naftolin, 2016; Essau et al., 2018; Locke et al., 2015; Olariu et al., 2015). To accomplish this, a quasi-experimental analytical retrospective cohort study design was used to conduct analysis of deidentified medical records. A retrospective case control study is a type of epidemiological study which follows a group of individuals over time to investigate the hypothetical associations between risk factors and outcomes (Sertia, 2016). Symptoms were assessed in the data with an outcome a of having a GAD (ICD-10 F41.1) for the prior 18-month period. The exposures or predictors in this case were the somatic symptoms as recorded by the clinical staff in patient records in primary care settings.

Data for these types of studies is usually collected from existing records or databases (Sertia, 2016). The controls chosen for these cased were based on matching criteria or age groups including children ages 2 to 11, for adolescents ages 12 to 18, and for young adults ages 19 to 25, adults ages 26-55, and elderly adults aged 56- 80 without have a diagnosis of GAD. Therein subjects with a disease or a condition (cases) such as

GAD were matched to subjects without the disease (controls) in order to create similar groups in terms of confounding variable.

Population

According to Bandelow and Michaelis (2015), to be reliable and generalizable, studies using epidemiological survey data should have very large sample sizes. Additionally, the sample sizes need to be large to enable subgroup analyses that compare gender, age, ethnicity, and other factors prevalence rates (Bandelow & Michaelis, 2015). The population sample for this study was obtained from the medical records from large primary health care systems in the State of Michigan.

The population was derived from a sample of patients having visited primary care sites over the past 18 months. The dataset was derived from (HCOs) in the State of Michigan and who have significant numbers of patient records necessary to generate a sample representative of population of the geographic region. The target sample included data from across the health system's departments including behavioral health units where the patient chart included a diagnosis of GAD, coded as F41.0.

Sampling and Sampling Procedures

TriNetx is a global health research network that purports to optimize clinical research by providing data sets obtained from global healthcare organization to answer research questions (TriNetx.com, 2021). Their TriNetx Analyze product provides an option for researchers to query and analyze data from 40 healthcare systems in the United States. Their database is comprised of aggregated information obtained directly from electronic medical records (EMR) systems. The datasets contained various factors

including age groups, income levels and geographical data from hospital, primary and specialty treatment provider. It contained information essential to measuring outcomes such as laboratory results, diagnosis information and other supporting information including clinical notes.

As, stated before, the TriNetx data was not available at the time of this study. For this study, a convenience sample obtained from the Michigan Department of Health and Human Services (MDHHS) administrative claims database warehouse. The MDHHS administrative claims data was used to determine the association between the variables and to answer the research questions. Patients meeting the criteria of had a diagnosis code of F41.1 recorded in the prior 18 months was selected. Patients with other diagnosis codes were excluded from the data set. Selection of patient data was in the form diagnoses, recorded symptoms and notes from primary care providers contained in the EMR of patient from the age groups including children ages 2 to 11, adolescents ages 12 to 18, young adults ages 19 to 25, adults ages 26-55, and elderly adults aged 56- 80.

The use of MDHHS administrative claims data was supported by Berger et al. (2016), Brundin-Mather et al. (2018), Masurkar et al. (2019), Singh and Khan. (2020), and Vassar and Holzmann (2013). They described a retrospective medical record chart review, or a retrospective chart review (RCR) as a research design in which previously recorded patient data is used to answer the research questions. RCRs methodology includes a review of data from a specified timeframe. For this study the time frame was the previous18-months between June 1, 2020, and January 31, 2021. According to Bandelow and Michaelis (2015) and Sertia (2016), to be reliable and generalizable,

retrospective studies which should have very large sample sizes. Additionally, the sample sizes need to be large to enable subgroup analyses that compare cohort data such as age group.

The population was derived from a sample of patients having visited primary care sites over the past 18-months. It was assumed that the primary health care systems generated a sample representative of population of the geographic region. The target sample included data from across the health system's departments including behavioral health units where the patient chart included a diagnosis of GAD, coded as F41.0. In addition to coded diagnosis, contextual data contained within the patient record was used to tease symptomology that would not otherwise be found in the ICD-10 codes. Contextual data included recorded symptoms and physician notes or free text coded entries.

Free text data important to diagnostic discrimination might be recorded in medical records is used to form alerts and reminders to support clinical informatics decision algorithms (Horng et al., 2017). These decision support algorithms may contribute to changes in clinician behaviors for a spectrum of disease. In their study, Horng et al. (2017) informed that these decision support systems rely on coded structured data such as demographics, vital signs, and lab results. Rarely included in these tools are free data collected routinely as a part of routine care which is a rich source of patient information. For example, the vague symptom presentations cited by patients as the reason for the primary care visit is collected during triage and is stored as free text data. However, it is not entered in the patient record as structured coded data. One reason proposed is due to

the need to allocate additional resources to enter the coded data in already overburdened primary care settings such as emergency departments. Their objective was to determine the incremental benefit of free text data to identify patient suspected of having an infection in the emergency department (Horng et al., 2017). Their method involved a respective, observational cohort review of 230,936 emergency department patient visits between 2008 and 2013. The primary outcome measure was having an ICD-10 discharge diagnosis of infection related. Their study found that compared to using only structured data, using of all available data including free text, data increased detection of infections from .67 to .86 (Horng et al., 2017).

In the current study, a quantitative method of data collection and analysis to answer the research questions and to confirm or disconfirm the hypothesis. In this study, the research hypothesis, there are differences in the clinical presentation of GAD by somatic symptom clusters as recorded by PCPs when analyzed by age groups: children ages 2 to 11, adolescents ages 12 to 18, young adults ages 19 to 25, adults ages 26-55, and elderly adults aged 56- 80. To date, few studies have examined the differences in presentation of physical complaints in primary care settings by developmental age. Making use of available secondary data contained in the MDHHS databases which contained approximately 51 million patient records from health systems across the State of Michigan facilitated this sample collection (Tipirneni, R. et al. 2020). Data from within the database included medical records data from the medical records systems from HCOs across the State of Michigan (Tipirneni, R. et al. 2020).

An initial scan of cases meeting the criterial of having an ICD-10 diagnosis of F41 GAD yielded approximately 300,000 patient records. The number of recordings found between the years of 2020 and 2021 yielded 145,495 records and 41,119 for patients between the ages of 18-55. Patients between the ages of 18-55 represented three of the identified age stratifications within the current study. These large sample sizes provided the opportunity to explore the relationships between the age groups and the somatic complaints that were not previously reported in the literature. This additional research may help to develop case finding tools to enhance PCP detection of GAD in primary care patients. Despite a large available population size, the sample was considered a convenience sample.

Procedures for Recruitment, Participation, and Data Collection

There was a wealth of data available in the TriNetx and the MDHHS databases taken from intake questionnaires that were captured on paper forms, scantron pages, or inputted in electronic tablets, and then entered into the electronic patient record (Singh & Khan, 2018; & Tipirneni, R. et al. 2020). The procedures for recruitment began with a real-time search of patients using the TriNetX Research Network. The TriNetx database provided access to more than 51 million patient records (Singh & Khan, 2018). As, stated before, the TriNetx data was not available at the time of this study. For this study, a convenience sample obtained from the Michigan Department of Health and Human Services (MDHHS) administrative claims data warehouse. The data was rich with patient demographic information; however, this study's interest was in the stratified age bands that were aligned with the research questions (Tipirneni, R. et al. 2020). Specifically,

these were children ages 2-11, adolescents ages 12-18, young adults ages 19-25, adults ages 26-55, and older adults ages 56-80. Second, participants were further stratified into two groups. These patients were from records coded with a primary diagnosis of GAD ICD-10 Code F41 and those who did not. The diagnosis code F41 is aligned with the recommended terminology from the WHO and Centers for Disease Control and Prevention. The exclusion criteria for both groups included having any other mental health diagnosis. In addition to coded ICD-10 diagnostic codes, patient contextual clinical information in the form of free text coded was examined to support age related symptom presentation (Tipirneni, R. et al., 2020). A waiver from Walden University Institutional Review Board (IRB) for obtaining informed consent was received. Obtaining informed consent for these patient records was not required for two reasons. First, prior studies have shown that the data aggregators, TriNetx and MDHHS, remove protected health information and obfuscates patient counts in their statistical summaries and free text-coded data (Singh & Khan, 2018 & Tipirneni, R. et al., 2020). They each remove protected health information and obfuscates patient counts to safeguard protected health information by rounding patient counts in analyses up to the nearest 10 (Singh & Khan, 2018). Further, while the real-time clinical data from TriNetx and MDHHS was taken directly from patient records from participating HCOs, all data including the name of the HCO remained anonymous. This classification of having not having ICD-10 code F41. enabled enrollment of enough cases and matching controls Table 5.

Table 5

Sampling Procedure

Cases	Controls
Diagnosed with GAD (F41.1) coded 1	No diagnosis of GAD coded 2
No – comorbid mental health condition. Eg. depression, mood disorder	No – comorbid mental health condition. Eg. depression, mood disorder
Time span: 18-month look back	

Use of this approach means that it was not required to add another control (e.g. sex, education, socioeconomic status) to add statistical power. After definition of the cases, the data was collected and the procedures for collection of all data was collected using the same approach. To answer each research question, one or more electronic health data bases was analyzed. I compared the somatic complaints of children, adolescents, young adult, adult and elderly patients who had a diagnosis of GAD. No consideration was given to the treatment provided.

Instrumentation and Operationalization of Constructs

The independent variable used to conduct the analysis; physical symptom clusters was operationalized by the symptoms identified within the patient medical record. These symptoms may be found in both the structural (ICD-10) or free text codes within the patient records as guided by the literature on age related symptom presentations (APA, 2013; Bandelow & Michaelis, 2015; Dillon-Naftolin, 2016; Essau et al., 2018; Gale & Millichamp, 2016); Haller, et al., 2016; Hornig et al., 2017; Locke et al., 2015; Olariu et al., 2015 and WHO, 2017) and the use of patient records to determine prevalence rates

(Roehrs et al., 2017; Vassar & Holzmann, 2013) and finally methods used in cohort studies (Setia, 2016).

The dependent variable, age groups was operationalized by the band of age stratifications that aligned with established major periods of human development (Berk, 2014). A search of the literature found inconsistent definitions of the ages contained with each chronological age stratification. There were variations on the reported ages for children, adolescents and adults depending on the purpose of the research (Contopoulos-Ioannidis et al., 2012). For example, the American Academic of Pediatrics' Standard 6, for pediatric clinical trials, defined children as ranging from age 2 to age 11 (Williams et al., 2012). Age stratifications definitions was supported by several studies from the literature. These included Children*:* ages 2 to 11 years (Dillion-Naftolin, 2016; Essau et al., 2018; and U.S. Census Bureau, 2015); Adolescents: individuals ages 12 to 17 years old (Essau et al., 2018); Young Adults: individuals ages 18 to 25 (Arnett, 2015 & Essau et al., 2018); *Adults*: individuals ages 26-55 and older adults' individuals ages 56 to 80 (Miloyan & Pachana, 2016 and Olariu et al., 2015).

Table 6

Groups of Case Stratified by Age

Age Group	GAD (F41.1)	No GAD	Label
Children: ages 2 to 11 years	1	0	A
Adolescents: 12 to 17 years	1	0	B
Young Adults: ages 18 to 25 years	1	0	C
Adults: ages 26 to 55 years	1	0	D
Elderly Adults: ages 56 to 80 years	1	0	D

sources: (Dillion-Naftolin, 2016; Essau et al., 2018; Miloyan & Pachana, 2016; & Olariu et al., 2015)

The diagnosis of GAD was informed by the ICD-10 diagnosis, Table 2. The literature has shown that while this criteria exists, primary care practitioners routinely do not become suspicious of these symptoms as pointing to GAD. It is important to rely on prior research to enhance detection of the various complaints recorded across the developmental stages within the research. For example, there were a significant number of physiological symptoms of GAD in the ICD-10 diagnostic criteria (Table 2). Conversely there were few physical symptoms included in the DSM-V diagnostic criteria for GAD (Table 2). Another reason was there no recommendation from the USPTF (2016) to screen for anxiety disorder in general and specifically for GAD. Without this recommendation, there exists no mechanism or process to alert PCP to the existence of GAD. Further, the highly recognized and validated signal detection measure used to confirm a diagnosis of GAD, the GAD-7 (Mossman et al., 2017) relies on DSM-V criteria, or rather the psychological symptoms of distress in GAD patients. Neither of these approaches to detection of GAD in primary care settings incorporates the true essence of Engle's 1977 BPS of patient care (Engle, 1997; Havelka et al.,2009).

These groups were labeled to enable analysis on the independent variables (see Table 5). As informed by the literature, the independent variables were somatic or physical symptoms of GAD as recorded in the patient record. To provide this list, data in the form of structured codes and free text data was analyzed to identify the recorded symptoms. These were coded with a y or no to for the presence of ICD-10 F41.1 GAD diagnosis. In the 2017 study conducted by Horng and colleagues, free text data from electronic patient records was collected and grouped into 'features' of the most frequently

used words in the text. Amongst these features where demographic data (age), vital signs (diastolic and systolic blood pressure, heart rate and the similar), and free texts chief complaint data (chest pain, nausea, dizziness) and free texts of nursing assessment data (pain rating, other reported symptoms). Horng proposed using a machine learning program to detect disease after scanning the data to find list of commonly used descriptors in order to create 'tokens' to operationalize the text data. The researchers described this model for the collection of descriptions as a bag of words. Which uses the chief complaint and nursing assessment text. Their study proposed machine learning as a tool to analyze this bag of words, to improve real time prediction of infection in septic patients. Their results were found to be valid and improving the rate of detection of disease (Mao et al., 2018). Their results were included in an emerging body of evidence which supports using machine learning also described as artificial intelligence (Chalen, et al., 2019 & Esteya et al. 2019) to solve complex problems in healthcare. For the purposes of this study, only the methods used by Horng to identify symptoms recorded in the patient records (the bag of words) and then to operationalize them for statistical analysis was leveraged to test our hypothesis. While one of the potential outcomes of this study was to recommend development of an algorithm, the processes and procedures including machine learning to develop such an algorithm were out of scope for this study.

Data Analysis Plan

First, data was extracted, screened for exclusion criteria (any other mental health diagnosis). Next binary logistic regression was used to identify cases and controls. Second, symptoms were identified from recorded structural codes and free text entries in

the patient records. Records missing text data was excluded from the sample. Third, text data was operationalized using a descriptive code to enable statistical analysis was leveraged the ‘bag of bones and token approaches proposed by Horng et al. (2017) to test the hypothesis. Fourth, descriptive statistics were used to first identify patient somatic complaint data using means standard deviations and odds ratio statistics. Fifth, multiple regression analysis was used to determine the relationship between the levels of the independent variable, (clusters of physical symptoms) found in each age group’s patient records were examined using the dependent variables age stratifications and an ICD-10 F-41 GAD. Descriptive statistics was used to first identify patient somatic complaint data using means standard deviations and odds ratio statistics. Next binary logistic regression was used to identify cases and controls.

Assumptions of the Statistical Analysis:

First binary logistic regression: the dependent variable must be binary, was used to determine cases and controls. For this analysis, this dependent variable was dichotomous and have only two outcomes yes or no e,g. the presence of GAD or no. Another test excluded another mental health diagnosis. The outcomes here were yes or no. The second assumption is that one or more of the independent variables. For this study, the ordinal variable was continuous and nominal e.g., age stratifications. The third assumption was there were independence of observations. This meant that the dichotomous dependent variables and the independent variables were mutually exclusive. The fourth assumptions involved having a minimum of 15 cases per independent variable.

Additional statistics using SPSS was used to satisfy the following remaining assumptions. These were (a) there was a linear relationship between the continuous independent variables and the logistical transformation of the dependent variable; (b) there was not any multicollinearity; c) there were no significant outliers, leverage or influential points.

If all of the assumptions were met, then case selection was accomplished. This process occurred twice during the analysis. Once for the selection of cases, and then selection of groups. Test for model appropriateness such as the Hosmer and Lemeshow goodness of fit test. The Cox and Snell R Square and Nagelkerke R Square values were used to understand the degree of variation on the independent model. The logistic regression estimates the probability of an event (in this case, having GAD). The probability statistic used was greater than or equal to 0.5 or a .5% chance event occurring was due to chance.

Logistical regression assumes the variables were independent of each other. As mentioned before, the value of free text data contained in the medical record cannot be overstated. As such, patient records with null entries for text data was excluded from the sample. Support for this research design was detailed in Chapter 2 the literature review and the design rationale. The statistical techniques used to evaluate the data included one-way ANOVA, chi-square, correlation, and logistical regression using SPSS version 28 software.

The ANOVA (analysis of variance) is a statistical test which makes a single, overall decision as to whether a significant difference is present among three or more

sample means (Levin 484). An ANOVA is similar to a t-test. However, the ANOVA can also test multiple groups to see if, they differ on one or more variables.

Threats to Validity

The goal of this retrospective medical records review was to establish a relationship between the predictors and the outcomes of GAD in primary care patients. There were several threats to validity for retrospective case control designs which limited the generalizability of the results (Viswanathan et al., 2014). Firstly, there was a chance of systematic error in the data resulting in confounding errors due to self-selection bias of diagnosis in the record. There may be systemic differences in the baseline characteristic of the data obtained from the dataset which was derived from multiple health systems across the US. There was no available data on collection procedures at the time of this proposal. Additionally, there was the risk of selection bias due to the potential of inappropriately selecting case and controls, i.e., specifying the outcome variable F41.1 GAD diagnosis rather than another anxiety disorder diagnosis. Another threat to validity was the potential for reporting bias by physicians, clinical staff or by the patient via self-report as recorded in the patient report.

Threats to External Validity

There were three known threats to external validity in this section. First, the extent to which the study findings was generalizable to other populations was unknown because the sample was restricted to one geographical location, the United States. Second, the participants were ethnically homogenous meaning they have received care in

primary care settings only. Third, given differences in prevalence of anxiety disorders across ethnic groups, the generalizability of the present findings may be limited.

Threats to Internal Validity

There were several potential threats to internal validity including history, statistical regression to the mean and social interaction. There was a threat that another event over the research period may have influenced the symptom presentation or the diagnosis. The current study did not analyze changes in diagnosis or the factors that caused the change. There was a threat of statistical regression in certain populations examined in the study. For example, the number of symptoms detailed in the literature which were subscribed by one or more of the age groups. The opposite may be true for the elderly population which were reported not to report anxiety but rather only physical symptoms. The study did not control for sex, race or cultural factors which may influence symptom presentation. The study additionally utilized standardized measures for recording symptoms, yet it assumed a uniformly application of the ICD-10 diagnosis for GAD in all primary patients. Finally, the study did not account for potential social interaction threats such as the outside influences and interactions with patients.

Threats to Statistical Conclusion Validity

Statistical conclusion validity (SCV) holds when there is an appropriate and adequate analysis of the data (Matthay & Glymour, 2020). These threats typically require the researcher to conduct the appropriate statistical analysis. There were six potential threats to statistical conclusion validity including low statistical power, violation of the

assumptions of the statistical test, fishing and the error rate problem: incorrect calculation of the effect size, extraneous variance in the test setting and unreliability of error.

First, SCV could occur when there is low statistical power in the research. Then the research may conclude there is no relationships between the variables and thereby creating a type 1 error and reject the Null hypothesis. Due to the proposed large sample size of this study, there was little risk of low statistical power or creating a type 1 error. Second, a violation of the assumptions of the statistical test can result in incorrectly estimating the size and precision of an effect. Third, a fishing and the error rate problem can result from the use of repeated tests for significant relationships. This type of error could have occurred for this study due to the plan to test the associations between multiple independent variables and multiple levels of the dependent variable. According to Matthay and Glymour, (2020) if uncorrected, the number of tests, can inflate statistical significance thereby creating a type II error and false accept the Null hypothesis. Fourth, a threat to SCV can result from an incorrect calculation of the effect size this can occur in some estimation approaches which systematically incorrectly estimate the magnitude of a given causal quantity. For this study, there was a risk that certain symptoms may over repeated in the record and therefor overestimated. Such an error can result in a type II error. Fifth and final, a threat to SCV can occurr from an extraneous variance in the test setting and may inflate error, therefor making detection of an effect difficult and undermining the validity of the results. For this study, there was an assumption that all clinical data in the record meets uniform data. There was also an assumption of the minimum diagnostic threshold was applied when a patient was diagnosed with GAD in

primary care settings. Further, since no instrument was deployed, there was a risk of an underestimation for overestimation of the effect in the study.

Ethical Procedures

No vulnerable subjects were used in the study as was reviewed and approved by the Institutional Research Board (IRB) at Walden University and the research coordinator.

To ensure patient privacy, all data in the dataset contained deidentified medical records data. MDHHS had a process for ensuring patient confidentiality. For example, MDHHS networks provided a cloud-base real-time access to de identified longitudinal clinical data. This data was derived from health care organizations (HCOs) and aggregated directly from electronic medical records systems (Singh & Khan, 2020). HCOs participation in the TriNetx or MDHHS database consists or primary care (inpatient, outpatient and specialty care) service providers from across the United States.

Summary

The current study involved an analytical quantitative approach to retrospectively review patient medical records using sample data from the MDHHS administrative databases. A convenience sample obtained from the MDHHS administrative database was used to determine the association between patients meeting the criteria of have a diagnosis code of F41.1 recorded in the prior 18 months was selected. The estimated size of the population is 312, 295. From that population an age stratified convenience sample of 1000 patient records included a matching control group was extracted, operationalized,

and then statistically described and testing using binary logistic regression, one-way ANOVA, chi-square, correlation, and logistical regression using SPSS software.

There were no ethical concerns regarding treatment, use of vulnerable subject or confidentiality issues. The procedures for collection of study participants involved standard processes for the use of MDHHS' anonymous data and with approval from Walden's IRB. This study design enabled the researcher to identify, characterize and analyze the physical complaints listed by patients with a diagnosis of GAD as they present in primary care settings; to associate those symptoms to age groups and to determine if any differences existed by developmental age as recorded in the patient record. Results from this study may address the gap in the literature that more research is needed to enhance detection of GAD bay age in in primary care settings.

Chapter 4: Results

The purpose of this quantitative study was to identify alongside affective symptoms, the specific physical symptoms of GAD that are recorded by PCPs and to stratify these by age. The current research was planned to focus on associating the clusters of physical symptoms or symptom clusters of GAD when analyzed by age stratifications for (a) children, (b) adolescents (c) young adults, (d) adults, and (e) the elderly. This study was focused on the following research questions and their corresponding hypotheses.

RQ1: What is the current prevalence of GAD in the population cohort of primary care settings when compared to prior research for different age groupings including children ages 2-11, for adolescents ages 12-18, for young adults ages 19-25, for adults ages 26-55, and for older adults ages 56-80?

$H_0$1: There are no significant differences in prevalence rates in the primary care population sample differentiated by age stratification when compared with previous research.

H_a1: There are significant differences in prevalence rates in the primary care population sample differentiated by age stratification when compared to previous research.

RQ2: What are the differences in physical symptoms or symptom clusters of each of the age groups, children ages 2-11, for adolescents ages 12-18, for young adults ages 19-25, for adults ages 26-55, and for older adults ages 56-80 as they present in primary care settings?

$H_0$2: There are no significant differences in physical symptoms or symptom clusters in the primary care population sample differentiated by age stratification.

H_a2: There are significant differences in physical symptoms or symptom clusters in the primary care population sample differentiated by age stratification.

RQ3: What is the association between diagnosis of GAD and physical symptoms of GAD in children ages 2-11, for adolescents ages 12-18, for young adults ages 19-25, for adults ages 26-55, and for older adults ages 56-80 as they present in primary care settings?

$H_0$3: There is not an association between diagnosis of GAD and physical symptoms of GAD in the primary care population sample differentiated by age stratification.

H_a3: There is an association between diagnosis of GAD and physical symptoms of GAD in the primary care population sample differentiated by age stratification.

The population was patients who visited primary care sites over the past 18 months. The target sample included data from across the health system's departments including behavioral health units where the patient chart includes a diagnosis of GAD, coded as F41.0. Graphical representation of the data, descriptive analyses, the chi-square test, and logistic regression analysis were conducted to assess the research questions and hypotheses.

The current chapter is structured as follows. First, the data collection procedure is described. After that, the results from the data analyses conducted to evaluate the research hypotheses are provided. Lastly, the chapter concludes with a summary of the quantitative results.

Data Collection

In the current study, a quantitative method of data collection analysis was used to evaluate the research questions and their related hypothesis. This study made use of secondary data contained in the electronic medical records of patients with GAD (F41.1) and anxiety disorder NOS (F41.9) diagnoses and without diagnosis of any other mental illness from January 2020 to June 2021. These were provided by Michigan department of health administrative claims databases, which contain approximately 61 million patient records from health systems across the state (Tipirneni, R. et al. 2020). The database includes medical records data from the medical records system from HCOs across the state (Tipirneni, R. et al. 2020).

The population sample for this study was derived from Michigan Medicaid and Medicare patients seen by primary care providers over the past 18 months. The inclusion criteria consisted of medical records where a diagnosis of GAD, coded as F41.1; anxiety disorder, not otherwise classified, coded as F41.9; and for patients with no mental health or “F-codes”. The patient records where no “F" code was found which were used as controls. "F” codes ranging from F01 to F99 are a group of ICD-10 codes used to classify mental health disorders (WHO, 2017).

For this study, a convenience sample obtained from the Michigan administrative claims database was used to determine the association between the variables and to answer the research questions. Patients meeting the criteria of having a diagnosis code of F41.1 recorded in the prior 18 months were selected. Patients having other diagnosis codes were excluded from the data set.

The selection of patient data was in the form of diagnoses, recorded symptoms, and notes from primary care providers contained in the EMR claims data of patients from four age groups. Specifically, these age groups were children ages 2-11, adolescents ages 12-18, young adults ages 19-25, adults ages 26-55, and older adults ages 56-80. Next, participants were further stratified into two groups. These patient's records were coded with a primary diagnosis of GAD ICD-10 Code F41. Records were obtained for patients who did not have a mental health diagnosis, subsequently identified as the control group. The diagnosis code F41 for GAD was aligned with the recommended terminology from the WHO and Centers for Disease Control and Prevention. The exclusion criteria for both groups included having any other mental health diagnosis.

The Michigan Department of Health and Human Services (MDHHS) data warehouse databases contain administrative claims data, derived from claims, and supplemental data for Medicaid and Medicare patients through the State of Michigan (Tipirneni, R. et al. 2020). Use of this data set represented a change from initial plan laid out in Chapter 3 because TriNetx data was not available for this study. Attempts to secure a sample of de-identified medical records data form alternative sources such as the EPIC System in use at the Henry Ford Medical Centers medical records were unsuccessful. The

MDHHS data warehouse contained data extracted from EMR systems data from hospitals, primary and specialty treatment providers, and pharmacies located within the State of Michigan. The database contained information used to measure patient outcomes such as laboratory results, diagnosis information, and other supporting information including clinical notes. Further, there was a wealth of data in the MDHHS databases taken from intake questionnaires, captured on paper forms, scantron pages, or input in electronic tablets, and then entered into the electronic patient record (Tipirneni, R. et al. 2020). The data also included ICD-10 diagnosis codes captured upon admission and discharge. The procedures for recruitment began with a real-time search of patients using the MDHHS claim data. The database provided access to more than 61 million patient records. The data was rich with patient demographic information; however, my interest was in the stratified age bands that aligned with the research questions.

The data for this study were derived from patients having visited primary care sites over the past 18 months. It was assumed that the State of Michigan primary health care systems generated a sample representative of the population of the geographic region. The target sample included data from across the health system's departments including behavioral health units where the patient chart includes a diagnosis of GAD, coded as F41.0. I additionally examined patients with a diagnosis code of anxiety disorder not otherwise classified (NOS) codes as F41.9.

Results

The sample for this study included information from a total of 1,336 patients. Tables 7 and 8 report the results from the frequency analyses for the categorical variables of the study.

Table 7

Frequency Analysis for Age Category

Age category	Frequency	Percent
2-11	282	21.1
12-18	269	20.1
19-25	253	18.9
26-55	258	19.3
56-80	274	20.2
Total	1336	100.0

Among the 1336 patients included in the sample, 37.4% (n = 500) only had a GAD (F41.1) diagnosis, 37.4% (n = 499) only had a F41.9 diagnosis, and an additional 25.2% (n = 337) had no mental illness or "F" diagnosis codes.

Table 8

Frequency Analysis for Type of Diagnosis

Population	Frequency	Percent
Only GAD (F41.1) diagnosis	500	37.4
Only anxiety disorder NOS (F41.9) diagnosis	499	37.4
No mental illness "F" diagnosis codes	337	25.2
Total	1336	100.0

An assessment of the research questions and their corresponding hypotheses is provided as follows. Table 9 exhibits the crosstabulation of population and age category. For the GAD (F41.1) population, the patients were evenly distributed and for the anxiety

disorder NOS (F41.9) population the patients were slightly evenly distributed by age category. However, for the control population, there were differences in the distributions of patients by age group. To evaluate $H_0$1, a chi-square test was conducted to determine whether there was a significant association between population group and age category. As shown in Table 10, a nonsignificant result was achieved, $\chi^2(8) = .000$, $p = 1.000$. Thus, the results from this test did not provide statistical evidence to reject $H_0$1.

Table 9

Crosstabulation of GAD, Anxiety disorder NOS and Control Diagnosis and Age Category

			Age Category					Total
			A:02-11	B:12-18	C:19-25	D:26-55	E:56-80	
Population	GAD (F41.1)	Count	100	100	100	100	100	500
		% within Population	20.0%	20.0%	20.0%	20.0%	20.0%	100.0%
	Anxiety disorder NOS (F41.9)	Count	100	100	99	100	100	499
		% within Population	20.0%	20.0%	19.8%	20.0%	20.0%	100.0%
	No "F" code Control	Count	82	69	54	58	74	337
		% within Population	24.3%	20.5%	16.0%	17.2%	22.0%	100.0%
Total		Count	282	269	253	258	274	1336
		% within Population	21.1%	20.1%	18.9%	19.3%	20.5%	100.0%

Table 10

Results of the Chi-Square Test Evaluating the Association Between GAD, Anxiety Disorder NOS and Controls Diagnosis and Age Category

Statistic	Value	*df*	Asymptotic Significance (2-sided)
Pearson chi-square	5.762	8	.674
Likelihood ratio	5.788	8	.671
Linear-by-linear association	.545	1	.460
N of valid cases	1336		

$H_0$2 was that there are significant differences in physical symptoms or symptom clusters in the primary care population sample differentiated by age stratification. Graphical representation of the data as well as a series of chi-square tests were used to address this hypothesis.

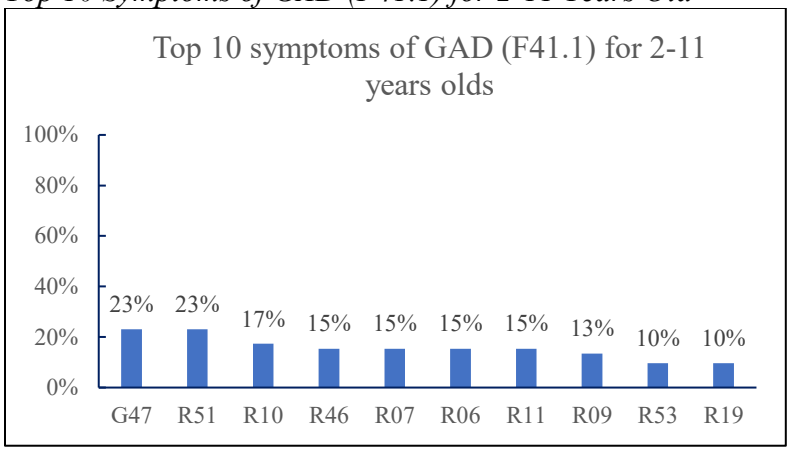
The calculated prevalence rates were then used to identify the topmost (top 10) symptom for the specified population and age group.

GAD (F41.1) Population.

For children ages 2-11 years old, the topmost symptoms were sleep disorders (G47) and headache (R51) that each had a 23% prevalence rate, followed by abdominal and pelvic pain with 17% (see Figure 2). For adolescents ages 12-18 years old, the topmost symptoms were abdominal and pelvic pain (R10) and headache (R51) that each had a 23% prevalence rate, followed by pain in throat and chest (R07) with 17% (see Figure 3). For young adults ages 19-25 years old, the topmost symptom was abdominal and pelvic pain (R10) that had a 43% prevalence rate, followed by nausea and vomiting (R11) with 31%, and headache (R51) with 29% (see Figure 4). For adults ages 26-55 years old, the topmost symptom was gastro-esophageal reflux disease (K21) that had a 43% prevalence rate, followed by nausea and vomiting (R11) with 36% and headache (R51) and abdominal and pelvic pain (R10), each with 35% (see Figure 5). Lastly, for older adults ages 56-80 years old, the topmost symptom was gastro-esophageal reflux disease (K21) that had a 60% prevalence rate, followed by abnormalities of breathing (R06) with 47% and malaise and fatigue (R53) with 46% (see Figure 6).

Figure 2

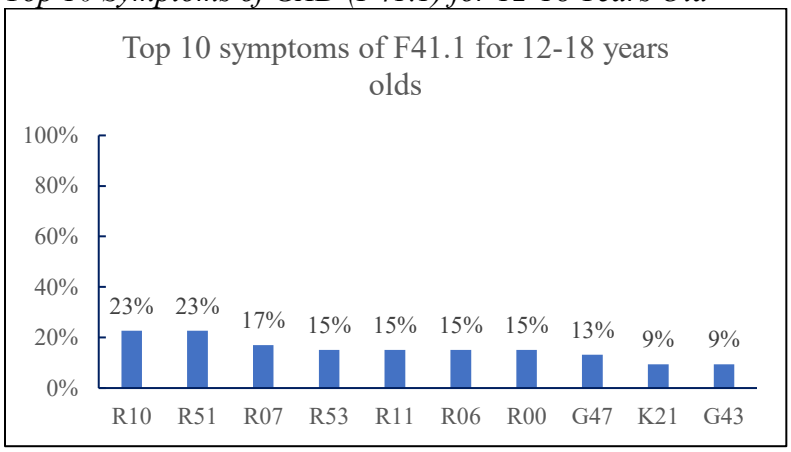
Top 10 Symptoms of GAD (F41.1) for 2-11 Years Old



Note. G47 = Sleep disorders; R51 = Headache; R10 = Abdominal and pelvic pain; R46 = Symptoms and signs involving appearance and behavior; R07 = Pain in throat and chest; R06 = Abnormalities of breathing; R11 = Nausea and vomiting; R09 = Other symptoms and signs involving the circulatory and respiratory systems; R53 = Malaise and fatigue; R19 = Other symptoms and signs involving the digestive system and abdomen.

Figure 3

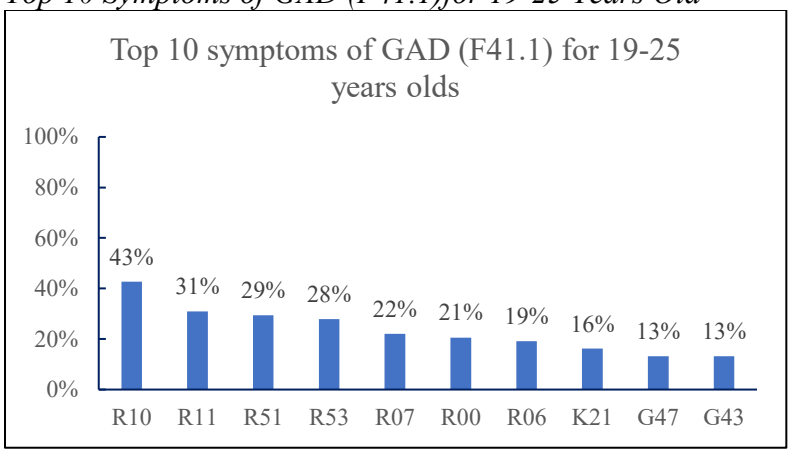
Top 10 Symptoms of GAD (F41.1) for 12-18 Years Old



Note. R10 = Abdominal and pelvic pain; R51 = Headache; R07 = Pain in throat and chest; R53 = Malaise and fatigue; R11 = Nausea and vomiting; R06 = Abnormalities of breathing; R00 = Abnormalities of heart beat; G47 = Sleep disorders; K21 = Gastro-esophageal reflux disease; G43 = Migraine.

Figure 4

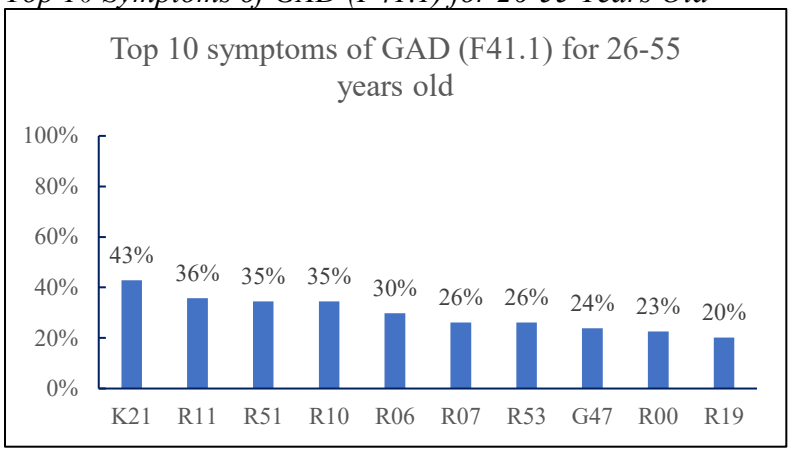
Top 10 Symptoms of GAD (F41.1)for 19-25 Years Old



Note. R10 = Abdominal and pelvic pain; R11 = Nausea and vomiting; R51 = Headache; R53 = Malaise and fatigue; R07 = Pain in throat and chest; R00 = Abnormalities of heart beat; R06 = Abnormalities of breathing; K21 = Gastro-esophageal reflux disease; G47 = Sleep disorders; G43 = Migraine.

Figure 5

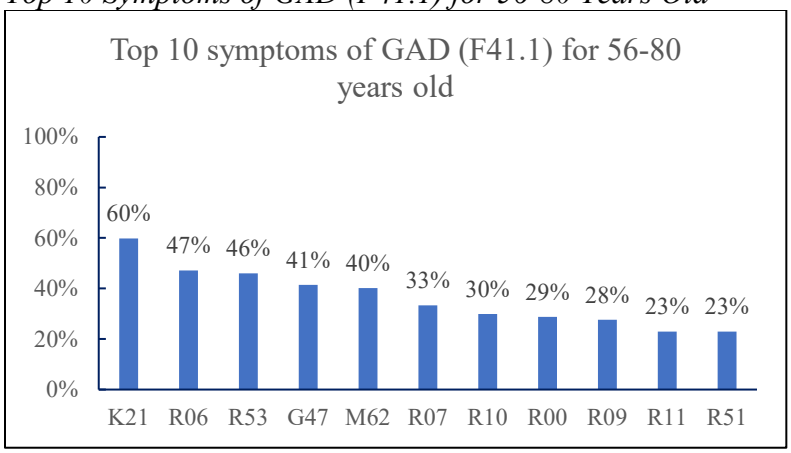
Top 10 Symptoms of GAD (F41.1) for 26-55 Years Old



Note. K21 = Gastro-esophageal reflux disease; R11 = Nausea and vomiting; R51 = Headache; R10 = Abdominal and pelvic pain; R06 = Abnormalities of breathing; R07 = Pain in throat and chest; R53 = Malaise and fatigue; G47 = Sleep disorders; R00 = Abnormalities of heart beat; R19 = Other symptoms and signs involving the digestive system and abdomen.

Figure 6

Top 10 Symptoms of GAD (F41.1) for 56-80 Years Old



Note. K21 = Gastro-esophageal reflux disease; R06 = Abnormalities of breathing; R53 = Malaise and fatigue; G47 = Sleep disorders; M62 = Other disorders of muscle; R07 = Pain in throat and chest; R10 = Abdominal and pelvic pain; R00 = Abnormalities of heart beat; R09 = Other symptoms and signs involving the circulatory and respiratory systems; R11 = Nausea and vomiting; R51 = Headache.

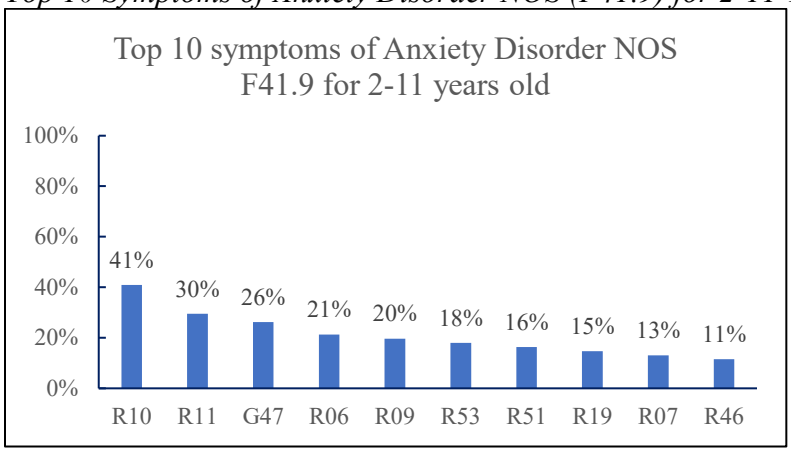
Anxiety Disorder NOS (F41.9) Population.

For children ages 2-11 years old, the topmost symptom was abdominal and pelvic pain (R10) that had a 41% prevalence rate, followed by nausea and vomiting (R11) with 30% and sleep disorders (G47) with 26% (see Figure 6). For adolescents ages 12-18 years old, the topmost symptom was abdominal and pelvic pain (R10) that had a 43% prevalence rate, followed by sleep disorders (G47) with 34% and nausea and vomiting (R11) with 33% (see Figure 7). For young adults ages 19-25 years old, the topmost symptom was abdominal and pelvic pain (R10) that had a 44% prevalence rate, followed by headache (R51) and nausea and vomiting (R11) with 33% (see Figure 8). For adults ages 26-55 years old, the topmost symptom was abdominal and pelvic pain (R10) that had a 39% prevalence rate, followed by gastro-esophageal reflux disease (K21) with 37% and malaise and fatigue (R53) with 33% (see Figure 9). Lastly, for older adults ages

56-80 years old, the topmost symptom was abnormalities of breathing (R06) that had a 53% prevalence rate, followed by pain in throat and chest (R07) with 50% and gastro-esophageal reflux disease (K21) with 46% (see Figure 10).

Figure 7

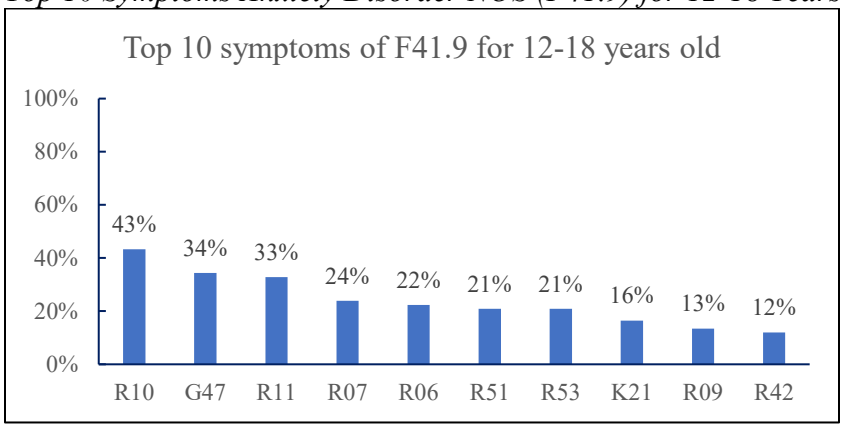
Top 10 Symptoms of Anxiety Disorder NOS (F41.9) for 2-11 Years Old



Note. R10 = Abdominal and pelvic pain; R11 = Nausea and vomiting; G47 = Sleep disorders; R06 = Abnormalities of breathing; R09 = Other symptoms and signs involving the circulatory and respiratory systems; R53 = Malaise and fatigue; R51 = Headache; R19 = Other symptoms and signs involving the digestive system and abdomen; R07 = Pain in throat and chest; R46 = Symptoms and signs involving appearance and behavior.

Figure 8

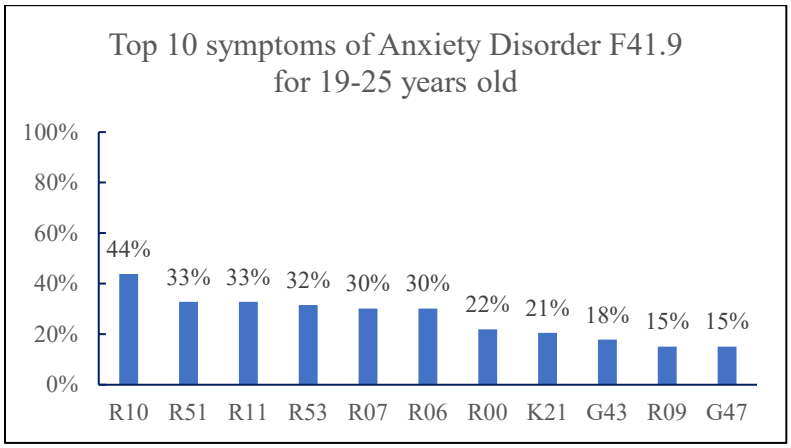
Top 10 Symptoms Anxiety Disorder NOS (F41.9) for 12-18 Years Old



Note. R10 = Abdominal and pelvic pain; G47 = Sleep disorders; R11 = Nausea and vomiting; R07 = Pain in throat and chest; R06 = Abnormalities of breathing; R51 = Headache; R53 = Malaise and fatigue; K21 = Gastro-esophageal reflux disease; R42 = Dizziness and giddiness.

Figure 9

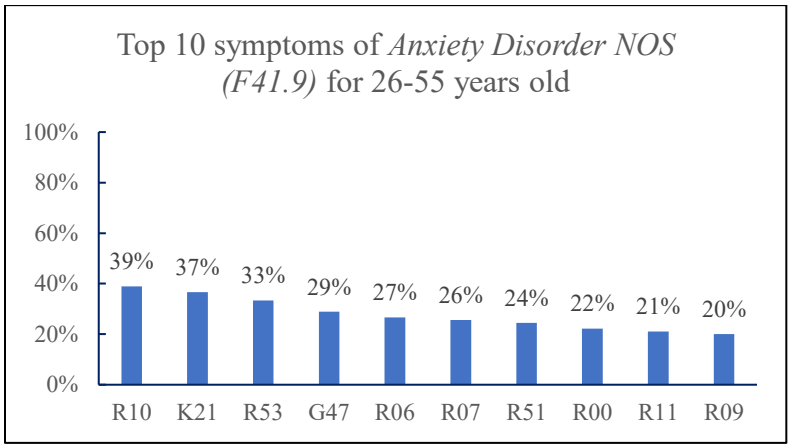
Top 10 Symptoms of Anxiety Disorder NOS (F41.9) for 19-25 Years Old



Note. R10 = Abdominal and pelvic pain; R51 = Headache; R11 = Nausea and vomiting; R53 = Malaise and fatigue; R07 = Pain in throat and chest; R06 = Abnormalities of breathing; R00 = Abnormalities of heart beat; K21 = Gastro-esophageal reflux disease; G43 = Migraine; R09 = Other symptoms and signs involving the circulatory and respiratory systems; G47 = Sleep disorders.

Figure 10

Top 10 Symptoms of F41.9 for 26-55 Years Old

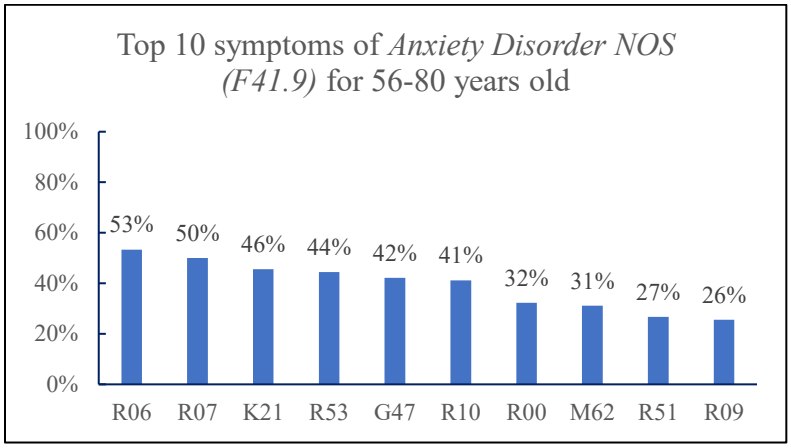


Note. R10 = Abdominal and pelvic pain; K21 = Gastro-esophageal reflux disease; R53 = Malaise and fatigue; G47 = Sleep disorders; R06 = Abnormalities of breathing; R07 = Pain in throat and chest; R51 = Headache; R00 =

Abnormalities of heart beat; R11 = Nausea and vomiting; R09 = Other symptoms and signs involving the circulatory and respiratory systems.

Figure 11

Top 10 Symptoms of Anxiety Disorder NOS (F41.9) for 56-80 Years Old



Note. R06 = Abnormalities of breathing; R07 = Pain in throat and chest; K21 = Gastro-oesophagael reflux disease; R53 = Malaise and fatigue; G47 = Sleep disorders; R10 = Abdominal and pelvic pain; R00 = Abnormalities of heart beat; M62 = Other disorders of muscle; R51 = Headache; R09 = Other symptoms and signs involving the circulatory and respiratory systems.

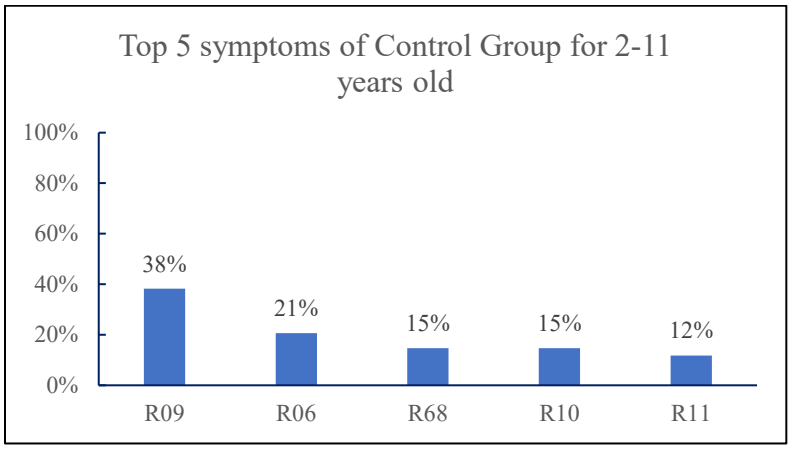
No Diagnosis of Any Other Mental Illness (Control) Population.

A total of 337 patients were under the control population. The histograms below show the percentage of patients who had a specific symptom out of the 337 patients based on age. For children ages 2-11 years old, the topmost symptom was from the category (R09) other symptoms and signs involving the circulatory and respiratory systems that had a 38% prevalence rate, followed by abnormalities of breathing (R06) with 21% and other general symptoms and signs (R68) with 15% (see Figure 11). For adolescents ages 12-18 years old, the topmost symptom was abdominal and pelvic pain (R10) that had a 44% prevalence rate, followed by headache (R51) with 22% and abnormalities of breathing (R06) and other symptoms and signs involving the circulatory and respiratory systems (R09) with 17% (see Figure 12). For young adults ages 19-25

years old, the topmost symptom was abdominal and pelvic pain (R10) that had a 35% prevalence rate, followed by headache (R51) and nausea and vomiting (R11) with 22% (see Figure 13). For adults ages 26-55 years old, the topmost symptom was abdominal and pelvic pain (R10) that had a 41% prevalence rate, followed by abnormalities of breathing (R06) with 19% (see Figure 14). Lastly, for older adults ages 56-80 years old, the topmost symptom was gastro-esophageal reflux disease (R06) that had a 35% prevalence rate, followed by abnormalities of breathing (R06) and sleep disorders (R53) with 26% (see Figure 15).

Figure 12

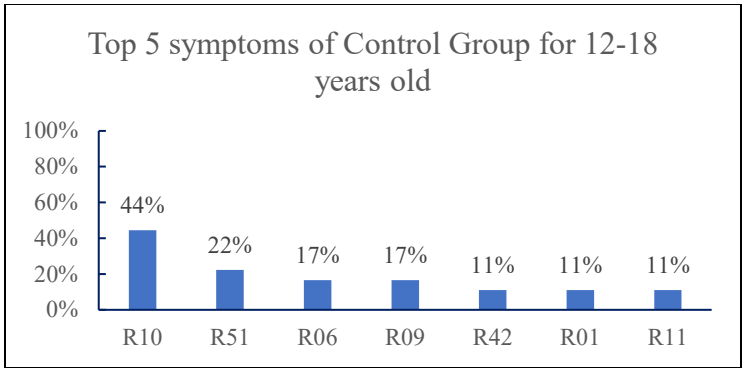
Top 10 Symptoms of Control Group for 2-11 Years Old



Note. R09 = Other symptoms and signs involving the circulatory and respiratory systems; R06 = Abnormalities of breathing; R68 = Other general symptoms and signs; R10 = Abdominal and pelvic pain; R11 = Nausea and vomiting.

Figure 13

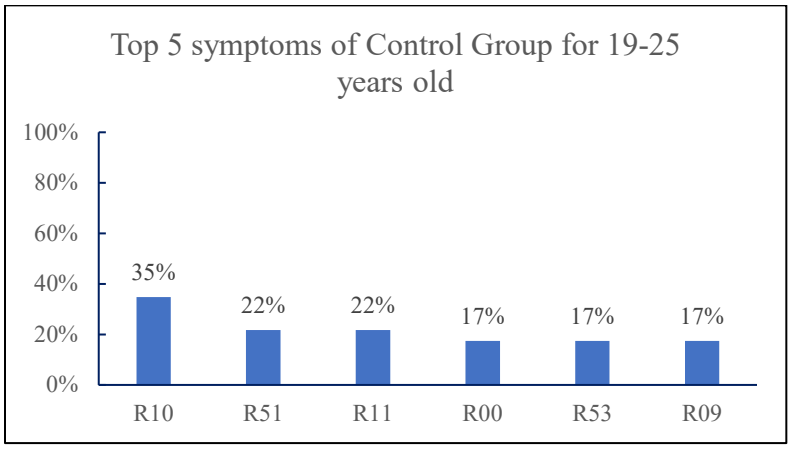
Top 10 Symptoms of Control Group for 12-18 Years Old



Note. R10 = Abdominal and pelvic pain; R51 = Headache; R06 = Abnormalities of breathing; R09 = Other symptoms and signs involving the circulatory and respiratory systems; R42 = Dizziness and giddiness; R01 = Cardiac murmurs and other cardiac sounds; R11 = Nausea and vomiting.

Figure 14

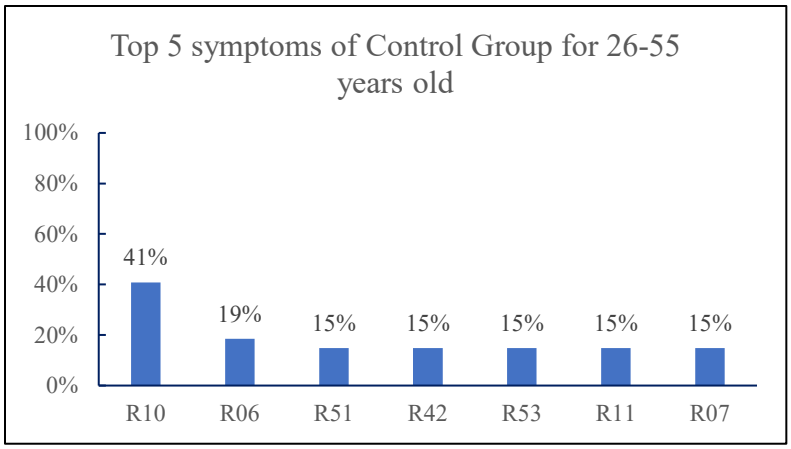
Top 10 Symptoms of Control Group for 19-25 Years Old



Note. R10 = Abdominal and pelvic pain; R51 = Headache; R11 = Nausea and vomiting; R00 = Abnormalities of heart beat; R53 = Malaise and fatigue; R09 = Other symptoms and signs involving the circulatory and respiratory systems.

Figure 15

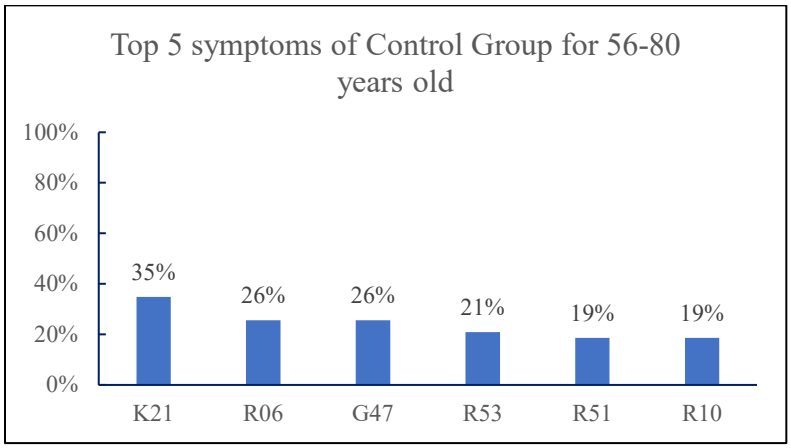
Top 10 Symptoms of Control Group for 26-55 Years Old



Note. R10 = Abdominal and pelvic pain; R06 = Abnormalities of breathing; R51 = Headache; R42 = Dizziness and giddiness; R53 = Malaise and fatigue; R11 = Nausea and vomiting; R07 = Pain in throat and chest.

Figure 16

Top 10 Symptoms of Control Group for 56-80 Years Old



Note. K21 = Gastro-esophageal reflux disease; R06 = Abnormalities of breathing; G47 = Sleep disorders; R53 = Malaise and fatigue; R53 = Malaise and fatigue; R10 = Abdominal and pelvic pain.

Comparison tables were created to address RQ2 by identifying the top 10 symptoms based on prevalence rate by population group and by age group. Table 5

presents the comparison table on GAD (F41.1) population. It showed that the abdominal and pelvic pain (R10), abnormalities of breathing (R06), headache (R51), nausea and vomiting (R11), pain in throat and chest (R07), and sleep disorders (G47) symptoms were present across all age groups. Meanwhile, the gastro-esophageal reflux disease (K21) and abnormalities of heartbeat (R00) were existing from patients 12 years old and above. Malaise and fatigue (R53) symptom only appeared for patients 2-11 years old and 19 years old onwards. Furthermore, other disorders of muscle (M62) symptom was only present in older adults (56-80 years old).

The results also showed that older adults (56-80 years old) had the most symptoms (10 out 10) that are in the top 10 symptoms for GAD (F41.1) patients, followed by young adults (19-25 years old) and adults (26-55 years old) with nine. Meanwhile, children (2-11 years old) had the least number of symptoms (7 out of 10) in the top 10 symptoms for GAD (F41.1) patients.

Table 11

Comparison Table for GAD (F41.1) Population

Rank	ICD-10 Code	Symptom Description	2-11 y.o.	12-18 y.o.	19-25 y.o.	26-55 y.o.	56-80 y.o.
1	K21	Gastro-esophageal reflux disease	4	8	11	36	52
2	R10	Abdominal and pelvic pain	9	16	29	29	26
3	R06	Abnormalities of breathing	8	11	13	25	41
4	R53	Malaise and fatigue	5	12	19	22	40
5	R51	Headache	12	15	20	29	20
6	R11	Nausea and vomiting	8	12	21	30	20
7	R07	Pain in throat and chest	8	13	15	22	29
8	G47	Sleep disorders	12	9	9	20	36
9	R00	Abnormalities of heartbeat	3	10	14	19	25
10	M62	Other disorders of muscle	3	2	8	10	35

Table 6 presents the comparison table on GAD (F41.9) population. It showed that the abdominal and pelvic pain (R10), abnormalities of breathing (R06), malaise and

fatigue (R53), sleep disorders (G47), pain in throat and chest (R07), headache (R51), and other symptoms and signs involving the circulatory and respiratory systems (R09) symptoms were present across all age groups. Meanwhile, the nausea and vomiting (R11) symptom only existed for patients 2 to 55 years old (children to adults). Gastro-esophageal reflux disease (K21) symptom only appears for patients 12 years old onwards. Furthermore, the abnormalities of heartbeat (R00) symptom was only present in patients 19 years old and above.

The results also showed that young adults 19-25 years old and adults 26-55 years old had the most symptoms (10 out 10) that are in the top 10 symptoms for GAD (F41.9) patients. Meanwhile, children 2-11 years old had the least number of symptoms (8 out of 10) in the top 10 symptoms for GAD (F41.9) patients.

Table 12

Comparison Table for GAD (F41.9) Population

Rank	ICD-10 Code	Symptom Description	2-11 y.o.	12-18 y.o.	19-25 y.o.	26-55 y.o.	56-80 y.o.
1	R10	Abdominal and pelvic pain	25	29	32	35	37
2	R06	Abnormalities of breathing	13	15	22	24	48
3	R53	Malaise and fatigue	11	14	23	30	40
4	G47	Sleep disorders	16	23	11	26	38
5	R07	Pain in throat and chest	8	16	22	23	45
6	R11	Nausea and vomiting	18	22	24	19	22
7	K21	Gastro-esophageal reflux disease	4	11	15	33	41
8	R51	Headache	10	14	24	22	24
9	R00	Abnormalities of heartbeat	5	6	16	20	29
10	R09	Other symptoms and signs involving the circulatory and respiratory systems	12	9	11	18	23

Table 7 presents the comparison table on the control population. It showed that the abdominal and pelvic pain (R10) symptom was present across all age groups. The other symptoms and signs involving the circulatory and respiratory systems (R09)

symptom was only present for patients 2-25 years old while the abnormalities of breathing (R06) symptom was only present for patients 2-18 years old and 26 years old and above. Headache (R51) symptom was observed only for patients 12 years old and onwards. Both gastro-esophageal reflux disease (K21) and sleep disorders (G47) were only existing for older adults. Malaise and fatigue (R53) symptom were only present for patients 19 years old and above. Pain in throat and chest (R07) symptom was only observed in adults 26-55 years old while abnormalities of heartbeat (R00) was only present in young adults 19-25 years old.

The results also showed that young adults and adults had the most symptoms (6 out 10) that are in the top 10 symptoms for patients without diagnosis of any other mental illness. Meanwhile, children had the least number of symptoms (4 out of 10) in the top 10 symptoms for control patients.

Table 13

Comparison Table for the Control Population

Rank	ICD-10 Code	Symptom Description	2-11 y.o.	12-18 y.o.	19-25 y.o.	26-55 y.o.	56-80 y.o.
1	R10	Abdominal and pelvic pain	5	8	8	11	8
2	R09	Other symptoms and signs involving the circulatory and respiratory systems	13	3	4	3	6
3	R06	Abnormalities of breathing	7	3	1	5	11
4	R51	Headache	2	4	5	4	8
5	K21	Gastro-esophageal reflux disease	2	0	2	1	15
6	R53	Malaise and fatigue	1	1	4	4	9
7	R07	Pain in throat and chest	2	1	3	4	7
8	R11	Nausea and vomiting	4	2	5	4	1
9	G47	Sleep disorders	2	1	2	0	11
10	R00	Abnormalities of heartbeat	1	0	4	3	6

A series of chi-square tests were conducted to determine whether there were significant differences in the number of patients identified with each of the symptoms of sleep disorders, gastro-esophageal reflux disease, other disorders of muscle,

abnormalities of heartbeat, abnormalities of breathing, pain in throat and chest, other symptoms and signs involving the circulatory and respiratory systems, abdominal and pelvic pain, nausea and vomiting, headache, malaise and fatigue by age group. These tests were conducted and reported for each population group separately, using the top 10 symptoms for that population, which are included in the symptoms listed above. To avoid increasing type I error probability due to multiple tests being performed for each population group, the significance level was adjusted using the Bonferroni correction by dividing it by the number of tests being conducted. Thus, the significance level the chi-square tests was set at $\alpha = .05/10 = .005$.

GAD (F41.1) Population.

For GAD (F41.1) patients, ten Pearson chi-square tests were conducted to examine whether there were associations between age group and having the symptoms of gastro-esophageal reflux disease, abdominal and pelvic pain, abnormalities of breathing, malaise and fatigue, headache, nausea and vomiting, pain in throat and chest, sleep disorders, abnormalities of heartbeat, and other disorders of muscle.

There results from these chi-square tests provided support that there were statistically significant associations between age group and diagnosis of sleep disorders ($\chi^2(4) = 36.709$, $p < .001$, Cramer's $V = .271$), gastro-esophageal reflux disease ($\chi^2(4) = 100.558$, $p < .001$, Cramer's $V = .448$), other disorders of muscle ($\chi^2(4) = 71.111$, $p < .001$, Cramer's $V = .377$), abnormalities of heartbeat ($\chi^2(4) = 23.212$, $p < .001$, Cramer's $V = .215$), abnormalities of breathing ($\chi^2(4) = 46.908$, $p < .001$, Cramer's $V = .306$), pain in throat and chest ($\chi^2(4) = 18.730$, $p = .001$, Cramer's $V = .194$), abdominal and pelvic pain ($\chi^2(4)$

= 18.701, p = .001, Cramer's V = .193), nausea and vomiting ($\chi^2(4) = 19.667$, p = .001, Cramer's V = .198), and malaise and fatigue ($\chi^2(4) = 43.989$, $p < .001$, Cramer's V = .297). However, no significant association was identified between age group and diagnosis of with headache ($\chi^2(4) = 10.752$, p = .029, Cramer's V = .147).

These results provided support that there were statistically significant differences in the number of patients having the symptoms of sleep disorders, gastro-esophageal reflux disease, other disorders of muscle, abnormalities of heartbeat, abnormalities of breathing, pain in throat and chest, abdominal and pelvic, nausea and vomiting, and malaise and fatigue by age stratification. The Cramer's V values indicated that the magnitude of these differences for sleep disorders, abnormalities of heartbeat, pain in throat and chest, abdominal and pelvic pain, nausea and vomiting, and malaise and fatigue was small, and for gastro-esophageal reflux disease, other disorders of muscle, and abnormalities of breathing was medium.

Anxiety Disorder NOS (F41.9) Population.

For Anxiety Disorder NOS (F41.9) patients, ten Pearson chi-square tests were conducted to evaluate whether there were significant associations between age group and having the symptoms of abdominal and pelvic pain, abnormalities of breathing, malaise and fatigue, sleep disorders, pain in throat and chest, nausea and vomiting, gastro-esophageal reflux disease, headache, abnormalities of heartbeat, and other symptoms and signs involving the circulatory and respiratory systems.

There results determined that there were statistically significant associations between age group and diagnoses of sleep disorders ($\chi^2(4) = 23.987$, $p < .001$, Cramer's V

= .219) , gastro esophageal reflux disease ($\chi^2(4) = 58.598$, $p < .001$, Cramer's $V = .343$) , abnormalities of heart beat ($\chi^2(4) = 31.220$, $p < .001$, Cramer's $V = .250$) , abnormalities of breathing ($\chi^2(4) = 42.234$, $p < .001$, Cramer's $V = .291$) , pain in throat and chest ($\chi^2(4) = 43.031$, $p < .001$, Cramer's $V = .294$), and malaise and fatigue ($\chi^2(4) = 31.069$, $p < .001$, Cramer's $V = .250$). On the contrary, no significant associations were identified between age group and diagnosis of other symptoms and signs involving the circulatory and respiratory systems ($\chi^2(4) = 10.592$, $p = .032$, Cramer's $V = .146$), abdominal and pelvic pain ($\chi^2(4) = 4.230$, $p = .376$, Cramer's $V = .092$) , nausea and vomiting ($\chi^2(4) = 1.529$, $p = .822$, Cramer's $V = .055$) , and headache ($\chi^2(4) = 10.928$, $p = .027$, Cramer's $V = .148$).

For Anxiety Disorder NOS (F41.9) patients, ten Pearson chi-square tests were conducted to evaluate whether there were significant associations between age group and having the symptoms of abdominal and pelvic pain, abnormalities of breathing, malaise and fatigue, sleep disorders, pain in throat and chest, nausea and vomiting, gastro-esophageal reflux disease, headache, abnormalities of heartbeat, and other symptoms and signs involving the circulatory and respiratory systems.

There results determined that there were statistically significant associations between age group and diagnoses of sleep disorders ($\chi^2(4) = 23.987$, $p < .001$, Cramer's $V = .219$) , gastro esophageal reflux disease ($\chi^2(4) = 58.598$, $p < .001$, Cramer's $V = .343$) , abnormalities of heart beat ($\chi^2(4) = 31.220$, $p < .001$, Cramer's $V = .250$) , abnormalities of breathing ($\chi^2(4) = 42.234$, $p < .001$, Cramer's $V = .291$) , pain in throat and chest ($\chi^2(4) = 43.031$, $p < .001$, Cramer's $V = .294$), and malaise and fatigue ($\chi^2(4) = 31.069$, $p < .001$, Cramer's $V = .250$). On the contrary, no significant associations were identified between

age group and diagnosis of other symptoms and signs involving the circulatory and respiratory systems ($\chi^2(4) = 10.592$, $p = .032$, Cramer's $V = .146$), abdominal and pelvic pain ($\chi^2(4) = 4.230$, $p = .376$, Cramer's $V = .092$) , nausea and vomiting ($\chi^2(4) = 1.529$, $p = .822$, Cramer's $V = .055$) , and headache ($\chi^2(4) = 10.928$, $p = .027$, Cramer's $V = .148$).

These results provided support that there were statistically significant differences in the number of patients having the symptoms of sleep disorders, gastro esophageal reflux disease, abnormalities of heartbeat, abnormalities of breathing, pain in throat and chest, and malaise and fatigue by age stratification. The Cramer's V values indicated that the magnitude of these differences for sleep disorders, abnormalities of heartbeat, abnormalities of breathing, pain in throat and chest, and malaise and fatigue was small, and for gastro esophageal reflux disease was medium.

Control Population.

For the control population, ten Pearson chi-square tests were performed to assess whether there were significant differences in the number of patients having the symptoms of abdominal and pelvic pain, other symptoms and signs involving the circulatory and respiratory systems, abnormalities of breathing, headache, gastro-esophageal reflux disease, malaise and fatigue, pain in throat and chest, nausea and vomiting, sleep disorders, and abnormalities of heartbeat by age group.

The results from these analyses revealed that that there were statistically associations between age group and the diagnoses of sleep disorders ($\chi^2(4) = 22.396$, $p < .001$, Cramer's $V = .258$) and gastro esophageal reflux disease ($\chi^2(4) = 35.713$, $p < .001$, Cramer's $V = .326$). However, no significant associations were found between age group

and diagnoses of abnormalities of heart beat ($\chi^2(4) = 9.256$, $p = .055$, Cramer's $V = .166$), abnormalities of breathing ($\chi^2(4) = 8.813$, $p = .066$, Cramer's $V = .066$), pain in throat and chest ($\chi^2(4) = 6.480$, $p = .166$, Cramer's $V = .139$), other symptoms and signs involving the circulatory and respiratory systems ($\chi^2(4) = 8.059$, $p = .089$, Cramer's $V = .155$), abdominal and pelvic pain ($\chi^2(4) = 5.936$, $p = .204$, Cramer's $V = .133$) , nausea and vomiting ($\chi^2(4) = 5.435$, $p = .246$, Cramer's $V = .127$), headache ($\chi^2(4) = 4.948$, $p = .293$, Cramer's $V = .121$), or malaise and fatigue ($\chi^2(4) = 11.696$, $p = .020$, Cramer's $V = .186$).

These results provided support that there were statistically significant differences in the number of patients having the symptoms of sleep disorders and gastro-esophageal reflux disease by age stratification. The Cramer's V values indicated that the magnitude of these differences for sleep disorders was small and for gastro-esophageal reflux disease was moderate.

Overall, these results provided partial support to reject Null Hypothesis 2 showing that in each population group, there were symptoms that significantly differed by age group, while there were also symptoms that did not significantly differ across age stratifications.

RQ3: What is the association between diagnosis of GAD and physical symptoms of GAD in children ages 2-11, for adolescents ages 12-18, for young adults ages 19-25, for adults ages 26-55, and for older adults ages 56-80 as they present in primary care settings (Essau et al., 2018 & Olariu et al., 2015)?

Null Hypothesis 3 is that there is an association between diagnosis of GAD and physical symptoms of GAD in the primary care population sample differentiated by age

stratification. Five binary logistic regression analyses were conducted to determine whether there were significant associations between the diagnosis of GAD and physical symptoms of GAD. These analyses were conducted for each age category separately. The dependent variable in these analyses was the diagnosis of GAD and the predictor variables were dummy variables indicating whether a patient was diagnosed with each of the following symptoms: sleep disorders, gastro-esophageal reflux disease, other disorders of muscle, abnormalities of heart beat, abnormalities of breathing, pain in throat and chest, other symptoms and signs involving the circulatory and respiratory systems, abdominal and pelvic pain, nausea and vomiting, headache, and malaise and fatigue.

Logistic Regression Analysis for Patients 2-11 Years Old

The first logistic regression model was conducted for patients 2-11 years old. As can be seen from Table 8, there were no multicollinearity issues among the predictor variables as all VIF values for these variables were less than 4.

Table 14

Assessment of Multicollinearity for the Logistic Regression Equation for Patients 2-11 Years Old

Variable	Tolerance	*VIF*
G47-sleep disorders	.788	1.268
K21-Gastro-esophageal reflux disease	.900	1.111
M62-Other disorders of muscle	.888	1.126
	.840	1.190
R00-Abnormalities of heartbeat		
R06-Abnormalities of breathing	.760	1.316
R07-Pain in throat and chest	.858	1.165
R09-Other symptoms and signs involving the	.799	1.252
circulatory and respiratory systems		
R10-Abdominal and pelvic pain	.814	1.229

R11-Nausea and vomiting	.859	1.164
R51-Headache	.885	1.130
R53-Malaise and fatigue	.910	1.099

The results revealed that the model did not provide a significantly better fit to the data compared to the null model with no predictors, $\chi^2(11) = 14.029$, $p = .231$. The Nagelkerke *R* square value for this model was .067. The results of the Hosmer and Lemeshow test did not indicate a lack of the model to the data, $\chi^2(4) = 1.404$, $p = .843$. An assessment of the classification table revealed that the model correctly predicted the outcome variable 66.7% of the time. The parameter estimates for this model are provided in Table 9.

It can be seen that the significant predictors of the outcome variable were diagnosis of abdominal and pelvic pain ($p < .05$) and diagnosis of headache ($p < .05$). The estimates of the odds ratios for these indicators suggested that for patients 2-11 years old those who had abdominal and pelvic pain symptoms were 66.2% less likely to be identified with GAD, and those who had headache symptoms were 2.68.7% more likely to be diagnosed with GAD.

Table 15

Parameter Estimates for the Logistic Regression Equation for Patients 2-11 Years Old

Variable	*B*	*S.E.*	Wald	*df*	*Sig.*	*Exp(B)*
G47-Sleep disorders	.583	.472	1.524	1	.217	1.792
K21-Gastro-esophageal reflux disease	.389	.724	.289	1	.591	1.476
M62-Other disorders of muscle	.493	.813	.367	1	.545	1.637
R00-Abnormalities of heartbeat	.141	.818	.030	1	.863	1.152
R06 -Abnormalities of breathing	-.158	.526	.091	1	.763	.853
R07-Pain in throat and chest	.260	.559	.217	1	.641	1.297
R09-Other symptoms and signs involving the circulatory and respiratory systems	-.767	.511	2.251	1	.134	.465
R10-Abdominal and pelvic pain	-1.086	.477	5.191	1	.023	.338
R11-Nausea and vomiting	-.331	.480	.476	1	.490	.718
R51-Headache	.989	.483	4.183	1	.041	2.687
R53-Malaise and fatigue	-.218	.594	.134	1	.714	.804

Logistic Regression Analysis for Patients 12-18 Years Old

The second logistic regression model was conducted for patients 12-18 years old. As can be seen from Table 10, there were no multicollinearity issues among the predictor variables as all VIF values for these variables were less than 4.

Table 16

Assessment of Multicollinearity for the Logistic Regression Equation for Patients 12-18 Years Old

Variable	Tolerance	*VIF*
G47-Sleep disorders	.797	1.254
K21-Gastro-esophageal reflux disease	.892	1.121
M62-Other disorders of muscle	.880	1.136
R00-Abnormalities of heartbeat	.814	1.228
R06-Abnormalities of breathing	.731	1.369
R07-Pain in throat and chest	.791	1.265
R09-Other symptoms and signs involving the circulatory and respiratory systems	.859	1.164
R10-Abdominal and pelvic pain	.677	1.477
R00-Nausea and vomiting	.665	1.505
R51-Headache	.774	1.293
R53-Malaise and fatigue	.764	1.308

The results revealed that the model did not provide a significantly better fit to the data compared to the null model with no predictors, $\chi^2(11) = 16.199$, $p = .134$. The Nagelkerke *R* square value for this model was .080. However, the results of the Hosmer and Lemeshow test did not indicate a lack of the model to the data, $\chi^2(4) = 6.253$, $p = .181$.

An assessment of the classification table revealed that the model correctly predicted the outcome variable 67.3% of the time. The parameter estimates for this model are provided in Table 11. The only significant predictor of the outcome variable was diagnosis abnormalities of heartbeat. The estimates of the odds ratios for this indicator suggested that for patients 12-18 years old those who had abnormalities of heartbeat

symptoms were 284.4% more likely to be identified with GAD than those who did not exhibit this symptom.

Table 17

Parameter Estimates for the Logistic Regression Equation for Patients 12-18 Years Old

Variable	*B*	*S.E.*	*Wald*	*df*	*Sig.*	*Exp(B)*
G47-Sleep disorders	-.780	.491	2.523	1	.112	.458
K21-Gastro-esophageal reflux disease	.483	.563	.737	1	.391	1.621
M62-Other disorders of muscle	-1.318	.916	2.067	1	.150	.268
Abnormalities of heartbeat	1.346	.630	4.570	1	.033	3.844
R06-Abnormalities of breathing	.215	.509	.178	1	.673	1.240
R07-Pain in throat and chest	.216	.477	.206	1	.650	1.242
R09 Other symptoms and signs involving the circulatory and respiratory systems	-.545	.625	.762	1	.383	.580
R10-Abdominal and pelvic pain	-.719	.422	2.902	1	.088	.487
R00-Nausea and vomiting	-.178	.492	.131	1	.718	.837
R51-Headache	.676	.457	2.187	1	.139	1.967
R53-Malaise and fatigue	.489	.499	.958	1	.328	1.630

Logistic Regression Analysis for Patients 19-25 Years Old

The third logistic regression model was conducted for patients 19-25 years old. As can be seen from Table 12, there were no multicollinearity issues among the predictor variables as all VIF values for these variables were less than 4.

Table 18

Assessment of Multicollinearity for the Logistic Regression Equation for Patients 19-25 Years Old

Variable	Tolerance	*VIF*
G47-Sleep disorders	.928	1.077
K21-Gastro-esophageal reflux disease	.905	1.104
M62-Other disorders of muscle	.927	1.079
Abnormalities of heart beat	.726	1.377
R06-Abnormalities of breathing	.707	1.414
R07-Pain in throat and chest	.711	1.406
R09-Other symptoms and signs involving the circulatory and respiratory systems	.888	1.127
R10-Abdominal and pelvic pain	.728	1.373
R00-Nausea and vomiting	.665	1.504
R51-Headache	.909	1.101
R53-Malaise and fatigue	.819	1.220

The results revealed that the model did not provide a significantly better fit to the data compared to the null model with no predictors, $\chi^2(11) = 1.300$, $p = 1.00$. The Nagelkerke *R* square value for this model was .007. The results of the Hosmer and Lemeshow test did not indicate a lack of a good fit to the model to the data, $\chi^2(6) = 12.182$, $p = .058$. An assessment of the classification table revealed that the model correctly predicted the outcome variable 60.5% of the time. The parameter estimates for this model are provided in Table 13. It can be seen that none of the indicators of the symptoms significantly predicted the outcome variable.

Table 19

Parameter Estimates for the Logistic Regression Equation for Patients 19-25 Years Old

Variable	*B*	*S.E.*	*Wald*	*df*	*Sig.*	*Exp(B)*
G47-Sleep disorders	.111	.473	.055	1	.814	1.118
K21-Gastro-esophageal reflux disease	-.028	.432	.004	1	.948	.972
M62-Other disorders of muscle	.211	.514	.168	1	.682	1.234
Abnormalities of heart beat	.145	.443	.106	1	.744	1.156
R06-Abnormalities of breathing	-.206	.444	.214	1	.643	.814
R07-Pain in throat and chest	-.114	.422	.073	1	.787	.892
R09-Other symptoms and signs involving the circulatory and respiratory systems	-.275	.487	.319	1	.572	.760
R10-Abdominal and pelvic pain	.102	.338	.091	1	.763	1.107
R00-Nausea and vomiting	.097	.395	.060	1	.806	1.102
R51-Headache	.034	.342	.010	1	.921	1.034
R53-Malaise and fatigue	.048	.368	.017	1	.896	1.049

Logistic Regression Analysis for Patients 26-55 Years Old

The fourth logistic regression model was conducted for patients 26-55 years old. As can be seen from Table 14, there were no multicollinearity issues among the predictor variables as all VIF values for these variables were less than 4.

Table 20

Assessment of Multicollinearity for the Logistic Regression Equation for Patients 26-55 Years Old

Variable	Tolerance	*VIF*
G47-Sleep disorders	.877	1.141
K21-Gastro-esophageal reflux disease	.831	1.203
M62-Other disorders of muscle	.980	1.021
R00-Abnormalities of heartbeat	.849	1.177
R06-Abnormalities of breathing	.794	1.260
R07-Pain in throat and chest	.670	1.492
Other symptoms and signs involving the circulatory and respiratory systems	.859	1.164
R10-Abdominal and pelvic pain	.819	1.221
R00-Nausea and vomiting	.809	1.237
R51-Headache	.838	1.193
R53-Malaise and fatigue	.814	1.228

The results revealed that the model provided a significantly better fit to the data compared to the null model with no predictors, $\chi^2(11) = 22.507$, $p = .021$. The Nagelkerke *R* square value for this model was .113. The results of the Hosmer and Lemeshow test did not indicate a lack of a good fit of the model to the data, $\chi^2(6) = 2.859$, $p = .826$.

An assessment of the classification table revealed that the model correctly predicted the outcome variable 65.5% of the time. The parameter estimates for this model are provided in Table 15. It was found that the significant predictors of the outcome variable were diagnosis of gastro-esophageal reflux disease ($p < .05$) and diagnosis of nausea and vomiting ($p < .05$). The estimates of the odds ratios for these indicators suggested that for patients 26-55 years old those who had gastro-esophageal reflux disease symptoms were

106.1% less likely to be identified with GAD, and those who had nausea and vomiting symptoms were 146.1% more likely to be diagnosed with GAD.

Table 21

Parameter Estimates for the Logistic Regression Equation for Patients 26-55 Years Old

Variable	B	S.E.	Wald	Df	Sig.	Exp(B)
G47-Sleep disorders	.072	.372	.037	1	.847	1.074
K21-Gastro-esophageal reflux disease	.723	.325	4.958	1	.026	2.061
M62-Other disorders of muscle	.076	.479	.025	1	.873	1.079
R00-Abnormalities of heartbeat	.088	.392	.050	1	.823	1.092
R06-Abnormalities of breathing	.378	.366	1.067	1	.302	1.459
R07-Pain in throat and chest	-.100	.415	.059	1	.809	.904
Other symptoms and signs involving the circulatory and respiratory systems	-.896	.482	3.449	1	.063	.408
R10-Abdominal and pelvic pain	-.470	.338	1.929	1	.165	.625
R00-Nausea and vomiting	.901	.363	6.151	1	.013	2.461
R51-Headache	.578	.349	2.738	1	.098	1.782
R53-Malaise and fatigue	-.230	.360	.409	1	.523	.794

Logistic Regression Analysis for Patients 56-80 Years Old

The fifth logistic regression model was conducted for patients 56-80 years old. As can be seen from Table 16, there were no multicollinearity issues among the predictor variables as all VIF values for these variables were less than 4.

Table 22

Assessment of Multicollinearity for the Logistic Regression Equation for Patients 56-80 Years Old

Variable	Tolerance	*VIF*
G47-Sleep disorders	.837	1.195
K21-Gastro-esophageal reflux disease	.797	1.255
M62-Other disorders of muscle	.851	1.175
R00-Nausea and vomiting	.700	1.429
R06-Abnormalities of breathing	.616	1.624
R07-Pain in throat and chest	.688	1.453
Other symptoms and signs involving the circulatory and respiratory systems	.818	1.223
R10-Abdominal and pelvic pain	.722	1.386
R00-Nausea and vomiting	.732	1.367
R51-Headache	.883	1.132
R53-Malaise and fatigue	.761	1.314

The results revealed that the model provided a significantly better fit to the data compared to the null model with no predictors, $\chi^2(11) = 22.436$, $p = .021$. The Nagelkerke *R* square value for this model was .108. However, results of the Hosmer and Lemeshow test suggested that the model did not provide a lack of good fit to the data, $\chi^2(7) = 16.533$, $p = .021$.

An assessment of the classification table revealed that the model correctly predicted the outcome variable 64.2% of the time. The parameter estimates for this model are provided in Table 17. It can be seen that the significant predictors of the outcome variable were diagnosis of gastro-esophageal reflux disease ($p < .05$) and other disorders of muscle ($p < .05$). The estimates of the odds ratios for these indicators suggested that for patients 56-80 years old those who had gastro-esophageal reflux disease symptoms

were 117.3% more likely to be diagnosed with GAD, and those who had other disorders of muscle symptoms were 108.5% more likely to be diagnosed with GAD.

Table 23

Parameter Estimates for the Logistic Regression Equation for Patients 56-80 Years Old

Variable	*B*	*S.E.*	*Wald*	*Df*	*Sig.*	*Exp(B)*
G47-sleep disorders	.156	.306	.259	1	.611	1.168
K21-Gastro-esophageal reflux disease	.776	.295	6.905	1	.009	2.173
M62-Other disorders of muscle	.735	.319	5.319	1	.021	2.085
R00-Abnormalities of heartbeat	-.165	.376	.192	1	.661	.848
R06-Abnormalities of breathing	-.015	.343	.002	1	.965	.985
R07-Pain in throat and chest	-.390	.346	1.268	1	.260	.677
Other symptoms and signs involving the circulatory and respiratory systems	.283	.359	.620	1	.431	1.327
R10-Abdominal and pelvic pain	-.290	.353	.676	1	.411	.748
R00-Nausea and vomiting	.253	.414	.374	1	.541	1.288
R51-Headache	-.249	.356	.488	1	.485	.780
R53-Malaise and fatigue	.353	.313	1.269	1	.260	1.423

Summary

This quantitative study aimed to identify alongside affective symptoms, the specific physical symptoms of GAD that are recorded by PCPs and to stratify these by age (Olariu et al., 2015). Three research questions and their corresponding hypotheses guided this study. A sample obtained from the MDHHS administrative claims database was used to determine the association between the variables and to answer the research questions. The sample included data from a total of 1336 patients. Among these patients, 500 only had a GAD (F41.1) diagnosis, 499 only had an anxiety disorder NOS (F41.9)

diagnosis, and an additional 337 had no mental illness (F) diagnosis codes in their medical record.. To evaluate Null Hypothesis 1, a chi-square test was conducted to determine whether there was a significant association between population group and age category. A non-significant result was achieved; thus, this hypothesis was not rejected. Furthermore, to address Null Hypotheses 2 graphical representation of the data as well as a series of chi-square tests were used. These results provided partial support to reject Null Hypothesis 2 showing that in each population group, there were symptoms that significantly differ by age group, while there were also symptoms that did not significantly differed across age stratifications. Null Hypothesis 3 was evaluated using multiple binary logistic regression analyses for each age group separately. The outcome variable in these analyses was the diagnosis of GAD. The results from these analyses revealed that the significant predictors of the outcome variable for patients 2-11 years old were diagnosis of abdominal and pelvic pain and diagnosis of headache, for patients 12-18 years old was diagnosis abnormalities of heart beat, for patients 26-55 years old were diagnosis of gastro-esophageal reflux disease and diagnosis of nausea and vomiting, and for patients 56-80 years old were diagnosis of gastro-esophageal reflux disease ($p < .05$) and other disorders of muscle.

Chapter 5: Discussion, Conclusions, and Recommendations

GAD is characterized as excessive worry and anxiety about day-to-day situations (Bandelow et al., 2013: Dillon-Naftolin, E., 2016; Locke et al., 2015: Mohammadi et al., 2020; Olariu et al., 2015; Roberge et al., 2015). The anxiety experienced is intrusive, usually accompanied by a variety of physical symptoms, and results in emotional distress and or functional impairment (APA, 2013; Bandelow et al., 2013; Buszewicz et al.,2017; Dillion-Naftolin, 2016). GAD is often underrecognized and misdiagnosed in primary care settings due to the similarity of the psychological and physical symptoms presentations to other common mental illnesses such as major depression and panic disorder (Dillon-Naftolin, 2016; Olariu et al., 2015). The presentation of GAD is further confusing as its presentation may also be like symptoms of physical or organic illnesses such as heart or gastrointestinal diseases (Dillon-Naftolin, 2016; Olariu et al., 2015). Locke et al. (2015) found that anxiety disorders such as GAD and PD are often misdiagnosed due to symptoms that can be associated with physical causes.

Prior research has documented the failure of PCPs to recognize anxiety disorders in general and specifically GAD disorders (Dillion-Naftolin, 2016; Olariu et al., 2015; Roberge et al., 2015). The low recognition of anxiety disorders has been found to contribute to primary care patients undergoing unnecessary, costly, and potentially invasive diagnostic investigations (Olariu et al., 2015). As of the date of this analysis, there was no USPTF recommendation to screen for or to use a case finding algorithm designed to recognize anxiety disorders in primary care patients. As anxiety disorders present differently at various ages and stages of life, systematic case findings are further

complicated by the absence of algorithms for age stratified somatic symptom clusters of GAD as they are presented in the primary settings.

The study was guided by the theoretical framework Engel's (1977) BPS theory. The BPS theory integrates the biological, social, psychological, and behavioral dimensions of illness and supports a collaborative or integrative approach for behavioral health to patient care where medical care operates hand in hand with psychological care (Engel, 1977; Havelka, et al., 2009; Miller, 2013). What is significant in this theory is that it integrates medicine and psychology which bridges conventional and alternative medical systems (Havelka et al., 2009; Miller, 2013). Integrative medicine within the context of BPS theory is broader than biomedical models due to its recognition that medicine alone cannot fully address the growing epidemics and burdens of chronic diseases in the United States (Havelka et al., 2009; Maizes et al., 2009)

The purpose of this quantitative study was to identify alongside affective symptoms, the specific physical symptoms of GAD that are recorded by PCPs and to stratify these by age. The research focused on associating the clusters of physical symptoms or symptom clusters of GAD when analyzed by age stratifications for (a) children, (b) adolescents (c) young adults, (d) adults, and (e) the elderly. The data for this study were derived from deidentified patient records retrieved from the State of Michigan DHHS administrative claims data warehouse. Patients that met the criteria of having a diagnosis code of GAD (F41.1) recorded in the prior 18 months were selected and patients that had other diagnoses were excluded from the data. The selection of patient data was in the form of diagnoses, recorded symptoms, and notes from primary care

providers contained in the electronic medical records of patients from four age groups. The study focused on the following research questions and hypothesis:

RQ1: What is the current prevalence of GAD in the population cohort of primary care settings when compared to prior research for different age groupings including children ages 2-11, for adolescents ages 12-18, for young adults ages 19-25, for adults ages 26-55, and for older adults ages 56-80?

$H_0$1: There are no significant differences in prevalence rates in the primary care population sample differentiated by age stratification when compared with previous research.

H_a1: There are significant differences in prevalence rates in the primary care population sample differentiated by age stratification when compared to previous research.

RQ2: What are the differences in physical symptoms or symptom clusters of each of the age groups, children ages 2-11, for adolescents ages 12-18, for young adults ages 19-25, for adults ages 26-55, and for older adults ages 56-80 as they present in primary care settings?

$H_0$2: There are no significant differences in physical symptoms or symptom clusters in the primary care population sample differentiated by age stratification.

H_a2: There are significant differences in physical symptoms or symptom clusters in the primary care population sample differentiated by age stratification.

RQ3: What is the association between diagnosis of GAD and physical symptoms of GAD in children ages 2-11, for adolescents ages 12-18, for young adults ages 19-25, for adults ages 26-55, and for older adults ages 56-80 as they present in primary care settings?

$H_0$3: There is not an association between diagnosis of GAD and physical symptoms of GAD in the primary care population sample differentiated by age stratification.

H_a3: There is an association between diagnosis of GAD and physical symptoms of GAD in the primary care population sample differentiated by age stratification.

To address the research questions and hypotheses for this study a quantitative method was used to retrospectively review patient records to identify and determine the differences in symptom presentation of GAD in primary care by age group. The independent variables of the study were multiple symptom clusters that were stratified by age group, while the dependent variable was the diagnosis of GAD. I also aimed to retrospectively reviewed via free-text coding of de-identified electronic medical records, data collected from patients that were seen in an urban primary care setting over the previous 18-month period. However, the review of free text coding data could not be performed as of this study. This study was conducted because it addressed several gaps in the literature that related to the age-related differences in somatic complaints of GAD in primary care patients.

The sample that was used in this study contained data collected from 1,336 patients. $H_0$1 was tested aimed to determine whether there was a significant association between population group and age categories. The chi-square test that was conducted showed a nonsignificant result. The graphic representation and chi-square tests for $H_0$2 provided partial support to reject the null hypothesis and showed that in each population group there were symptoms that significantly differed by age group, and there were also symptoms that did not significantly differ across age stratifications. $H_0$3 was evaluated using multiple binary logistic regression analyses for each age group separately with the outcome variable being the diagnosis of GAD (F41.1). The results of the analysis concluded that the significant predictors of the outcome variable for patients 2-11 years old were diagnoses of abdominal and pelvic pain and diagnosis of headache, for patients 12-18 years old was diagnosis of abnormalities of heart beat, for patients 26-55 years old were diagnosis of gastro-esophageal reflux disease and diagnosis of nausea and vomiting, and for patients 56-80 years old were diagnoses of gastro-esophageal reflux disease and other disorders of the muscle.

Interpretation of the Findings

The physical symptoms of GAD can include irritability, sleep disturbance, muscle tension, restlessness, chronic headaches, fatigue, and gastrointestinal symptoms (Dillon-Naftolin, 2016; Locke et al., 2015). The results of this study confirmed these symptoms that may be present in primary care patients with GAD. The current study confirmed that significant predictors of GAD were a diagnosis of gastro-esophageal reflux disease and a diagnosis of vomiting. Other predictors of GAD were abnormalities of heartbeat and the

presence of headaches. As has been stated by previous studies, the presentation of GAD varies by age and the diagnosis of GAD is typically missed due to symptoms that are often associated with physical causes (Dillon-Naftolin, 2016; Locke et al., 2015; Olariu et al., 2015). Many of the symptoms that were present in the sample of this study are also symptoms that are present in other health issues.

Essau et al. (2018) noted that the differences in presentation by developmental phases is largely ignored and has been overlooked by the current diagnostic classification systems in both the DSM-5 and ICD-10. My study confirmed the differences in symptoms among age groups such as the presence of abnormalities of heartbeat for patients aged 12-18 years old, and for patients 56-80 years old the presence of gastro-esophageal reflux disease and other disorders of the muscle. Dillion-Naftolin (2016) concluded in their study that children present initially to primary care settings with complaints of physical symptoms such as pain, stomach problems, headaches, or racing heart, which was confirmed in this study. Other symptoms that were noted by Dillion-Naftolin included fatigue, muscle tension and aches, sweating, trembling, hyperventilation, twitching, nausea, diarrhea, and irritable bowel syndrome, some of which were also present in the current study. One of the results of the current study that was conducted was that patients aged 2-18 years old presented similar symptoms such as abnormalities of heartbeat and headache. Sleep disorders were also noted as one of the most common symptoms in children ages 2-11 years old and this was consistent with the findings in the study by Dillon-Naftolin.

Burstein et al. (2014) concluded that there are age related differences in the symptoms and clinical course of GAD. The current study has confirmed by showing from the quantitative results that the symptoms are inherently different between age groups. One difficulty that was noted in the literature is the fact that children lack the cognitive or language ability to communicate the associated distress in terms of emotions, impairments, or avoidance. This lack of communication makes it challenging to precisely access the symptoms that are associated with GAD in younger children.

The comparison tables of this study confirmed that abdominal and pelvic pain, abnormalities of breathing, headache, nausea and vomiting, pain in throat and chest, and sleep disorders were present across all age groups. This finding provided pertinent information that clinicians can use to develop a screening tool that can be used by PCPs to help diagnose GAD in patients. As stated by physicians in the study by Chavira et al. (2014), many physicians find the current screening tools difficult to use, so using the data from this study and the commonalities of certain symptoms between age groups, an easier-to-use screening tool could be developed that allows PCPs to diagnose patients with GAD while still accounting for specific age group symptoms.

The theoretical framework that guided this study was the BPS theory of clinical care proposed by Engel in 1977. The BPS incorporates the social, psychological, and behavioral dimensions of illness. In his theory, Engel (1977) posited that disease is the result of the interaction between biological, psychological, and social factors. Biological factors include genetic and biochemical factors such as genes, viruses, and somatic parameters. Psychological factors include mood, behavior, and personality. Social factors

include familial, cultural, socioeconomic, and medical factors. The findings of this study and the confirmation of symptoms of GAD across age groups verified that illness incorporates the social, psychological, and behavioral dimensions. The sleep disorders that were found between the age groups could be attributed to certain psychological and biological factors combined with GAD. This Engel's BPS theory can be used to understand the originating source of these symptoms and assist in appropriate treatment and diagnosis.

Limitations of the Study

There were several limitations that affected this study. The first limitation that was identified was that data from primary care patient medical record data cannot be generalized to all health care system populations and all patients. The screening tools that are used in one healthcare facility to detect and diagnose GAD may not be used by other systems. Differences in how physicians diagnose and interpret the symptoms presented by patients could also affect the diagnosis and the study results. The lack of demographic data from the patients, also limits the generalizability of the results to the general population. Certain factors may contribute to patients' symptoms other than GAD and certain ethnic groups may be more susceptible to GAD than others. These specific social, physical, and mental health challenges that are more persistent in some ethnic groups over others can contribute to GAD symptoms and can also explain the prevalence of GAD in certain ethnic groups.

Another limitation that was found in this study was that there was no avenue to control for the way physicians interpreted symptoms presented to them from patients.

The written description in patient's records by the physicians can be subjective as some physicians may not be appropriately educated on how to interpret the symptoms that patients present. Olariu et al. (2015) noted that GPs had difficulty diagnosing anxiety disorders even with assistance. Assistance was defined as screening instruments, case finding questions, or severity measure scales. Some of the patients that are expressing symptoms of GAD are pediatric patients and their lack of ability to communicate the symptoms they are experiencing properly and effectively, or to connect situational information to those symptoms, can make it difficult to attribute their symptoms to GAD. As noted in the study by Dillion-Naftolin (2016), the necessity for assessment of anxiety in children stems from their lack of ability to communicate distress in terms of emotions, impairments, and avoidance. The language that is used in patients' medical records may not always have utilized ICD language, which also limited the generalizability of the study results.

The diagnosis code F41was used as a guiding baseline for the inclusion of data which according to the World Health Organization and Centers for Disease Control and Prevention is the recommended code for GAD. The patient data that was used in this study may not be appropriately coded with GAD, meaning some patient records may be coded with this when it is not accurate. A surprising finding this study confirms that physicians recognize an anxiety disorder in their patients even if they are not able to diagnose GAD. Reporting bias by physicians, clinical staff, or by the patient via self-reported measures, had the potential for bias. Internal validity threats to the study included that during the research period, other events may have influenced the

presentation of symptoms or the diagnosis of GAD. This study did not analyze changes in diagnosis or the factors that caused the change and that might have threatened the validity of the study findings.

Recommendations

Several recommendations for further research can be made from the results of this study. Conducting a study that collected demographic data and analyzed the results according to ethnicity could be valuable in determining symptomology differences between not only age but also ethnicity. Factors that may be attributed to specific ethnic groups could influence the symptoms individuals have in the presence of GAD. The study by Essau et al. (2018) was also limited in its generalizability because the sample only included individuals of European-American descent. The prevalence rates of anxiety disorders differ among ethnic groups, so conducting a study that used samples that were representative of various ethnic groups would provide more insight into the symptomology of GAD and what factors affect their presence across ethnic groups.

Studies such as the one conducted by Burnstein et al. (2014) confirmed that additional research needs to be conducted on the clinical characteristics of sub-threshold GAD in adolescents. Identifying these characteristics can help treat adolescents whose GAD has gone undetected or untreated because their symptoms did not meet the threshold. Given that this current study provided symptomology for GAD in a variety of age ranges, additional research should be conducted by clinical researchers to gain a better understanding and more accurate tabulation of the symptoms that are present in patients with GAD.

A more in-depth study should be conducted to analyze patient records over a specific period and account for any changes in symptomology that occurs which will provide a more accurate record of the symptoms associated with GAD. There is a high prevalence of sub threshold GAD in all populations, but these rates are higher in adolescents and older adults (Haller et al., 2014). Further research should be conducted to analyze and explore these sub thresholds and recognize these cases when presented in primary care patients by employing treatment algorithms.

General practitioners have been found to have difficulty diagnosing anxiety disorders even with assistance. Conducting further research to identify the challenges and difficulties general practitioners have in diagnosing GAD would be beneficial. This could be conducted using either, or both, a quantitative or qualitative research method. Future research is also needed to provide better and unbiased estimates of GP's recognition rates and diagnostic accuracy in age groups present in primary care.

An additional recommendation for further research was to include samples that also have other underlying diagnosed mental health disorders to explore whether the symptoms they present are only associated with GAD or are a result of the combination of disorders. This study examined the symptoms associated with GAD, but effective treatment options should also be studied. It would be practical to provide patients with a course of treatment or appropriate ways for them to manage GAD once they are diagnosed.

More population-based research using primary and secondary data retrieved from administrative health databases could provide a more complete understanding of the burden of anxiety in its various forms on the health care system.

Implications

Prior research found that there are currently no screening tools targeting GAD or other anxiety disorders in pediatric primary care settings, with children presenting as a particularly underserved group (Dillion-Naftolin, 2016; Essau et al., 2018; Gale & Millichamp, 2016; Panganiban, 2019). As of this publication, the USPTF published a draft recommendation for screening children and adolescents ages 8 to 18 for anxiety disorders in primary care settings (Canady, 2022). The recommendation did not address screening in younger children citing a paucity of research and the lack of accurate instruments both sensitive and specific to identify a given anxiety disorder (USPTF, 2022). For example, of the three studies identified by the task force, the sensitivity for detection of GAD ranged from 0.50 to 0.88 and specificity ranged from 0.63 to 0.98 (USTPF, 2022). While progress this development represents progress, there remains a gap in the knowledge base which addresses screen for anxiety disorders for younger children. There is also a lack of criterion for distinguishing normal situational and pathological anxiety in children (Essau et al., 2018). Because of this gap in screening tools and lack of criterion, a new DSM category should be created to account for these. This will assist PCPs in recognizing the symptoms of GAD in children and adolescents since it has proven to be a barrier (Aydin et al., 2020). Improving PCPs familiarity with initial symptom presentation in anxiety disorder can improve timely recognition. PCPs

have also found difficulty in using current screening tools due to both their lack of knowledge and clinical time with patients. It was suggested in the study by Chavira et al. (2014) that physicians should screen for anxiety disorders while investigating somatic complaints from pediatric patients. The screening process should occur early in the clinical process to prevent children from undergoing costly and invasive medical tests to formulate a diagnosis for their somatic complaints. This type of screening can only be done once appropriate screening tools are created for pediatric patients.

Results from this study will contribute to social change improvements for patients, providers, healthcare systems, analytical processes, and psychometrics. The findings of this study can contribute to initiatives to increase intervention efficacy and reduce health care utilization costs for patients with GAD (Olariu et al., 2015). Understanding the symptoms that are associated with GAD and the challenges that are present in accurately diagnosing patients with GAD can also provide these patients with improvements in diagnostic process and thus a better quality of life and reduced medical costs. Confirming the symptoms associated with GAD in younger patients can assist in better diagnosis for this group of patients to alleviate the underdiagnosis of this disorder because of their lack of communication of their symptoms in relation to anxiety-provoking situations. The development of an actuarial algorithm for healthcare systems' analysis and the decision process of policy makers and funders in healthcare systems can also be aided by this study. More importantly, the findings of this study can contribute to the development of age-specific screening tools and case finding instruments which could

facilitate improved recognition and diagnosis of those age groups currently with lowest diagnostics accuracy (Olariu et al., 2015).

The adoption of a case-finding instrument to enhance GP's suspicions of the presence of an anxiety disorder may be beneficial, as improving GPs' familiarity with initial symptom presentation in anxiety disorder can improve timely recognition. Better understanding of the bi-directional relationships between physical and mental health in the case of anxiety disorders, specifically GAD, could also result.

Conclusion

This study addressed gaps in the literature by identifying alongside affective symptoms, the specific physical symptoms of GAD that are recorded by PCPs and stratifying these by age. For this study, a quantitative approach was used to retrospectively review and analyze patient medical records. First, the results of this study found that the somatic complaints of GAD in primary care settings can vary by age group (Bryant et al., 2013; Combs & Markman, 2014). Although prior research has confirmed the differentiation of GAD symptoms by age, there is a lack of studies confirming these findings in the primary care patient population. Secondly, this study found significant differences in the somatic complaints listed by patients with a diagnosis of GAD presenting in primary care settings. These symptoms included: gastro-esophageal reflux disease, vomiting, abnormal heartbeat and headaches. Third, these results are aligned with the literature and confirm that without the aid of a diagnostic tool for GAD, PCPs are more likely to investigate individual somatic complaints. The absence of diagnostic tools can lead to ongoing unnecessary physical assessment rather than identification of

anxiety as the cause for the symptoms reported by patients. Finally, this study also provided support for the development of an algorithm to enhance PCP's suspicions of the existence of an anxiety disorder in their patients based on the identified somatic complaint clusters when stratified by age in children and adults.

Results from this study highlighted the need to develop an age-specific case finding algorithm to enable primary care practitioners to more readily identify and appropriately refer patients with generalized anxiety disorder. This study may contribute to social change improvements for these patients, providers, healthcare systems, analytical processes, and psychometrics.

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